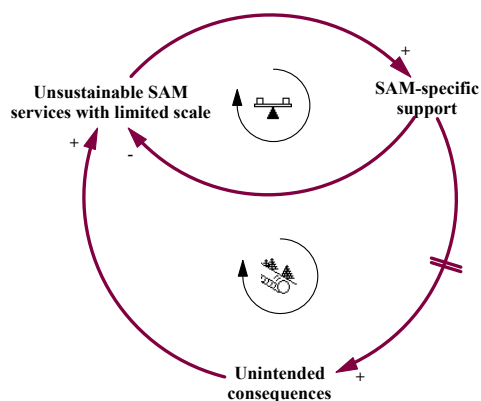


Understanding pathways of integrating severe acute malnutrition interventions into national health systems in low-income countries

Applying systems thinking to study
the complexity of health systems

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Per aspera ad astra

Executive summary

Worldwide, severe acute malnutrition (SAM) affects about 16 million children under 5 at any time and kills over half a million annually. Until 2000, few children with SAM were treated in hospital or temporary emergency centers often far from their homes. The advent of ready-to-use therapeutic food in the 1990s allowed treatment of uncomplicated SAM in decentralized primary healthcare and made scale-up possible. The global annual SAM treatment caseload grew from a few thousand in 2000 to over 3 million in 2014 in about 80 countries, but less than 20% of children with SAM received care. While significant progress has been made to make SAM case management routinely available in high-burden countries, weak national health systems lack capacities to sustain quality SAM services at scale, and accelerated change is required to cover the unmet need.

SAM interventions have aimed to support governments to achieve quality of care at scale. Their effectiveness has been studied in terms of service outcome, service access and cost-effectiveness, but not in terms of improved integration and sustainability of SAM services at scale has not. This study aimed to fill the void in understanding integration of SAM interventions by exploring what integration means, how integration has progressed beyond service provision and which factors have enabled or hindered the integration process.

The expected result of this research was the formulation of a refined theory that explains pathways of SAM integration. Recurring patterns of how integration of SAM interventions were uncovered by engaging health actors throughout the research steps. This refined theory may be tested in subsequent research inquiries (e.g., in real-time settings or system dynamics models) to deepen the understanding of how and why and in what circumstances policies or interventions improve integration (or not), and whether integration is desirable.

Methods

The study opted for a theory-driven approach to explore how and under what circumstances interventions produced the observed outcomes. This approach allowed studying concepts and pathways of integration and applying systems thinking to uncover the complexity of the health system. The theory-driven approach is method neutral, and allows mixed methods to refine or refute the initial theory. Different methodologies under the realist paradigm provided increasing insights into complexity by exploring how things worked in real-world settings and generated explanations of causal processes.

Because health systems are complex adaptive and social systems, and integration interventions and SAM interventions are complex interventions with unpredictable outcomes where context matters, a systems thinking approach was applied. This led to the use of multiple methods to explore the theory through various lenses and from different angles. From an epistemological perspective, the different methodologies

stimulated generative causation and cumulative learning from studying the various levels and aspects of health systems from different perspectives.

A scoping study provided information about concepts, policies, evidence and proposed research questions for the theoretical inquiry. It also provided knowledge for building the initial theory and theoretical framework for empirical testing in the case study approach. The research questions then informed the choice of mixed methods and the development of data collection and analysis tools. Analytical frameworks, indicators and system dynamics models were adapted to the empirical explorations.

Methodologies in the case studies used a framework approach to study dimensions, extent and factors influencing progress outcome, taking into account the complexities of integration and studying interactions and system dynamics. The causal loop analysis made visible mental models of causality and feedback loops of integration determinants and as such provided opportunities to discuss complexity and constraints and ways to mitigate those constraints. The CLD then helped test scenarios and explore the consequences or effects of probable decisions or perturbations.

Agent-based modelling provided bottom-up learning by simulating the complexity of SAM interventions. The micro-level model mimicked a community environment of one health centre and children with SAM with their carers, and a meso-level model mimicked a district health subsystem with health centres and clients. The conceptual model was developed from parameters and if-then rules based on evidence and assumptions from tacit knowledge of experts to mimic a situation from a high-burden, low-income country. Changes were introduced in the model by modifying transition rules and using history and time to uncover patterns behind probabilities in order to deepen insights and foster new knowledge from unexpected behaviour.

Results

First, a **scoping study** explored concepts, policies and evidence on integration of health intervention into national health systems that were relevant to SAM and uncovered the evidence and progress of SAM integration to date.

The concept of integration and its attributes and the evidence of its effects were explored in the literature. Integration had various meanings and dimensions, but there was agreement that integrated health services were desirable for clients to receive cost-effective continuity of care that responded to their needs and expectations. It was generally assumed that integrated services promoted collaboration, teamwork and rationalised use of limited resources that then contributed to improved sustainable services at scale. We identified the following modes of integration of interventions: add-on (unidirectional) or merged (bidirectional) services; a package of services, a one-stop-shop (single provider) or referral-based services; a continuum of non-integrated through partially to fully integrated services; and vertical, horizontal, mixed (diagonal) or virtual integration.

Different dimensions of integration indicated the importance of looking at integration beyond service delivery. At the micro level, from the perspective of a client, clinical integration of SAM means comprehensive care across time, space and the lifecycle. Professional integration is working in collaboration or in teams, and combining and sharing tasks, information and resources. Organisational integration is forming working alliances. Systemic integration is coherence of policies, rules and regulations. Functional integration aligns funding, information, human resources and supply systems. Normative integration ensures shared values, culture and vision. Because integration of health interventions is a process, the intensity of integration across dimensions and tiers is not homogeneous; it is more complex than the yes-no binary form. Determinants or factors that boost or hinder the integration process may explain the patchwork results of the extent of integration. Factors that affect the extent and speed of integration may relate to the health problem, the interventions, the process of adoption, health system characteristics or the broader context.

The *policy map* found a large base of guidance and tools that had been developed to support planning, implementation, scale-up and evaluation of SAM. Most SAM policies and guidelines were based on evidence from biomedical or effectiveness studies with a probabilistic nature. These explained whether interventions worked but not how and why they worked under what circumstances.

While integration of SAM interventions was often discussed and put high on the research agenda, there was limited guidance based on understanding. A wealth of guidance and evaluations on SAM implementation existed, but not on how to assess the need and improve integration or what modalities to consider. The current guidance focused on scaling up SAM case management based on best practice, and on integrating SAM into an existing package of integrated community-case management (iCCM), and infant and young child feeding into SAM case management.

The *evidence map* of health service integration provided learning on the various modes of integration of services, resulting in positive perceptions of integrated services but small gains in effectiveness or added value. The literature on integrating SAM services into primary care as a new intervention (or into secondary care as a newly adapted intervention) studied service outcome (contact coverage; barriers to access to services; and performance indicators of recovery, case-fatality during treatment and defaulting; and capacity by number of admissions). Three studies reported on cost effectiveness. Evidence of SAM treatment integration came from two studies, one on integrating treatment of SAM into iCCM in a pilot setting and another on integrating HIV testing and treatment into SAM case management in a hospital setting. Both studies showed promising results. The studies deduced whether SAM service integration worked (or not), but did neither explain how or in what circumstances the service outcome came about, nor provided guidance for other settings. They studied neither sustainability nor the contribution of technical and financial support to the outcome. Evaluations of the countries studied identified that similar support for SAM interventions had been provided, but the mode of introduction (emergency or development context), breadth (amount), depth (detail), duration (in years) of technical and financial support and many other

factors that were not studied differed. The strategic visions or plans for integrating SAM interventions were similar from the perspective of clinical integration, described in national nutrition strategies and/or SAM guidelines: SAM services were provided in determined geographical areas or countrywide and/or scaled up in phases that partially or completely covered the countries. However, guidance did not set integration priorities or plans for achieving comprehensive child healthcare. In most settings, SAM service integration was assumed achieved and therefore strategic plans had not been developed or progress monitored. SAM services were commonly provided with (in parallel to) or added to existing services, or were 'referral-based' when children were referred to other health facilities for treatment. In many hospitals, SAM services were provided outside paediatric departments, with their own staff and different supply and support systems. Community-based service components were often provided in parallel systems and managed by (international) non-governmental organisations. An issue of concern was reliance on external emergency funding with short-term cycles of technical and supply support, with supplies accounting for one-third of the cost of SAM treatment (that in most cases were imported).

The *global map* of systemic integration progress resulting from SAM-specific support interventions revealed a certain level of integration and mixed picture of progress. Because integration was assessed superficially from a systemic and SAM-specific focus, it was not possible to judge whether the mode of integration balanced the need and capacities, or achieved comprehensive child healthcare. For example, SAM may have been added to health policies under the nutrition pillar but not the child health and disease pillar; the division of child health and nutrition in separate pillars was common, which may have emphasised the importance of interventions but may have hampered comprehensiveness of continuum care.

The scoping study concluded that understanding factors (and their interactions) that influence the extent and speed of the integration progress would allow health actors to strategize integration based on need and capacities. It also suggested applying systems thinking, because SAM interventions are complex as their integration into a complex health system creates unpredictable consequences. The scoping study retained six questions for empirically exploration pathways of SAM integration into national health systems through case studies:

1. In which contexts is SAM integrated?
2. Is integration set as a goal, and if so, why and how?
3. What is the extent (and trend) of the integration process?
4. What factors facilitate or hinder the integration process?
5. How do factors that influence integration interact?
6. What scenarios can be identified to improve SAM integration, and what strategies can be proposed to overcome unintended consequences?

Second, the scoping study informed the **building of the initial theory** and theoretical framework. The following initial theory was proposed:

If health actors have a shared understanding of the integration pathways of SAM interventions in a given health system, then they can have a shared strategic vision of integration and propose customized, adapted interventions that seek the optimal modality and degree of integration in terms of need and capacity of the health system by applying systems thinking.

Analytical frameworks, indicators and system dynamics models were developed and proposed for various methods in the empirical exploration in the case studies.

Third, the **Niger case study** explored the breadth and depth of integration of SAM interventions into Niger's national health system to empirically test the initial theory. We first investigated the SAM burden, intervention strategy and performance, policy context and health actor involvement. We then measured the extent of integration and explored factors that influenced the progress and trend of integration. A multi-framework approach studied the extent of systemic, organisational, functional, professional and clinical integration from national and district perspectives. Niger's SAM guidelines described a clinical integration strategy. Interventions to treat complicated and uncomplicated SAM were to be provided in all health facilities of the country in either an 'add-on' or 'referral-based' mode (i.e., in health posts without nurses) with a referral and counter-referral system between the care components. Community-based SAM interventions were to be provided through community outreach, which in practice was limited to child health days or outsourced to NGOs that implemented the interventions in a parallel system that included referral to treatment. The extent of integration was assessed over three time periods (2007, 2010 and 2013) and showed a patchwork of progress. Full integration was achieved in four health system functions, partial integration in 22 and no integration in three, with six functions showing stagnation over the three time periods.

Factors that facilitated integration were knowledge and recognition of the SAM problem, supported by accurate information; effectively decentralised continuity of care; compatibility with health actor goals, support and involvement; and leadership for aligning policies and partners and mobilising resources in a favourable political context driven by multisectoral development goals. Factors that hindered integration were incomplete understanding of the severity of the SAM problem and its causes and consequences; limited utilisation of and trust in health interventions; high health worker workload, turnover and attrition; and high dependence on short-term emergency financial and technical support in a context of high demographic pressure.

The case study concluded that SAM integration in Niger had progressed well with limited integration-specific support but then stagnated. SAM-specific support interventions improved integration up to a point, but sustainability of service quality and financial support was a major concern. The same problems had been identified before, but the linear solutions proposed never broke the impasse to cover the unmet needs. A systems thinking lens could have been more useful in identifying weaknesses and opportunities to unlock untapped capacities for sustained change.

Fourth, two **case studies in Nepal and Burkina Faso** explored the integration of SAM interventions into the national health systems by testing the initial theory with a framework and a system dynamics approach. A rapid and participatory assessment explored perceptions of integration dimensions (systemic, organisational, functional, professional and clinical) at the levels of national governance, district management and service delivery (including community and facility-based primary care and secondary care), as well as factors that facilitated and hindered the integration process.

The collaborative investigation involved a large group of health actors from various backgrounds who ‘learned together by doing’ by applying a systems thinking lens and conducting a causal loop analysis to explore the complexity of the health system. Causal loop diagrams described interactions of factors that influenced integration and allowed thinking through probable scenarios and their effects to recommend actions to anticipate negative effects. Participants found the CLD method innovative and eye opening, and understanding and applying systems thinking to deal with complexity inspiring, even if the results were incomplete or not comprehensive. The exercise gave insights into finer-grained explanations of a complex (wicked) problem and the inadequacy of linear solutions to solve complex problems.

Fifth, a case study explored the integration of SAM interventions with **agent-based modelling** (ABM) progressing from a micro-level model to a meso-level model mimicking a real-world situation. The first model mimicked a health facility environment with two agents: 1) children with SAM and their carers that were aware of the illness and the treatment pathway and lived a certain distance from the health centre and 2) a health centre that provided quality care and had motivated staff. Outcomes of interest were coverage, recovery and case-fatality. Multiple scenarios were investigated using varying parameters and mimicking rules of interventions to improve child health-seeking behaviour (e.g., providing counselling and assisting with transportation) and health centre performance (e.g., providing training and improving supervision). Results pointed to synergies between interventions that improved early start of treatment and increased recovery from SAM. When these interventions were adequately combined, outcomes of coverage, recovery and overall survival improved.

Building on the first application, the second model was expanded to represent a health district with more than one health centre interacting with its clients. Subsequent steps started from the basic model of one centre and no intervention. Results showed first baseline outcome variables of recovery, coverage and case-fatality in the community. Second, we simulated three health centres with the same incidence and initial characteristics and rules. Recovery and coverage were slightly worse than the results for one centre. Third, we introduced rivalry between centres, with children and their carers choosing health centres with better quality. When all children were admitted in the centre with better quality, recovery was indeed better, but coverage and case-fatality remained similar. Fourth, we introduced caseload, assuming that health centres with a caseload higher than capacity would affect quality and then also the other characteristics. Results

showed no advantage from the choice of a centre with better quality, and the superior quality of one centre did not persist over time. Fifth, we introduced close and remote location of health centres. Both recovery and coverage were better in the close health centre than in the remote one, but these results were not sustained. This may be because the close centre with better quality attracted children but eventually lost its advantage because increased workload affected health worker performance, so children returned to the poorer performing centres. In a sixth step, various scenarios were tested to overcome the bottlenecks. Increasing capacity alone or quality and motivation of staff alone did not improve outcome. Increasing quality and motivation of staff in all centres, increasing awareness of the SAM problem and reducing the distance of the centres produced the best outcome.

The case study showed that expanding and changing the ABM model by introducing different factors that influence integration generated new learning each time. It showed ABM's potential to test scenarios by adapting intervention strategies or changing policies and to learn from emerging patterns of new behaviour. As models were based on simple rules, they did not provide a full or realistic picture of a real-world setting, but they added learning from testing scenarios that could not have been possible otherwise.

Discussion

Learning from applying various theoretical lenses and methods of empirically exploring the initial theory was synthesised by:

- Comprehensive child healthcare balances SAM as a public health priority;
- A strong model of comprehensive child healthcare in primary care adopts SAM;
- Motivating and empowering health actors stimulate comprehensive child healthcare;
- Flexible health systems maximise synergies and optimize resources; and
- Collaborative leadership with a vision creates networks and supports change to adapt policy design and implementation to changing contexts and needs.

The analysis of these patterns in throughout the case studies led to the following refined theory:

Understanding integration pathways and the complexity of the health system environment enables health actors to ...

- *Recognise SAM as a public health priority that receives sufficient and balanced attention according to people's needs (the problem);*
- *Simplify SAM services to fit into comprehensive child healthcare (the intervention);*
- *Motivate and empower actors and teams to provide comprehensive child healthcare (adoption system);*
- *Flexibly adapt health system functions to changing contexts (the health system);*
- *Create collaborative leadership with a vision of networking and supporting*

- change (the broader context); and*
- *Apply systems thinking to maximise synergies and minimise unintended consequences and build skills to adapt integration strategies to fast-changing complex contexts,*

... which identifies customized, adapted SAM interventions that seek the optimal modality and degree of integration in terms of need and capacity of the health system by applying systems thinking,

... which improves integration of SAM services,

... which contributes to sustainable, quality SAM services at scale that promote comprehensive child healthcare and improve child health outcome.

The theory-driven approach was appropriate because it allowed identifying causal inferences from a variety of methods and multiple perspectives confronting various opinions and context to deepen our understanding of a fuzzy subject. The knowledge and learning from the various methods and study settings that uncovered pathways of the integration process led to abstractions for refining of the theory.

From an epistemological perspective, the use of different methodologies stimulated flexibility in learning from various levels and aspects of health systems in different ways, depending on their ontological and epistemological positions. Through retroductive reasoning, we aggregated insights by moving iteratively from theory to empirical evidence and back to theory. In addition, learning flowed from a broad base, mixing results of qualitative and quantitative research on evidence and practices. The case studies, using a framework approach, focused on specific aspects of the extent of integration and factors influencing integration, but kept the macro perspective and added a system dynamics perspective that showed how tiers in the health system interacted to produce outcomes. Finally, the ABM approach provided micro-level learning from the bottom up.

The study did not aim for generalisations. Instead, cumulative learning from the case studies generated a sufficient level of abstraction of integration pathways to refine the theory, which is transferrable to other settings. Nonetheless, the refined theory is still very general and needs further testing for refinement to increase its relevance. The study methods generated both similar and different explanations, which may indicate that the problem we studied is wicked (e.g., lacking a final explanation; suggesting one acceptable explanation with a temporary validity; different perceptions giving different explanations). This wicked nature of integration points to the need for a paradigm shift in decision-making about the organisation of health services. Health actors need to learn to manage uncertainties that cannot be handled only in 'ideological' ways through constructivist approaches, but with methods that provide general rules, with enough abstraction, that allows adapting policies or interventions and learning to new contexts.

Limitations. Because the integration of SAM interventions is a wicked problem, different researchers may propose different programme theories with different plausible explanations. Continued research will further test and refine the theory to complete the

learning. Joint learning evolved, and the collaborative work with key health actors was stimulating, but the study would have benefited from debate among a larger team with mixed expertise. Confusing terminology on health system interventions and integration misled the literature review, which probably could have discovered more learning. Case studies suffered from contextual and time constraints, and data collection methods and tools had to be adapted to the circumstances and could not produce the rigour initially planned. The participatory methods and progressive collaborative validation partially made up for the shortcomings.

Recommendations. The study did not propose an assessment method or tool to monitor integration of SAM into health systems. However, it found value in adding a few indicators of integration and systems thinking to the district bottleneck analysis tool to measure progress and stimulate strategic planning with a systems thinking lens. The findings could be the basis for consultative meetings with health actors to strengthen knowledge and skills to contribute to health system strengthening, integration and systems thinking.

This study encourages continued research to further explore integration and expand learning. Suggestions include: 1) evaluating missed opportunities in current SAM implementation using a realist evaluation method to uncover what worked for whom in what circumstances, and 2) studying the effectiveness and impact of integrating SAM into child healthcare by simulating system dynamics by stock and flow diagram or ABM. The study could be expanded to study comprehensive childhealth care, or the implementation of the multisectoral nutrition strategies that are being rolled out in many countries.

Conclusions

While evidence is increasing on the integration of health interventions into primary care, few studies have applied a systems thinking approach to consider complexity, and few have studied comprehensive child healthcare that includes SAM. We used different methodological approaches to deepen our understanding through cumulative learning of the extent and progress of integration. The theoretical lenses zoomed in to the community level and out to the national level, and meandered in various ways to generate causal explanations and identify recurrent causal patterns from various perspectives. Even then, the picture of pathways to integrate SAM was incomplete.

The applications and results of the study methods showed that the participatory approach of the inquiry cleared the fog around a fuzzy subject and deepened participants' understanding of integration. In addition, making mental models explicit through the application of systems thinking methods facilitated dialogue on integration improvement and demystified complexity.

As such, our initial learning about integration pathways may inform policy guidance to improve comprehensive child healthcare and the lives of millions of malnourished children. We hope that this study will inspire and encourage further research to gain more insights into integration using a systems approach.

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Abbreviations

Aka	Also known as
ABM	Agent-based modelling
BOT	Behaviour-over-time graph
CB PHC	Community-based primary healthcare
CBO	Community-based organisation
CCM	Community case management
CHD	Child health division
CHW	Community health worker
CLA	Causal loop analysis
CLD	Causal loop diagram
CMAM	Community-based management of acute malnutrition
CMO	Context-Mechanism-Outcome configuration
DALY	Disability-adjusted life years
DHMT	District health management team
DHO	District health office
EPI	Expanded programme on immunization
ETAT	Emergency triage assessment and treatment
FB PHC	Facility-based primary healthcare
FCHV	Female community health volunteer
FGD	Focus group discussion
FP	Family planning
GAM	Global acute malnutrition
HIV	Human immunodeficiency virus
HMIS	Health management information system
HPSR	Health policy and system research
HSS	Health system strengthening
HW	Health worker
iCCM	Integrated community case management
ICT	Information and communication technology
IMAM	Integrated management of acute malnutrition
IM(N)CI	Integrated management of (neonatal and) childhood illness
IPTM	Intermittent preventive treatment for malaria
IR	Implementation research
IYCF	Infant and young child feeding
KII	Key informant interview
LHW	Lay health worker
L(M)IC	Low-income (and middle-income) country(s)
M&E	Monitoring and evaluation
MAM	Moderate acute malnutrition
M(N)CH(N)	Maternal (newborn) and child health (and nutrition)
MOH	Ministry of Health
MRT	Middle range theory
MSNP	Multisectoral Nutrition Plan
MUAC	Mid-upper arm circumference
NGO	Non-governmental organisation
NRH	Nutrition rehabilitation home
PHC	Primary healthcare

PLW	Pregnant and lactating women
PMTCT	Prevention of mother-to-child transmission of HIV
RCT	Randomised controlled trial
RHD	Regional Health Directorate
RUTF	Ready-to-use therapeutic food
SAM	Severe acute malnutrition
SHC	Secondary healthcare
(S)RH	Sexual and reproductive health
STI	Sexually transmitted illness
TBA	Traditional birth attendant
TFP	Technical and financial partner
UN	United Nations
Under 5	Child under 5 years of age
UNICEF	United Nations Children's Fund
VDC	Village development committee
VHC	Village health committee
WFP	World Food Programme
WHO	World Health Organization

Acronymes

ASBC	Agent de santé à base communautaire
ATPE	Aliment thérapeutique prêt à l'emploi
CHR	Centre hospitalier régional
CISSE	Centre d'information sanitaire et de surveillance épidémiologique
CMA	Centre médical avec antenne chirurgicale
COGES	Comité de gestion
CPN	Consultation pré- et postnatale
CREN	Centre de récupération et d'éducation nutritionnelle
CSPS	Centre de santé et de promotion sociale
DN	Direction de la nutrition
DRS	Direction régionale de la santé
DS	District sanitaire
ECD	Équipe cadre de district
IRSS	Institut de recherche santé et société
MS	Ministère de la santé
OBCE	Organisation à base communautaire d'exécution
OMS	Organisation mondiale de la santé
PAM	Programme alimentaire mondial
PCIMA	Prise en charge intégrée de la malnutrition aiguë
PCIME	Prise en charge intégrée des maladies de l'enfant
PEC	Prise en charge
PEV	Programme élargi de vaccination
PFNR	Point focale nutrition de la région
TPS	Tradipraticien de santé
UCL	Université catholique de Louvain
UNICEF	Fonds des Nations unies pour l'enfance
VBC	Volontaire à base communautaire

Preface

Being in difficult places at the right time drew me into the quest to integrate severe acute malnutrition (SAM) interventions into routine health services. It all started in 2013, when I headed a large emergency health and nutrition programme for Save the Children in Ethiopia, covering emergency hotspots across the country. We were tasked to open 20 temporary therapeutic feeding centres with 100-bed capacity in various districts to treat children with SAM, amongst other responsibilities. Each time we opened a centre, we filled it the same day with severely ill children and were obliged to instantly double the bed capacity. Children who came late in the progress of disease had a high case fatality. Children who came early survived and were cured in a very short time. Population assessments taught us that there were many more children with SAM whom we were not reaching.

We were lucky that outpatient case management was being piloted in the country on a small scale with a new ready-to-use therapeutic food, yielding good results. We managed to convince the government to adapt the national SAM treatment protocol and allow treatment in primary care. As such, we could provide SAM treatment in all health posts in ten districts and increased SAM case management capacity to levels unseen before. Unfortunately, the next summer, when the nutrition situation had improved and donor emergency funding had ended, we were obliged to end all services while there were still many children in treatment. We made a major plea to the government and donors to continue the services as part of routine child healthcare. That time we did not succeed.

Three months after our activities had ended and staff had left and found new work elsewhere, the government was obliged to restart SAM services in the same health facilities for the same communities. Capacities had to be rebuilt from scratch with inexperienced new staff. Lessons were learned, but late and at a cost. Subsequent emergency responses (e.g., civil strife in Darfur, food insecurity in the Sahel and Southern Africa, earthquakes and floods in Haiti and Pakistan) uncovered the high but often hidden baseline burden of SAM and efficient strategies to tackle the problem. From then onward, in high SAM burden countries, the focus of financial and technical partners turned to strengthen national and local governments' capacities to provide SAM case management in routine child healthcare and build their resilience to nutritional crisis.

Expertise has expanded and coverage improved, but major challenges remain in managing acute malnutrition. This study aims to contribute to the understanding of and learning on improving SAM interventions to hopefully improve the lives of children and their families.

PART I. STUDY CONTEXT

CHAPTER 1.

Formulating the problem and purpose of the study

Severe acute malnutrition (SAM) in children under 5 is a serious public health problem in many low-income countries, and is the focus of the research study. This introductory chapter provides first an overview of the burden of SAM, SAM interventions—drawing a situational map of how SAM has been addressed to date—, capacity of health systems and health actors who involve in SAM interventions. Next, a justification of the research study and an explanation of how the research questions were retained are provided. To facilitate reading, Annex 1 lists study definitions of key concepts used throughout this document.

i. Severe acute malnutrition, a public health problem

SAM is a serious illness in children under 5, caused by infection or by inadequate food intake or absorption. It is characterised by two different forms of undernutrition, severe wasting (clinically known as marasmus) and nutritional oedema (clinically known as kwashiorkor) [1]. SAM is related to a combination of determinants, including dietary intake, illness, care and the health environment [2]. The World Health Organization (WHO) defines SAM by either mid-upper-arm circumference (MUAC) less than (<) 115 mm or weight-for-height z-score (WHZ) below minus 3 standard deviations from the median of the WHO Child Growth Standards or the presence of bilateral pitting oedema [3].

Burden of disease

Children with SAM have an altered metabolism that weakens their immune systems and makes them more susceptible to illness, hampering good health and development. Their risk of death is nine times higher than that of well-nourished children [4]. SAM incidence in high burden low-income countries increases seasonally to peak in the lean season and often coincide with other infectious diseases incidence peaks such as diarrhoea, pneumonia or malaria [5].

Malnutrition not only affects survival but also impairs physical growth, cognitive development, reproduction and physical work capacity and increases risks for several adult-onset chronic diseases [6] even after effective treatment [7]. Children who are wasted are often stunted, which increases the risk of infection and mortality further [8]. Cumulative risks, as one study found, showed a 12-fold increase of mortality from SAM combined with malaria and stunting [9]. Risks of developing SAM and dying are exacerbated during humanitarian emergencies because of increased food shortages and nutrient imbalances, increased risk of infectious diseases from water and sanitation breakdowns or reduced access to essential services [10].

In 2014, SAM affected 16 million children under 5 worldwide [11] and was responsible for 500,000 child deaths annually [4]. While SAM received more attention in sub-Saharan Africa than elsewhere because of recurrent emergencies, the majority of children affected with SAM live in countries in East and South Asia [12] that have large under 5 populations. Figure 1.1 shows the distribution of SAM prevalence in 2015. Asia contains 60% of the burden of SAM spread over 19 countries, and sub-Saharan Africa contains 25% spread over 40 countries. For example, in Niger¹ during the 2010 emergency, the prevalence of SAM oscillated around 3%, affecting 87,420 children at any given time [13]. In India² in

¹ The Niger under 5 population was 3 362 293 in 2010.

² The India under 5 population was 124 441 134 in 2014.

2014, the national prevalence of severe wasting was 4.6%, affecting 5,72 million children at any given time, thus accounting for one-third of the global total burden [11].

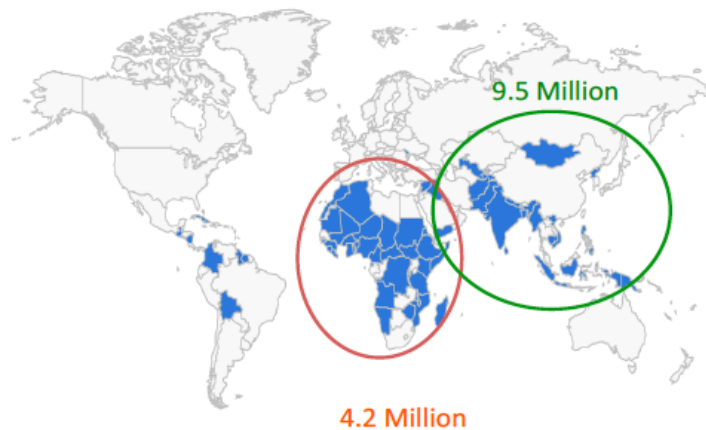


Figure 1.1. Countries with SAM prevalence above 1% (coloured)[11]

SAM interventions

Inpatient case management of SAM has always been part of paediatric care, and until the application of the 1999 WHO treatment protocol, it was characterized by high case-fatality and low coverage [14]. Inpatient care has also been provided in various forms in nutritional rehabilitation centres in development and emergency contexts. It was possible to manage high caseloads in *therapeutic feeding centres* during humanitarian actions when skills and other resources for the highly specialised care were available as part of the emergency response.

Evolution of SAM case management

Shortcomings of inpatient care included centralised care with limited reach, the risk of nosocomial infections, long and expensive hospital stays for SAM children that were clinically well and had appetite and opportunity costs for carers. These challenges led in the 1990s to research into a ready-to-use therapeutic food (RUTF) that had the same ingredients as therapeutic milk, had no risk of bacterial growth and thus could be consumed at home. The subsequent availability of RUTF from 2000 onward enabled a paradigm shift to treating children with SAM without medical complications (accounting for about 80% of SAM cases) in decentralised care closer to their homes until recovery. Treatment protocols were adapted and outpatient case management piloted. The emerging evidence of effectiveness [15-17] paved the way to offering decentralised SAM outpatient care at scale. It took until 2007 for United Nations (UN) agencies to endorse the new treatment approach [18] and support ministries of health in taking on and scaling up SAM outpatient care.

Concurrently, improved surveillance systems highlighted a consistently high burden of SAM in both post-emergency settings and countries with stable conditions [12] promoting the inclusion of SAM case management in child survival strategies [19]. Moreover, the global child survival impetus put pressure on national governments to reach the Millennium Development Goals (MDGs) [20] and encouraged donors, governments and their emergency and development partners to invest in multisectoral nutrition strategies to address the determinants of malnutrition, which included case management of SAM in high burden countries.

While in 2000 very few countries reported on SAM, in 2014 about 80 countries reported on SAM services, of which 13 countries offered in most of their primary care facilities. Global annual SAM treatment coverage grew from a few thousand in 2000 to 1 million in 2009 and over 3 million in 2014 (Figure 1.2). However, expansion did not spread homogeneously within and across countries, and was slow considering that in 2014 less than 15% of children under 5 with SAM received care [21].

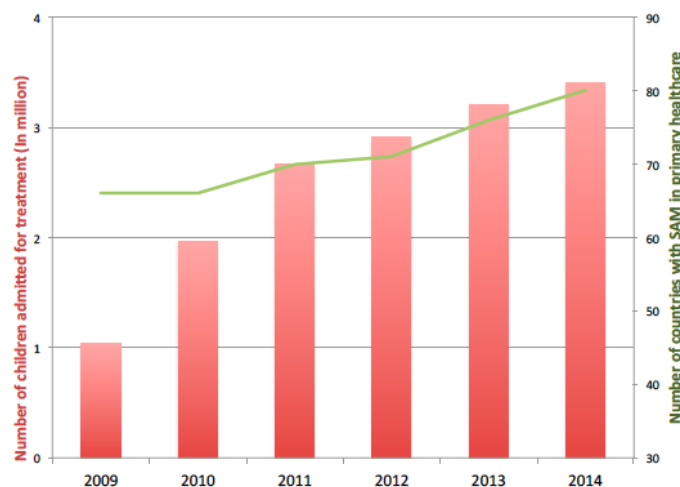


Figure 1.2. Global annual numbers of children under 5 treated for SAM since the start of global tracking in 2009 [21]

SAM service package

SAM treatment protocols (and organisation of services) followed evolving guidance [3, 18, 22, 23]. Because normative guidance became available late, non-governmental organisations (NGOs) with expertise with financial partners took the lead in introducing and scaling up of SAM services in a vertical, bottom-up, parallel system. As a next step, national governments became more involved and gradually took on the services. National guidelines were developed that sought alignment with national policies and drug treatment protocols. National protocols and service implementation varied according to the level of involvement of national and international health expertise, the pace of

adopting new evidence or global guidance, and countries' openness to innovative health practices.

The usual package of interventions put in place for SAM case management in children under 5 is described here. In line with the WHO definition of a health intervention [24], this study defines a SAM intervention as a SAM-specific clinical, public health or policy intervention that is a single activity or set of activities aimed at modifying a process, course of action or sequence of events to change one or several of its characteristics (e.g., individual SAM treatment process and outcome, population health outcome, SAM clinical quality of care, performance of SAM services). The package of SAM interventions varied but commonly included:

- Community engagement to create awareness of the acute malnutrition problem and generate demand for treatment and engagement in active case finding and referral for treatment;
- Outpatient management of uncomplicated SAM until full recovery;
- Community-based or outpatient management of moderate acute malnutrition (MAM) until full recovery; and
- Inpatient management of SAM with medical complications for stabilisation in 24-hour care followed by referral to continued outpatient treatment.

The package of interventions was called 'integrated management of acute malnutrition' (IMAM), or 'community-based therapeutic care' (CTC) or 'community-based management of acute malnutrition' (CMAM) depending on the country's implementation strategy or influence. Key to all for effective care was active community screening for early detection and start of treatment. A continuum of care approach tracked children with acute malnutrition and their carers (e.g., mothers) across the service components (in time and space). Children were vertically referred to higher and lower healthcare levels if their situation worsened or improved, and horizontally benefited from immunization or other child health services as needed and available. Depending on the setting and capacities, SAM interventions were linked where possible with promotive, preventive and other curative health and nutrition interventions, as well as social safety nets targeting vulnerable populations in the community [25].

Table 1.1 lists the service activities of SAM interventions for the respective delivery platforms of community-based primary healthcare (CB-PHC), facility-based primary healthcare (FB-PHC) and secondary (and tertiary) healthcare. Service activities and platforms could be fluid. For example, in some settings treatment of SAM was provided in the community (also known as [aka] community case management) or mobile teams operating from the FB-PHC to provide case management in outreach sites for remote or vulnerable populations.

The tiers of the healthcare system involved in SAM case management service delivery, organisation and governance bottom up are (Figure 1.3):

Table 1.1. Package of SAM services, by delivery platform

Service delivery platform	SAM services
Community-based primary healthcare	1. Health and nutrition promotion for awareness creation and demand generation, social and behaviour change and enhanced case finding 2. Community engagement for social mobilisation and involvement in design, planning, service delivery and use and monitoring, including contributing resources 3. Active case finding based on anthropometry (mid-upper arm circumference [MUAC] and presence of bilateral pitting oedema) 4. Referral for treatment 5. Home visits to problem cases 6. (Integrated) community case management (CCM or iCCM), where applicable 7. Linkage with preventive and other curative health and nutrition initiatives and social safety nets
Facility-based primary healthcare	1. Health and nutrition counselling to improve awareness, treatment adherence and behaviour change 2. Routine case finding 3. Anthropometric assessment 4. Clinical assessment: Initial (and repeated) assessment of danger signs, diagnosis and triage (per integrated management of childhood illness [IMCI]), including an appetite test 5. Referral and counter-referral 6. Treatment initiation 7. Monitoring of treatment progress through follow-up visits, evaluation of response to treatment and ending treatment 8. Treatment counselling on care and feeding practices, emotional stimulation of the child and psychosocial support of the carer 9. Registration, record keeping, monitoring and reporting
Secondary (and tertiary) healthcare	1. Health and nutrition counselling to improve awareness, treatment adherence and behaviour change 2. Routine case finding 3. Anthropometric assessment 4. Clinical assessment: Initial (and repeat) assessment of danger signs; diagnosis; emergency triage, assessment and treatment (ETAT) and in-depth examination 5. Referral and counter-referral 6. Treatment initiation 7. Monitoring of treatment progress through continuous evaluation of response to treatment and discharge to continued (outpatient) treatment 8. Counselling on care and feeding practices, emotional stimulation of the child and psychosocial support of the carer 9. Registration, record keeping, monitoring and reporting

- Primary care for uncomplicated SAM, delivered in community-based services, outreach services organised from the health facility (mobile units) and facility-based services;
- Secondary (and tertiary) care for complicated SAM, delivered in district and (sub)national hospitals or equipped health centres with inpatient care facilities;
- Operational management and governance, provided by the district and (sub)national health management system.

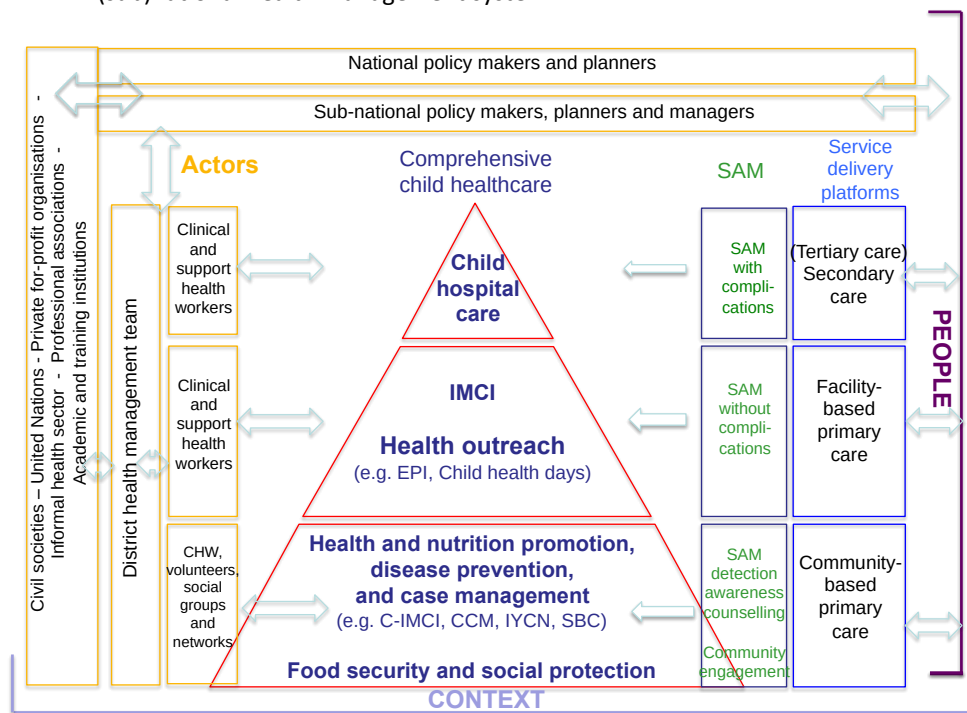


Figure 1.3. SAM interventions by delivery platforms and health actors

CCM = Community case management; CHW = community health workers; (C-)IMCI = (Community) integrated management of childhood illness; EPI = Expanded programme on immunization; IYCF = Infant and young child feeding; SAM = Severe acute malnutrition; SBC = Social and behaviour change communication.

SAM services provided through the CB-PHC platform typically included promotive and preventive health and nutrition interventions. In recent years in certain countries, curative SAM service activities were added to CB-PHC (as community case management [CCM]). In some settings, integrated community case management (iCCM) providing disease-specific curative care for diarrhoea, malaria and pneumonia included SAM treatment, e.g., on a small scale in Bangladesh, Mali, South Sudan and on a large scale in Pakistan [26]. More rare or in some emergency settings, SAM-specific CCM was provided by mobile roving teams set up by governments or by technical partners. Community-based activities for SAM were usually organised by private non-profit partners (NGOs or community-based organisations [CBOs]) that were better skilled, equipped and funded to reach remote or underserved populations than their colleagues from the public health sector.

Outpatient SAM services in the FB-PHC platform were provided in health centres, health posts, clinics or dispensaries, mobile units or hospital outpatient departments. Children were diagnosed and start treatment with antibiotics and the RUTF, which is the medicinal replacement food, consumed at home for an average of 6 weeks until recovery. Weekly follow-up visits to health facilities allowed monitoring of adherence and response to treatment, identification of problems and replenishment of RUTF. Which SAM services were offered through which platforms depended on the national health system structure and policies and the availability of competent health workers and supplies. For example, community health workers (CHWs) based at health posts, clinics or dispensaries (the lowest level of health facilities) detected and referred SAM cases but did not provide treatment. Community health outreach (organised from a primary healthcare facility, involving mobile teams conducting scheduled health extension visits or campaigns targeting populations rather than individuals) included SAM detection and referral in case treatment services were available. Inpatient SAM service activities were organised in secondary healthcare at hospitals or health facilities with 24-hour bed capacity, competent staff and essential supplies. Hospitals in high burden countries commonly had dedicated SAM wards separate from the paediatric wards, which were often better equipped and staffed because of availability of external resources and support.

The district management level was responsible for the organisation of essential health services, including for SAM, defined by needs-based action planning and budgeting of national policies. The organisational management of SAM at district management level included, e.g., ensuring an expanded staff with expertise by continual in-service or on-the-job training and supportive supervision; forecasting supply needs and managing supplies; monitoring performance; coordinating actors and services at the same level and across levels by linking intra- and inter- levels and sectors; engaging communities for social participation, demand generation, accountability, removal of barriers to service access and promoting healthy behaviours; and unlocking local capacities for improved sustainability and resilience.

The national (central) governance level was responsible for putting into place and/or adapting policy, financing, information, health workforce and supply systems to include SAM interventions, as well as coordinating and regulating the various health actors and planning for contingencies. More recently, multisectoral nutrition strategic plans required enhanced skills to coordinate complex actions of multiple health and non-health sectors, directories and actors across disciplines in public-private partnerships.

Monitoring quality

A well-performing SAM service, as for any health service, aspires to be 'accessible, acceptable, effective, efficient, equitable and sustainable and provide quality care that is patient centred, comprehensive with continuity of care in time and place and safe' [27, 28]. The ultimate aim is to improve outcomes of health, cost and care [29]. Quality of care implies that the client receives standardised, evidence-based care (with proven efficiency and cost-effectiveness) that responds to and satisfies his/her needs. With the new

decentralised approach to SAM case management, a robust monitoring system was put in place that measured the following SAM service performance indicators monthly or weekly (in certain emergencies) [22, 30]:

Clinical care

- Number of children under 5 who started treatment (admissions) and ended treatment (discharges); and
- Rates of recovery, case-fatality during treatment, drop-out (defaulting) and non-response to treatment, as a proportion of children who ended treatment. (Rates were not calculated with number of admissions as denominator because of the extended average duration of treatment or 6 to 8 weeks).

Operations

- RUTF consumption.

Recovery, case-fatality and defaulting rates indicating quality or adherence to standardised, evidence-based care protocols were weighed against agreed national or international benchmarks, such as the national guidelines or Sphere minimum standards [30]. Additional indicators monitored in services or populations in certain settings were:

Clinical care

- Average MUAC measurement or WHZ on admission (i.e., progress of disease);
- Average daily weight gain during recovery (after stabilisation) (i.e., velocity of recovery);
- Average length of stay in treatment; and
- Relapse (re-admissions) after recovery.

Operations

- Number of days with RUTF supply outages;
- Number of health workers trained in SAM treatment protocols;
- Geographic coverage (i.e., proportion of public health facilities in an impact area that offered SAM services);
- Contact coverage (i.e., proportion of children with SAM who started treatment) and barriers to access treatment; and
- Effectiveness coverage (i.e., proportion of children with SAM who were successfully treated).

Client satisfaction or responsiveness to the ill child's needs, cost of a treatment, or out-of-pocket payment (i.e., cost of a treatment for the carer), equity in service access of disadvantaged populations or sustainability of services were rarely assessed.

Numbers of admissions and rates of recovery, case-fatality during treatment and defaulting were measured monthly in a parallel SAM-specific monitoring system, or as part of the national health management and information system (HMIS). In some countries or during emergencies, weekly monitoring provided real-time data to respond or adapt to resource needs. UNICEF, which provided the most support for SAM services to

ministries of health and partners in about 80 countries, had a global monitoring system in place for nutrition interventions called NutriDash [21]. In 2014, 51 countries out of 80 providing SAM services reported performance indicators; of these countries, 38 countries reported good recovery ($\geq 75\%$) and retention in treatment (defaulting $\leq 15\%$) [21, 31]. Outcome indicators of SAM prevalence and child mortality were estimated in national and sub-national health and nutrition population surveys and assessed at national level in 5-yearly population surveys [32, 33] and at smaller scale in annual or bi-annual nutrition surveys (applying the Standardized Monitoring and Assessment of Relief and Transitions [SMART] method) [34].

Geographical coverage of SAM services provided in public health facilities was usually tracked by ministries of health and UNICEF. For example, in 2014, 19 out of 55 countries that reported on geographic coverage of SAM services delivered these services in over 50% of their public health facilities [21].

Contact coverage and barriers to service access and uptake, were studied in population surveys that applied specific survey methods [35] and yielded information on the following indicators:

- Contact coverage, or proportion of children with SAM starting SAM treatment; and
- Demand-side barriers to access SAM treatment (proximity, awareness, affordability and acceptability).

Since the start of SAM case management in primary care, measurement of direct contact coverage (treatment uptake) was promoted and considered the key indicator of quality of service offer, and, combined with recovery rate, of (un)met need. However, contact coverage estimates were sensitive to resource inputs from financial and technical partners, and multiple causes determined the coverage results and trends over time. Variation in results was due to the type of assessment method, the time since introduction of SAM interventions, the duration and intensity of resources and technical support inputs. Estimates were therefore difficult to understand out of context, or to compare within and across sites. Results showed that few countries had high levels of coverage ($>50\%$ in rural areas, $>70\%$ in urban areas, $>90\%$ in camp settings) [31], most countries had moderate levels (20%–50%), and few countries had low levels ($<20\%$) [21]. In 2014 direct coverage estimates of the 50 surveys in 14 countries ranged from 11% in rural Senegal to 88% in urban Nigeria [36].

Because coverage surveys were expensive and required international expertise, they were rare events. Therefore, indirect contact coverage estimates were frequently used [21] but these were highly unreliable and inaccurate. Annex 4 studies this problem in more depth. Most contact coverage surveys also assessed barriers to access and retention in treatment. The five most common barriers reported in 44 surveys were 1) lack of knowledge of malnutrition, 2) lack of knowledge of treatment programmes, 3) high opportunity costs for carers, 4) distance to treatment sites and 5) previous rejection by

healthcare providers [37].

Capacity of health systems

Countries with a high SAM burden were often characterised by weak health systems and faced challenges in planning and budgeting the scale-up of SAM services. For example, most SAM interventions had not been financed through pooled health budgets but were covered by parallel emergency funding streams. This external funding system hampered government ownership and accountability for sustaining quality care.

System indicators tracked as part of UNICEF's global nutrition dashboard [21] have shown promising advancements. Of the 73 countries with SAM services monitored in 2014, 69 included SAM in child health and nutrition policies, 34 included SAM supply budget lines and 39 included SAM programming budget lines in their annual action plans (31 included both budget lines) and 40 included SAM indicators in their HMIS. However, we do not know how these indicators were translated into positive change at the operational level. Nevertheless, accelerated change is required to cover the unmet needs of undernourished children efficiently and sustainably.

After the new treatment paradigm of uncomplicated SAM in outpatient care became available, numerous financial and technical partners supported the introduction and scale-up of SAM first during emergencies and later targeted high-burden countries. Vertical implementation strategies with explicit plans for phased handover of services to local governments were put in place relying on short-term emergency funding cycles. Often the fragility of national health systems and protracted emergencies or recurrent shocks, more the norm than the exception, trapped partners in long-term emergency support, delaying phase-out or sustainable capacity strengthening.

This history path shaped the current system support strategy to strengthen national capacities for adopting and rolling out SAM services in high burden countries. The SAM-specific support package included adapting child healthcare policies to enable SAM implementation; developing guidelines for standardised care; establishing coordination of partners and activities; expanding monitoring, supervision and information systems; ensuring SAM-specific drugs and supplies availability; and expanding knowledge and teaching skills for SAM implementation [38]. The support package responded well to the identified needs for SAM service delivery and yielded good performance results in terms of recovery, case-fatality and defaulting as discussed above. This success made of the support package a *blueprint* that was delivered across and within high burden countries.

Table 1.2 lists the activities that partners provided to national governments as part of this support package.

Table 1.2. SAM health system support package provided by partners in targeted countries or health districts

Function	SAM-specific health system support
Governance	Participating in developing policies, guidelines and tools for standardised care Participating in coordination of partners and their activities Strengthening advocacy Participating in strategic and annual action planning
Financing	Identifying funds for service delivery support Directly funding buffer stocks and other identified gaps Supporting refunds of fee waivers
Information	Establishing and maintaining a monitoring and reporting system with a data repository Developing tools and systems for improved monitoring Conducting nutrition surveys and coverage assessments Reporting and sharing information online and in national (and global) workshops and meetings (global conferences) Improving knowledge by operations and experimental research (e.g., biomedical intervention and cost-effectiveness studies)
Workforce	Engaging additional health workers (e.g., hiring additional ministry of health [MOH] staff, adding own staff) Providing salary top-ups and/or incentives to MOH health workers and volunteers Training health workers Developing training materials and job aids Facilitating supportive supervision and problem solving
Supplies	Providing logistic management support for equipment, drugs and supplies Providing buffer stocks Providing transport for supervision or referrals (ambulances)
Service delivery	Providing organisational and management support for SAM service delivery Generating demand and behaviour change Organising community screening and referral Supporting health outreach Providing health and nutrition counselling in communities Supporting and organising referral systems Promoting social participation and involvement for demand generation and behaviour change Linking with existing social structures and safety nets

Health actors

For the purpose of this study, health actors, or stakeholders, involved in SAM are individuals or groups with varied roles and responsibilities, interests, values and power distributions involved in or targeted for child healthcare. On the supply side (service provision), key actors are policy- and decision-makers, planners, managers and service providers (involved in production of goods and services). On the demand side (service use), key actors are service users or recipients. Other actors include funders, researchers and trainers involved in expanding the knowledge base and citizens involved in stewardship.

Key child health actors involved in SAM come from the public sector (government), UN, civil society or private-non-profit sector (academics, NGOs, CBOs), private-for-profit sector (e.g., local drug vendors) and informal health sector (traditional healers), with potential to perform the following functions (See also Figure 1.3):

- Health professionals involved in administrative and operational management of SAM (e.g., health policy- and decision-makers, planners and managers at international, national, sub-national and district health management levels);
- Health professionals involved in SAM clinical care (e.g., paediatricians, physicians, nurses, midwives, CHWs, social workers, traditional healers, traditional birth attendants, pharmacists [drug vendors and dispensers, medical store keepers]);
- Opinion leaders (e.g., government or administrative, traditional, religious and cultural leaders);
- Community members (e.g., committees and social group members, lay health workers or volunteers, households, individuals and patients);
- Educators and researchers (e.g., from academic, training and research institutions involved in SAM-related health sciences, medical education, training and research);
- Members of professional associations;
- Government officials at the macro (national), meso (sub-national and district) and micro (community) levels, covering planning, financing, information and education; and
- Financial contributors, global initiatives and private and bilateral donors.

In most settings, SAM in CB-PHC was provided by volunteer lay health workers (LHWs), often CHWs who are national health staff paid, trained and supervised by the public or private health sector. LHWs had limited training and supervision. Both LHW and CHW did the same or similar jobs, depending on the context, but their working conditions differed. They were normally (but not always) based in their communities and were linked with, coordinated by or working in close collaboration with community opinion leaders, community (health) committees and social groups.

Private non-profit health actors involved in SAM were usually international NGOs. Later, national NGOs and CBOs involved, the latter in health and nutrition promotion, preventive care or case management of MAM. Together they formed the technical partners of ministries of health, and with donor agencies added, they were called technical and financial partners (TFP). The major UN agencies involved in SAM have been WHO and UNICEF, with the latter providing most technical and financial support to other technical partners and governments.

ii. Justification and aim of the study

On numerous occasions, policy makers and health managers from ministries of health and partner agencies have expressed the need to accelerate continuous and sustained quality improvement of SAM at scale. The 'integration' of SAM services was debated as a solution to solve capacity gaps. Most countries called the package of SAM activities 'integrated' management of SAM (IMAM) indicating its integrated nature. However, subsequent discussions on accelerating scale-up of SAM services to cover unmet needs did not articulate explicitly or concretely the meaning, aim, strategy or consequences of integration. Yet, there was a general belief that 'integration' would solve health system capacity issues and induce sustained quality of care at scale.

SAM interventions aimed to achieve quality of care at scale, and their effectiveness had been studied in terms of service outcome, and service access and uptake [37, 39-41], and some studied cost-effectiveness [42-45]. But none had studied how and why SAM-specific support interventions improved SAM services quality, whether integration was desirable, or whether SAM services were sustainable.

This study aims to fill the void in understanding integration of SAM services by exploring what integration means, how integration has progressed beyond service provision, and which factors have enabled or hindered the integration process. The gain in understanding may identify patterns on what worked for whom, why and how. These theoretical propositions can then be tested, to evaluate the impact of integrated SAM services to improve health outcome and sustainability of services (as part of integrated and comprehensive child healthcare) to inform the integration strategy and policy changes.

iii. Position of the researcher

As a SAM expert and researcher, I chose to study SAM integration with a systems perspective and to apply research methods that explore the dynamics of complex health systems into which SAM interventions are integrated.

The following elements of my professional path challenged my preconceptions on the study subject that influenced the focus of the research subject, shaped the research design and came into play during the research process and the conclusions.

First, my background in public health and epidemiology gave me a strong quantitative research base, and my early studies of anthropology and subsequent fieldwork gave me useful insights into the values of qualitative research.

Second, my professional experience in emergency health and nutrition and epidemiology was built at international organisations and academic institutions in various settings in the world throughout the levels of the health system, from global and national decision making to individual level care. I was fortunate to have a wide perspective that influenced my perception of strengthening capacities from bottom-up from within.

Third, the knowledge and expertise I accumulated over the years gave me an initial understanding and perspective of the need to improve the sustainability of SAM case management at scale by strengthening health systems. Growing interest but lack of expertise in our understanding of health system strengthening and integration concepts among SAM health workers induced misinterpretation and confusion that needed to be cleared to not miss opportunities.

Other researchers might have studied the same subject with a different research methodology or knowledge paradigm.

iv. Research questions

Framing the problem and research question was not an easy task because of the vagueness of the integration topic, the complexity of the health system and the seemingly scarce or unclear evidence. One could call the problem of integrating SAM interventions into national health systems a "wicked³ problem" [46], or a problem that is difficult to solve because there are different perspectives and different solutions that may be contradictory. Wicked problems in health have complex roots in the labyrinth structures through which healthcare is delivered [47]. Accepting the wicked nature of our study field helped us in the search of pinning down and framing the research questions, the choice of methods, and extracting learning from the results. Therefore, the research question and methodological approach was only formalised after a review of the published and unpublished literature that guided our understanding of the complex study field.

We explain here how in evolving steps the research questions were framed by starting from a broad perspective of the problem to narrowing down to the final study focus.

Would-be research questions

Our involvement in SAM service delivery taught us that a large number of children with SAM had an increased risk of death and were not accessing treatment because services were not offered routinely or equitably, and capacities are insufficient. The overall **problem** therefore was the need to provide sustainable equitable quality SAM services at scale to reach the missed 85% of children.

The research questions would therefore be (step 1):

'How to improve SAM services to be sustainable equitable with quality at scale?',
or
'What interventions improve SAM services more sustainability, equity, quality and scale?'

This research question was a tricky question that cannot be answered simply because it addresses a complex problem: multiple interacting agents are involved, the context in which it operates is continuously changing, changes of interventions do not follow linear or simple patterns and elements of the system adapt, learn new behaviours, and new patterns may emerge over time [48].

³ Wicked here denotes resistance to resolution.

From reviewing the literature, and tacit knowledge, we learned that pathways that may contribute to improving SAM services outcome included:

- Simplify diagnosis and treatment protocols
- Facilitate local productions of RUTF
- Improve surveillance and forecasting
- Improve information sharing and learning
- Improve local capacities and involvement
- ...
- *'Improve integration'*

We also learned that:

- A package of SAM-specific support interventions were in place to improve SAM-specific quality and scale-up, but no 'integration' strategies or interventions were in place to improve 'integrated' SAM services specifically; and
- The meaning of integration and the ways how to improve integration were unclear but some global guidance and evidence on the integration of other health interventions existed.

The **problem** we decided to focus our study on, as we justified in the above sections, was to provide integrated services for improving sustainable equitable quality SAM services at scale.

The research question would therefore be (step 2):

'Do integrated SAM services improve sustainability, equity, quality and scale-up (hence contribute to improved health outcome)?'

But how can we formulate a hypothesis to test 'what works' in the absence of integration-specific interventions? And how can we verify the impact of integration interventions and control confounding and contributing factors of a complex system? In the absence of existing or formulated integration-specific interventions for SAM, and evidence on implementation and impact beyond SAM service delivery activities, the research question was reformulated.

The reformulated research question would therefore be (step 2 reformulated):

'What (integration) interventions work how, why and in what circumstances to improve integrated services?'

The reformulated question elucidated the need to explore and understand the effectiveness of the system to provide effective SAM interventions (systems lens), rather than study the effectiveness of SAM interventions (intervention lens). The evolving

question was then how to learn from effective systems that are able to provide effective SAM interventions with large-scale effect, which helped us formulate the focus of our research.

Retained research questions

In the quest to explore the effectiveness of the national health system to provide effective SAM interventions at scale, we decided to narrow the focus of this study that we further explain here. The steps in framing the research questions and assumptions, and their position in the overall subject study frame are presented in Figure 1.4.

Our overall research question is therefore (step 3):

‘What pathways improve the integration of SAM interventions for children under 5 into national health systems in high-burden low-income countries?’

Our specific questions are therefore:

- What can we learn from the integration of SAM interventions to date?
- What can we learn from the integration of other targeted health interventions?
- Does systems thinking contribute to the understanding?

These questions lead us to the initial theory (for building of theory, see Chapter 4):

If health actors have a shared understanding of the integration pathways of SAM interventions in a given health system, then they can have a shared strategic vision of integration and propose customized, adapted interventions that seek the optimal modality and degree of integration in terms of need and capacity of the health system by applying systems thinking.

The expected result from this research is the formulation of a refined theory that explains pathways of SAM integration. Re-occurring patterns of how integration of SAM interventions came about will be uncovered by engaging health actors throughout the research steps. This refined theory may be tested in subsequent research inquiries (e.g., in real-time setting or in system dynamics models) to deepen the understanding on how and why and in what circumstances policies or interventions improve integration (or not), and whether integration is desirable.

Because we were interested in studying the fuzzy concept of integration with a complexity approach, there was a need to understand integration better first. Therefore, we decided to take on a systems lens to explain and explore the process of integration, rather than take on an intervention lens to study the effectiveness of integration interventions. We consider this study therefore as a first step of uncovering the various unknowns with studying the complexity of the health system in preparation of future research inquiries.

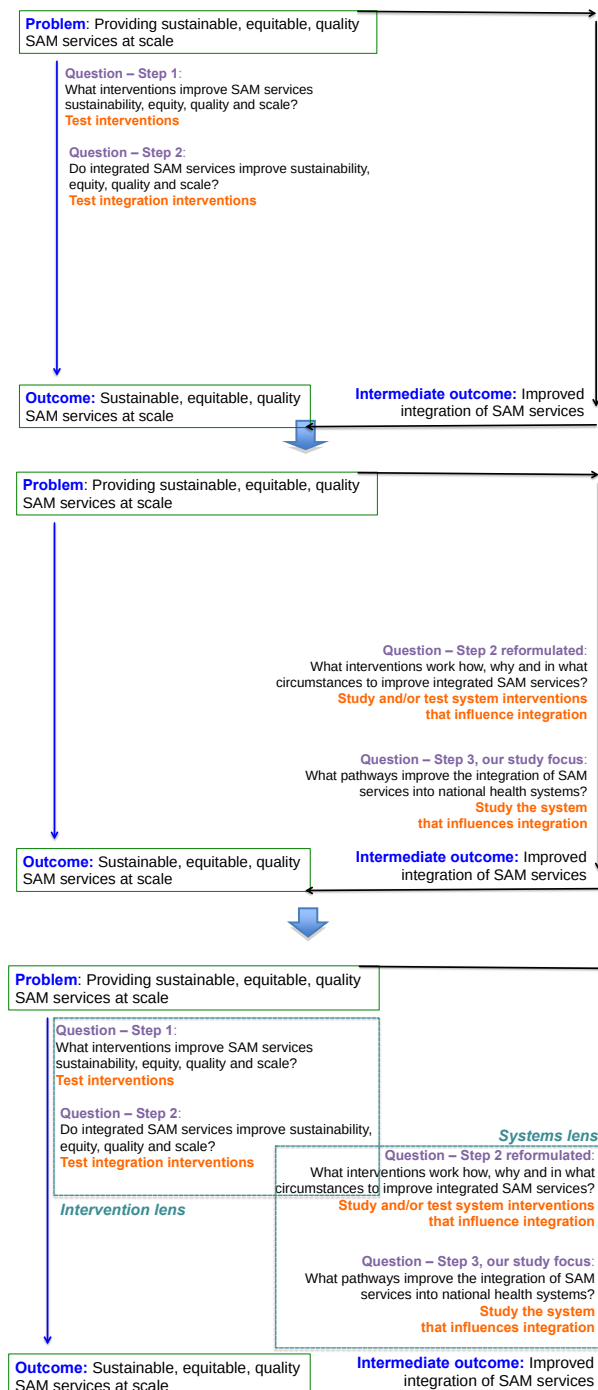


Figure 1.4. Evolving steps in framing the research question

CHAPTER 2.

Designing the research study

This chapter first explains the research paradigm with the epistemological considerations for studying complex health interventions and the positioning of our study in critical realism. It then shares how the study design of the theory-driven inquiry uses mixed methods to understand in depth the study subject. It ends with giving an overview of the various steps of the study.

i. Research paradigm

This section discloses the research paradigm that our study embraced to answer the research questions and that influenced the epistemological position to study and interpret its results. It explains stepwise why the study is situated in the field of health policy and systems research, why a complexity lens is needed, and what the methodological consequences are. It ends with sharing methodological approaches for applying systems thinking to uncover the dynamics of the health systems studied.

Health policy and systems research frame

Health policy and systems research (HPSR) ‘seeks to understand and improve how societies organize themselves in achieving collective health goals, and how different actors interact in the policy and implementation processes to contribute to policy outcomes’ [49]. It is a multi-disciplinary research field that draws ‘a comprehensive picture of how health systems respond and adapt to health policies, and how health policies can shape and be shaped by health systems and the broader determinants of health’ [49]. HPSR links health systems and health policies in the following ways [50]:

1. Health policies are made to strengthen health systems to improve population health, improve patient experience, and contain cost;
2. Understanding how health policies are interpreted, sustained or adapted informs policy actions, and complement knowing how they function or perform;
3. Understanding the role and influence of health actors in policy development and implementation informs how to influence policy and strengthen health systems; and
4. A focus on policy implementation uncovers the organizational dynamics of health system functioning.

From a HPSR perspective, we were interested to explore how policies were adapted and implemented to integrate SAM interventions, how these influenced health actors, how these were interpreted and implemented and what outcomes they produced.

HPSR is a relatively recent term, replacing and broadening the older ‘health services research’ [50]. HPSR, as other research fields, have unclear boundaries, and HPSR may function as an umbrella term for implementation, operation and action research (Figure 2.1). Implementation research (IR), aka implementation science or delivery science [51], focusing on inquiries concerning implementation, is gaining attention from global and academic players [52, 53]. All these terms have in common the study of phenomena in the heterogeneous setting of the real world, where change is dynamic and complex with multiple interactions and interconnections that cannot be controlled. They apply various research methods, and the choice of research method is driven by the research question [54, 55]. The differentiation of the research fields of HPSR, IR and operational research are

illustrated through examples of study subjects and study questions in Table 2.1 that show also the overlap.

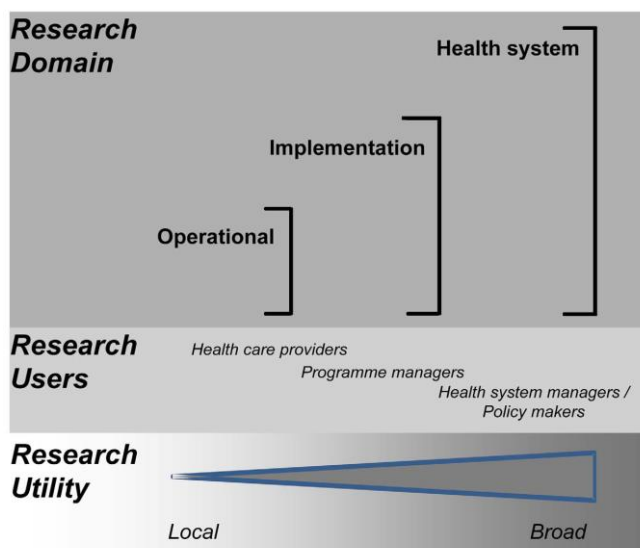


Figure 2.1. Research fields to study health system policies and functions [56]

HPSR and IR contrast with biomedical or epidemiological research in three ways. The first is **complex causality**, or ‘the understanding that an effect is not linked by a linear or predictable path to a cause, but that there are multi-interacting causes that generate a set of often unpredictable effects’ for which probabilistic causality does not fit [50].

Second, findings are **generalizable** not through extrapolation of statistical significance of representative samples but through careful analysis of inputs, processes and outcomes, reaching a sufficient level of abstraction that can be projected outside of the study context. For example, the identification of a middle-range theory (MRT), which is a level of theoretical abstraction that provides an explanation for reoccurring patterns, can be further tested and refined across settings to develop a unified theory [47, 57] that has a broad use. The aim of the research may not be generalisation but context-specific learning (‘illumination’) or learning from comparability across similar settings that may be transferrable to other settings.

Third, **learning** is not an act of transferring knowledge from one setting to another, but rather an integral part of the process of policy development and implementation; it is an experiential approach to learning, learning through reflexion on doing. Design, implementation and analysis of research in participatory discussions, with iterative cycles of going back and forth between data collection and data analysis, and between theory building and theory testing, contribute to the continuous learning of health actors as research subjects or researchers.

Table 2.1. Differentiation of research fields that study real-world settings

Research field	Study subject	Example of research questions
Health policy and systems research [50]	Seeks to understand and improve how societies organise themselves to achieve a collective goal, and how actors interact in the policy and implementation process to contribute to the outcome; Studies changes that affect health system functions dynamics and performance; Offers insights that have policy relevance; Has a broad use.	<i>What, why and how do policy and system interventions work?</i> For example, how effective are different policies to improve access to services? Could pay-for-performance improve access to services for vulnerable populations?
Implementation research [53]	Studies implementation, the act of carrying an intention into effect; the intentions can be policies, programmes or individual practices; Can consider any aspect of implementation—factors affecting, processes and result—including how to introduce potential solutions into a health system or how to promote their large scale use and sustainability; Has a broad and/or local use.	<i>What, why and how do interventions work?</i> For example, what interventions are effective to improve access to services for vulnerable populations?
Operational (operations) research [56]).	Studies operational issues of specific programmes; Relies mostly on information from routine monitoring; Has a local use, with learning across settings.	<i>Where are bottlenecks?</i> For example, what are the barriers to access services?
Action research	Is carried out during an activity or occupation to improve the methods and approach of those involved; Is participatory; Aims to assist the “actor” in improving and/or refining his/her actions.	<i>Where are the gaps, and what can we do to fill them?</i> For example, how can community health workers identify and address barriers to access services?

Complexity of health systems

Because from the outset we took a position to consider the complex dynamics of the health system to answer the research question, this section explains the elements of complexity and the characteristics of complex adaptive systems.

Simple, complicated and complex systems

A system consists of parts that are interconnected and come together for a purpose, acting as a whole. Systems can be considered on a continuum from simple, complicated to complex (to chaotic). A simple system has few elements with stable relationships. A complicated system has many elements that are intertwined; it has a predictable action and no adaption. When one part is removed or changed, the system stops or functions differently. A complex system has parts that are interconnected and have a capacity to

exchange information with their environment and adjust their behaviour that may continue or change unpredictably. Changing one part or connection affects other elements, and therefore the whole system changes [58]. When disturbed or forced to change, the complex system looks for a new equilibrium, and a new behaviour may emerge [58], or the system may fall back to its previous state.

Complex systems are called 'complex adaptive systems' (CAS) if they adapt and learn from experience and self-organise [48, 59]. CAS are open systems as they interact with their environment; they are influenced by the context that they in turn influence. Therefore, the context always matters. CAS have boundaries that are imaginary and transparent and overlap with other systems. Therefore, every system is a sub-system of a broader system; when studying a (sub-)system the setting of (fictive) boundaries will be needed.

CAS are characterised by non-linear relations, feedback loops and interaction among the elements, forming patterns of recurrence and networks. Outcomes are not always predictable in detail because the systems adapt and learn in non-linear pathways that may diverge (the same inputs yield different outcomes) or converge (many pathways lead to the same outcome). There may be time lags between inputs and outputs (delays) or sudden changes may occur that are unrelated to the amount of inputs (tipping points) [48]. Figure 2.2 shows CAS phenomena of path dependence (non-reversible processes with similar starting points), feedback (the output of one process is fed back as input into the same system), scale-free networks (structures may be dominated by a few focal points), emergent behaviour (spontaneous creation of order) and phase transitions (radical changes occur when parameters reach a certain critical point) [48].

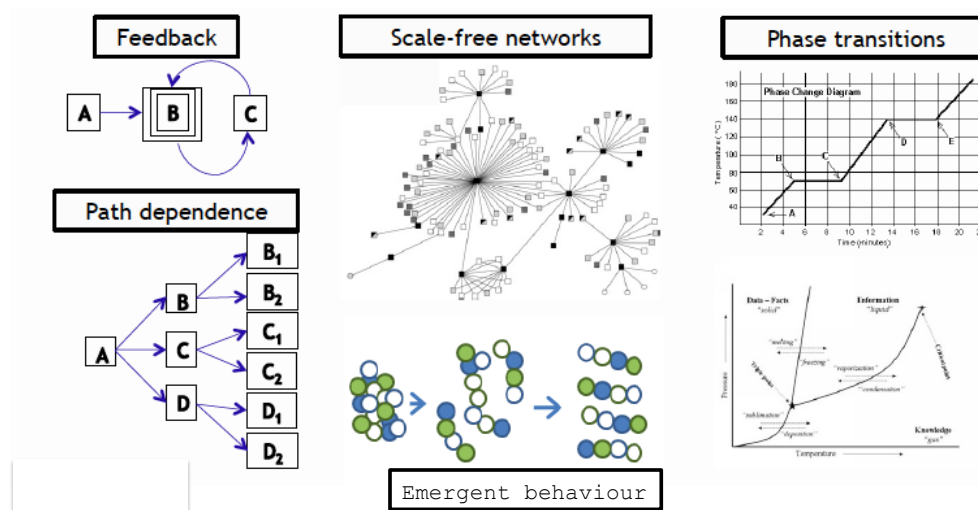


Figure 2.2. Understanding pathways for scaling up health services through the lens of complex adaptive systems (CAS) [60]

Understanding a complex system is challenging. Abstractions may help understand the system by presenting how the various key parts interact. Understanding the dynamics of a system and characteristics of their behaviour may uncover how intended changes impact on other elements in the system that may be unintended.

Health systems are complex adaptive systems

A health system is a system with the primary focus of promoting, restoring or maintaining health [61]. It is an open, complex, adaptive system (as are most biological, social and economic systems). It is made up of multiple sub-systems; operates at and across macro, meso and micro levels; and exchanges with the environment (Figure 2.3).

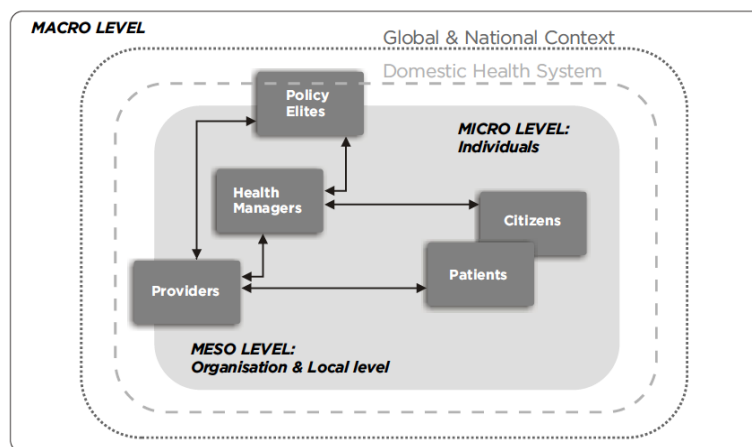


Figure 2.3. Different levels of the health system [50]

From the national (public) health system perspective, the macro level focuses on key health system functions, structures and roles that are influenced both by global or international changes and by changes bottom up. The meso level then comprises local or district health systems organising services and actors and adapting systems in response to local needs. The micro level is the level of individual citizens, professionals, managers and policy makers as providers or users, and their interactions. Examples of CAS characteristics of CAS in the health system, as discussed above and presented in Figure 2.2, are: path dependence in the adoption of global standards in different countries or in the implementations of national policies across districts because of the different context; feedback loop of improving quality of care that improves service uptake and increases workload that negatively affects quality of care; a scale-free network in the adoption of new practices that disproportionately are influenced by 'hub' individuals; emergent behaviour when informal providers organise themselves to protect their practices; and phase transition may explain how an epidemic threshold can be reached [60].

Because health is influenced by many determinants outside the health system, researchers are also interested in the impact of unintended actions and consequences of

organizations external to the health system, e.g., the food or tobacco industry, global warming. Figure 2.4 shows the different elements of a typical health system that extend beyond health service delivery alone.



Figure 2.4. Elements of a typical health system [52]

The WHO identified sub-system functions in six domains or ‘building blocks’ that make up health systems: governance, health financing, health information and research, health workforce, medical products and technologies and service delivery [62]. The domains address access, coverage, quality and safety, which result in the triple aim of improved health, responsiveness and financial risk reduction. The WHO building blocks framework is widely used and understood, conveniently creating a common language. The framework inconveniently organises health system functions in domains suggesting linearity and non-interaction which is opposite from the reality. As a consequence, health actors commonly adapted the framework to align it with their purpose of use (Figure A2.4).

Health systems are complex social systems

Health systems became acknowledged as ‘complex social systems’, where health actors, by choice or influence, consciously or unconsciously, interact with the systems functions and induce or prevent change. The latest WHO framework adaptations, therefore, have a seventh domain of ‘people’ as health actors –as institutions, communities, households and individuals–comprising both suppliers and recipients of policies, services and interventions who play important roles in the health system (Figure A2.4).

Another adaptation viewed health system functions as functions or instruments (the hardware), and the ideas and interests, values, norms as affinities and power (the

software) that both guide actions and underpin the relationships among system actors and elements [63]. In the complex health system, both hardware and software were considered critical to policy decisions and overall health systems performance that influences and is influenced by a social and political context, and the various levels of the international, (sub)national and local policy arena (Figure 2.5).

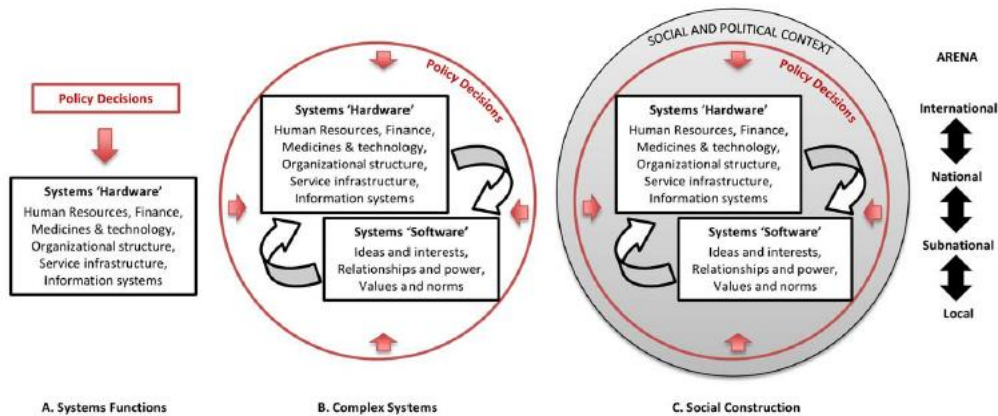


Figure 2.5. Perspectives of health policies and systems [63]

When the hardware and software of the health system work together to achieve health goals in a society, then **health policies** are the decisions, plans and actions to achieve the set goal [64]. An explicit health policy can achieve several things. It can define a vision of the future, which in turn helps establish targets and points of reference for the short and medium term. It can outline priorities and expected roles of different groups, build consensus and inform people [64]. Next, formal policy documents are shared and being translated into daily practices by the people who use them (e.g., health managers, health workers, service users and citizens). Health policies as experienced in daily practices by the users become health policies for the users, which may differ from the intentions of the formal documents. Therefore, policies can be seen as formal (normative) statements of intent and as informal, unwritten practices [50]. Normative policies differ from implemented policies because they are influenced by complex interactions of system functions, health actors and contexts.

Theoretical lenses to study complex health systems

If we consider the health system to be a complex adaptive and social system in which policy decisions are made and implemented, then policy research studies should aim to better understand the complex nature of the political and social reality in which health policy decisions and interventions happen. Contributions from various theories, policy analysis and sociology have helped to study health systems and policies as artifices of human creation that are embedded in a social and political reality that is shaped by particular, culturally determined ways of framing problems and solutions [63]. This view has implications for how research will explore health systems and policy implementation will be conceptualized, how theory reasoning is applied and what methods are selected to address both complex systems and social constructions.

We first discuss the methodological consequences of studying complexity. Then, we explore theory-driven approaches of the critical realist paradigm to study health systems as complex adaptive and social systems.

Methodological consequences to study complexity of health systems

Research efforts aim to expand knowledge about a topic or the way things are known (epistemology). Piecing together the multiple perspectives of knowledge on the topic then brings us closer to the truth or the higher level of truth of how things are (ontology) [65]. The complexity lens for exploring health systems and policy implementation influences the knowledge paradigm. Therefore, the epistemological questions and the understanding of the inquiries have methodological consequences that are being discussed here.

Open complex systems can never be described fully or their influencing factors controlled or isolated. Probability designs would not work. Multi-causality is an issue, as outcomes may be the result of multiple interacting determinants. Theories that explain the reality will be difficult to formulate. Hypotheses will be difficult to predict and test [50]. These arguments have consequences and influence the choice of research design and methods, how the knowledge is generated, and how the results are interpreted.

The broad different knowledge paradigms or ways of looking at and understanding the world are positivism, critical realism and constructivism (Figure 2.6) [50].

- **Positivism** (or empirical realism) is based on the ontological view that phenomena exist independently of how people understand and see them and can be measured without disturbing them. Hypotheses are set and empirically investigated by deductive reasoning. Patterns and regularities, causes and consequences can be identified through, for example, empirical investigation, based on predictive theory with probability designs (e.g., does x leads to y?). The question from this perspective is 'Is the policy or intervention effective? Does it work?'

Knowledge paradigm	←-----→		
	Positivism	Critical Realism	Relativism (interpretivism / social constructionism)
Types of questions addressed	Is the policy or intervention (cost)-effective?	What works for whom under which conditions?	How do actors experience and understand different types of interventions or policies? What are the social processes, including power relations, influencing actors' understandings and experiences?
Key research approaches and methods	Deductive: Hypothesis driven Measurement through surveys, use of archival and other data records Statistical analysis Qualitative data collected through, for example, semi-structured interviews and interviewing procedures	Deductive and inductive (theory testing and building) Multiple data collection methods including review of documents, range of interviewing methods, observation	Inductive (maybe theory building and/or testing) Multiple data collection methods including in-depth interviewing (individuals and groups), documentary review but also participant observation or life histories, for example.

Figure 2.6. Key elements of knowledge paradigms [50]

- **Relativism** (or constructivism) suggests that the social reality is constructed and relies on the interpretation of observers. Phenomena are produced by the mind through interaction among social actors. Phenomena do not exist independently of the actors but are constructed through the way the actors interpret or make meaning of their experience, and these interpretations change over time. Knowledge can therefore emerge from the many possible interpretations. From this perspective, facts are not clearly distinct from the values people hold, and searching for laws of cause and effect is irrelevant. Research grounded in this tradition focuses on people's intentions, beliefs, values, reasons and how they make meaning. It acknowledges that researchers also construct knowledge through interpretation of what they hear and observe. Theories may be built and tested by empirical investigation, applying inductive reasoning through, for example, descriptive or explanatory theory. HPSR in this tradition does not explain but understands the meanings given by actors to social phenomena, including the language used to construct reality. The question from this perspective is 'How do actors experience, understand or perceive policy interventions?'
- **Critical realism** suggests that 'the social reality exists independently of social actors and that the actors' interpretations of that reality influence the nature of social change' [66]. Actors therefore affect and are affected by the pre-existing structures and processes of society. Critical realists seek to identify the causal mechanisms underpinning social phenomena and adopt an interpretive understanding [50]. They do not accept that cause and effect mechanisms hold across context and times, but believes that there is a range of mechanisms

mediating between cause and effect, including those linked to actors and to contexts [50]. The task of research is to identify the mechanisms that explain the outcomes of interventions (e.g., what about x results in y?) and through generative causation make theoretical abstractions that explain the social world. Theories are built, tested and refined by cumulative empirical investigation and learning, applying retroductive reasoning (combined deductive and inductive reasoning that moves back and forth between theory and phenomena) to evolve closer to the truth (aligning epistemology with ontology). The question from this perspective is 'What works how, for whom, in which conditions and why?' [66].

Biomedical sciences and epidemiology draw from the positivist knowledge paradigm, based on deductive reasoning that is hypothesis driven. Typical research methods are health intervention studies with control designs. Efficacy and effectiveness studies using experimental methods adopted randomized controlled trial (RCTs) and meta-analysis as gold standards providing the highest level of scientific certainty. Evidence-based medicine for decision-making grew in importance over recent decades.

RCT designs study the causal chain between an agent and an outcome that is relatively short and simple, and results may be safely extrapolated to other settings. In public health interventions though, causal chains are complex. To control the effect modification in different populations when conducting research in the real world, RCT methods have been adapted, and for example cluster RCT or 'quasi'-experimental research methods are being used. Among the positivists, there is growing awareness of the limitations of RCT regarding causal inferences and external validity of health intervention studies in real-world settings [67].

HPSR draws from both the realist and constructivist knowledge paradigms to study the complexity of the health system and policy environment with methods borrowed from the social sciences [50]. HPSR promotes combining mixed research approaches in the different steps of problem analysis, hypothesis formulation, intervention and context description, data collection analysis and outcome evaluation, and let the methods selection be guided by the question and context.

Because HPSR studies complex health interventions comprehensively within certain boundaries, not only the outcome matters, but the understanding of how and why changes (or no changes) happen by considering interactions and consequences on the wider system by opening the black box. Depending on the purpose of the study, questions can be either exploratory, to find out what happens (e.g., to generate new insights, assess phenomena in new lights, generate hypotheses), descriptive, to give a picture of the situation or event (e.g., who is exposed, who is involved, to what extent), or explanatory, to explain a situation or patterns or identify causal relationships (e.g., why this is better than the other, what is more cost effective, how and why this impact resulted). Research methodologies are then chosen for their capacity of answering the study questions.

Theory-driven approach

HPSR and IR increasingly use theory-driven approaches to better understand and explain how and why interventions succeed or fail. This section describes briefly the principles of a theory-driven approach that is of interest to our study and underpins the critical realism paradigm. Box 2.1 differentiates the concepts of theory, model and framework.

Box 2.1: Theory, model, framework

A **theory** is a set of analytical principles or statements designed to structure our observation, understanding and explanation of the world. A good theory provides a clear explanation of how and why specific relationships lead to specific events. All theories are provisional and eventually will be replaced.

A **model** is an orderly map of relationships, showing causal or convenient pathways. It deliberately simplifies a phenomenon or a specific aspect of a phenomenon that is being described. Models need not be completely accurate representations of reality to have value. Models are closely related to theory, and the difference between a theory and a model is not always clear. Models can be described as theories with a more narrowly defined scope of explanation; a model is descriptive, whereas a theory is explanatory as well as descriptive.

A **framework** is a structure, overview, outline, system or plan consisting of various descriptive categories, e.g., concepts, constructs or variables, and the relations between them that are presumed to account for a phenomenon. Frameworks do not provide explanations; they only describe empirical phenomena by fitting them into a set of categories.

Source: Adapted from Nilsen (2015) [68]

Programme theory as a logic model

The theory-driven approach requires the design and application of the study to be guided by a programme theory defined as ‘a set of explicit or implicit assumptions about what action is required to solve a social, educational or health problem, and why the problem will respond to this action’ [69].

The programme theory represents a hypothesis that can be tested driving the inquiries [70]. Making assumptions explicit allows us to understand what is being implemented and why. It opens the ‘black box’ between intervention and outcome. As such, the programme theory explains (shows) how various components relate to one another. It therefore requires a good understanding of how different events, persons, functions and other elements represented in the theory are presumed to be related [71]. Programme theories are typically represented in graphic diagrams (models or frameworks) that vary in level of detail and complexity [71].

The linear programme theory model in Figure 2.7 includes inputs, activities, outputs and initial, mid-term and long-term outcomes. Inputs are the resources; activities are the actions to bring about a desired change (e.g., training and service delivery); outputs are the immediate results of an action (e.g., number of training courses, number of people trained, number of children who received services); and outcomes are the anticipated changes that occur directly or indirectly as a result of inputs, activities and outputs. Initial

outcomes are usually expressed as changes in knowledge, skills, abilities and other characteristics (e.g., increased knowledge of safe sexual practices). Intermediate outcomes are often classified as behavioural changes (e.g., increased use of condoms) that are believed to eventually produce changes in long-term outcomes, such as the alleviation, reduction or prevention of specific social problems or meeting the needs of a programme's target population (e.g., reduced incidence of HIV) [71].



Figure 2.7. Linear programme theory model [71].

The more contextualized, comprehensive and ecological programme theory model in Figure 2.8 is intended to integrate systems thinking into programme theory, taking into account contextual and other factors that influence and operate on programme processes and outcomes [72]. Their adequacy in representing complex realities and unpredictable, continuously changing, open and adaptive systems has been questioned [73].

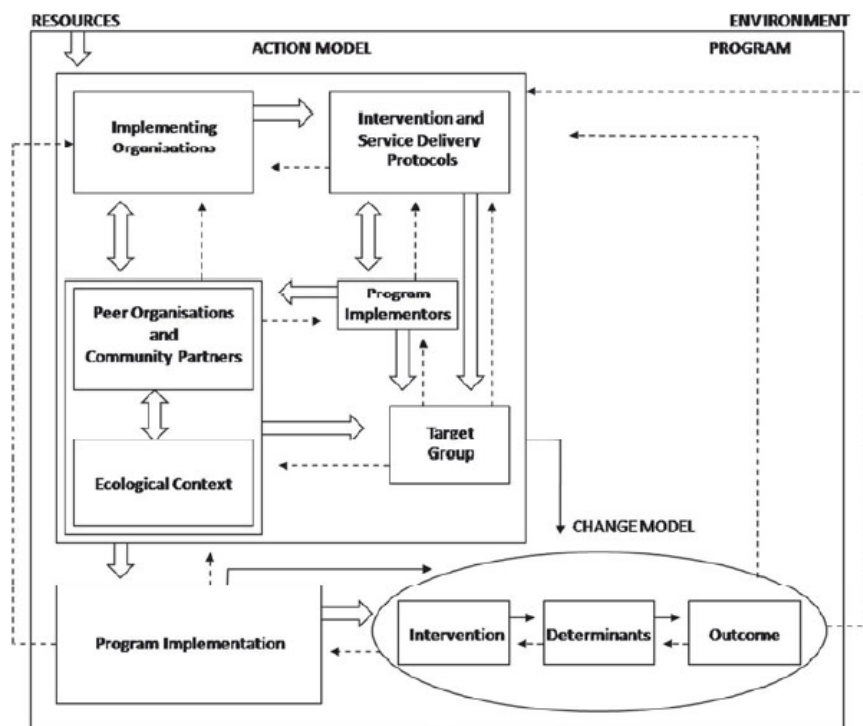


Figure 2.8. Non-linear programme theory model [69]

Chen (2005) [72] described how theory-driven inquiries use the action model and change model to address contextual factors and planning and implementation of programme theory:

The **action model** is the 'normative theory' and provides the rationale and justification of the programme. It provides a systematic plan for organising resources to reach a target group and deliver interventions. The action model consists of implementing organisations (that manage the services), programme implementers (that deliver the services), peer organisations (collaborators), intervention and service delivery protocols (operational and delivery standards), ecological context (involvement of a [non]supportive environment) at micro, meso or macro level, and a target population (based on eligibility criteria).

The **change model** is the 'causal theory' and describes the causal process generated by the programme that produces change. It consists of goals and outcomes (desire to fulfil unmet needs), determinants or intervening variables (leverage or mechanism upon which it can develop an intervention to meet a need), intervention or treatment (agents of change). It makes explicit the mental model and theory that underpins it.

The theory-driven approach guides how knowledge is acquired and interpreted, which has both conceptual and empirical applications. It is conceptual because it explicates a programme theory (the normative or action model, how things are expected to be done). It is empirical because it seeks to investigate how programmes cause intended or observed outcomes (the causal or logic, or change model, how things have been done) [69]. Theory-driven approach fits to study complexity because it adequately addresses complex causality in both experimental and quasi-experimental designs [58] to explain how new policies and interventions influence health system operations that are complex [74]. It can also generate ideas about how to influence the policy agenda or manage policy change [50].

Applications of theory-driven inquiries

The 'Theory-driven inquiry' in evaluation –focusing on the theory on which an intervention is based and explaining how an intervention works and in which conditions—is a more holistic assessment, taking contextual factors and causal mechanisms into consideration. Other evaluations (e.g., black-box and method-driven evaluations) provide information on what works but offer limited information for programme improvement beyond its context, which has implications for transposing learning [72].

The 'Theory of Change approach' is more pragmatic and seeks to establish links between intervention, context and outcome through the development and testing of logic models [70, 75]. It is used to evaluate health programmes that typically involve many agencies and actors, have various levels with different objectives, strategies, and activities that evolve in time, and outcomes that are difficult to measure [75].

In a 'Realist inquiry or synthesis', the programme theory specifies what mechanisms (M) will generate the outcome (O) and what features of the context (C) will affect whether or not those mechanisms operate [76]. It centres less on the intervention and more on how, why and in what circumstances outcomes are generated. Middle range theories (MRT), expressed as CMO configurations, are constructed by applying theory-building techniques to empirical research to produce generic propositions about the social world that in turn can be empirically tested [77] and further refined.

Methodological approaches to study complex health systems

Integration of a health intervention into a national health system unescapably implies to consider the health system as a whole and the dynamics of the interacting parts in the system. This section discusses what methodological approaches help to understand the dynamic complexity of change in the health system induced by policy changes or health interventions.

Systems thinking to study complex health systems

Systems thinking is a way of looking at complex realities, and seeks to understand how parts that form a complex system behave, interact with their environment and influence each other [58]. 'Systems thinking is an approach to problem solving that views problems as part of a wider dynamic system demanding an understanding of linkages, relationships, interactions and behaviours among the elements of the entire system [58].' It contrasts with reductionist thinking that studies the influence of one single factor on elements by keeping relations with other elements (artificially) constant [78].

Systems thinking lens

A system thinking approach helps to see the range of effects and potential synergies of interventions and to identify problems and solutions for improving service delivery [79]. Classically intervention studies ignore complexity and consider influencing factors in isolation of all others and study single, simple cause-effect relations by keeping everything else constant [78].

Systems thinking originated in complexity science (and chaos theory) where there is no total consensus on concepts and definitions [80]. Interestingly, what is usually referred to as complexity science is a collection of ideas, principles and influences from a number of other bodies of knowledge—including chaos theory, cybernetics and CAS in the natural sciences, postmodernism in the social sciences, and systems thinking found across all sciences [81]. Tools of complexity science evolved from within the physical sciences.

Systems thinking is particularly close in its origins and scope to complexity science, as complexity can only emerge in the context of a system. Some argue that differences vary depending on the perspective of the thinker [81]. Most agree that at the micro-level,

interactions of elements (agents) shape the behaviour of the system outputs by feedback loops, patterns or recurrences, and network development. At the macro level, in addition to the spontaneous emergence of order, the behaviour of complex systems is influenced by the system's history and the broader context, which is never totally predictable [80].

Applying systems thinking in health

Health interventions affect one or more health system functions [58] whether intended or not, whether studied or not. Health interventions may not immediately show visible or accurately predictable effects as they may be separated in time and space and are therefore difficult to study or evaluate in a classical way [59]. For example, health interventions implemented in research conditions need scale up in the real world; strategies may succeed from one health worker to the other but cannot be replicated in much detail; policy makers define strategies but have limited influence on how they are implemented; strategies may achieve their objectives but also produce unintended or unpredictable consequences; health policies targeting the poor rarely measure how they improve services for disadvantaged people [82].

The study of complex health systems is different from traditional biomedical studies that mostly depend on stochastic probability models with unchanging contexts and fixed interventions and fixed types of agents (i.e., reductionist thinking that differs from systems thinking). They assume regularity, no adaptation, stable change and predictability. The problem is 'does it work' or 'is it cost-efficient', and its application is considered evidence-based. However, it should be noted that not all health interventions studies need a systems thinking lens, depending on the level of complexity of the study subject and the objective of the study.

Complexity studies embrace irregularity, dynamism, adaptation, instability and unpredictability [82]. The complexity in health systems may be driven by the elements of 1) diversity (different system levels, delivery platforms, health actors); 2) connectedness (health entities and health actors are close and interwoven); 3) interdependence (entities copy and influence each other); and 4) learning (ability to learn and create new structures) [83]. Various theories underpin complexity, and adapted methods and tools will be applied to uncover and understand the complexity (discussed in the next section). Bishai et al. (2015) [83] proposed a conceptual framework to understand how a perturbation (e.g., an intervention) creates complex and non-complex changes in the health system with outcomes that are intended and unintended (positive or negative) by changing and adapting and interacting with the environment to find a new equilibrium (Figure 2.9).

Applying systems thinking in health means that potential and unpredictable consequences of interventions on the wider system will be considered, by disentangling parts that connect and interact and influence each other [84]. It is in particular useful when the problem is about 'how do interventions work', 'how to grow or scale up', or 'how to sustain', and its application is considered evidence-informed. A broader and more sophisticated analysis of the context, health system elements, institutions, adoption

systems, problem perception and the innovation characteristics within these will enable better understanding of the short- and long-term effects of an innovation when introduced into health systems [84].

Applying a systems thinking approach informs on health interventions and health systems behaviours in various ways, e.g., to better understand dynamics and relationships of the health system, context and population health; identify root causes of variations in behaviour and services; identify factors that promote or hinder spread of innovation and integration; and understand unintended and unexpected consequences [83]. It uncovers the range of effects and potential synergies or hindrance of interventions to identify and mitigate problems and propose solutions for improvement [79].

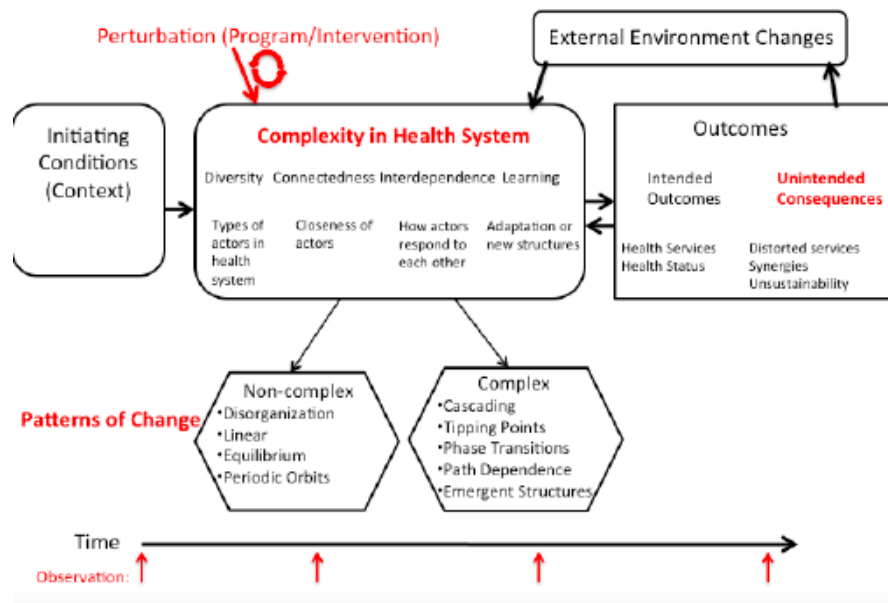


Figure 2.9. Model for understanding complexity in health systems [83].

As a consequence, we apply systems thinking as the theoretical lens to study and understand the integration of SAM into national health systems to consider intimately interrelated and connected system functions, interventions, actors, mechanisms of change, outcome and context [58, 85]. Interpreting interrelationships and interactions within and between system elements will deepen the understanding of the workings on the integration process beyond events and outcomes [85]. As systems thinking looks for patterns of behaviour and the underlying systemic interrelations, which are responsible for these patterns and their associated events [58], it embraces the understanding of open CAS that are constantly changing, resistant to change, counter-intuitive, non-linear, and where the whole is greater than the sum of the parts. Policymaking, planning and implementation need flexibility to address the dynamic and adaptive properties of health systems. Both qualitative and quantitative methods will contribute to the understanding of complexity and to more comprehensive learning of SAM integration [85].

ii. Systems thinking methods to study the integration of SAM

A multitude of methods and tools exist to study complexity of health systems. Peters et al. (2014) [82] developed a comprehensive summary of system thinking methods and tools that we further expanded to the best of our knowledge (Table 2.2). We opted for the scoping study and case study designs that allowed applying systems thinking methods to explore our topic of interest with a systems lens. These study designs then used a variety of methods that will be further discussed.

Scoping study

A scoping study (or scoping review) commonly refers to ‘a process of summarizing a range of evidence to convey the breath and depth of a field’ [86]. Since 2005, its popularity in health research grew and kicked off with the publication of a first methodological framework [87]. A scoping study is considered useful to synthesize evidence when a concept is complex or high quality evidence is scarce but a wide range of literature on the topic exists. As such, study designs that complement effectiveness interventions are incorporated to deepen the understanding on the topic and identify knowledge gaps and innovations. The scoping study may then formulate subsequent research requirements [86]. We felt this method appropriate for our use, as we were from the outset of our study confronted with undefined and fuzzy concepts and scattered emerging evidence.

Two publications on scoping studies of Levac et al. (2010)[86] and Anderson et al. (2008) [88] inspired us to adopt the scoping study method for our use. Scoping of the literature promised to help ‘identifying the sorts of things we know and do not know; and then setting this within policy and practice contexts’ [88]. The following elements of scoping of interest were (in logical order):

- **Conceptual mapping** identifies how terms are used, by whom and for what purpose. It provides a comprehensive overview of meanings, uses and characteristics of the concepts found in the literature.
- **Policy mapping** identifies main documents, statements, events from government agencies and other influential global and/or national entities that have an impact on processes and practices on the topic of interest.

- **Evidence mapping** or literature scoping identifies a variety of evidence that goes well beyond systematic reviews or effectiveness studies when these are scarce. Typical for scoping studies is that the nature and extent of the study selection method does not discriminate studies based on methodological criteria [87].
- **Stakeholder consultation** is useful to identify research gaps in the existing literature and set in participatory discussion and mutual agreement research priorities to target, and validate the scoping results, and not to forget the mutual learning.

The scoping study method has certain limitations that relate to the evidence quality methodological rigor, that need to be considered in the interpretation of results [86].

Table 2.2. Systems thinking methods and tools (Adapted from Peters et al., 2014 [82])

Methods	Purpose and description
Agent-based modelling (ABM)	ABM creates a virtual representation of a complex system, modelling individual agents who interact with each other and the environment. Although the interactions are based on simple, pre-defined rules, in a complex system these simulations allow for the identification of emergence and self-organization.
Case studies	Case studies are useful to explore, explain and learn from the great variation of causal factors and outcomes of complex interventions. They can be used to, e.g., understand interdependence, sensitivity to relationships, focus on non-linearity, look for unexpected, focus on process as well as events, recognize the dynamics, describe patterns, see patterns across levels, understand that patterns change, recognize that in given situation different patterns may be successful. [89].
Network analysis	Network analysis uses graphical methods to demonstrate relations between objects. Social network analysis applies the network theory to social entities (e.g., people, groups, organizations) demonstrating nodes (individual actors within a network), and ties (the type of relationship) between actors, and uses a range of tools for displaying the networks and analysing the nature of the relationships.
Participatory impact pathways analysis (PIPA)	PIPA is a workshop-based approach that combines impact pathway logic models and network mapping through a process involving stakeholder engagements. PIPA workshops help participants make their assumptions and underlying mental models about how projects run explicit and to reach consensus on how to achieve impact.
Scenario planning	A strategic planning method that uses a series of tools to identify and analyse possible future events and alternative possible outcomes. These can involve quantitative projections and/or qualitative judgements about alternatives. The value lies more in learning from the planning process than the actual plans and scenarios.
Systems dynamics modelling	An approach that uses a set of tools to understand the behaviour of complex systems over time. They are designed to solve the problem of simultaneity (mutual causation) by being able to change variables over small periods of time while allowing a feedback and various interactions and delays. The common tools include causal loop diagrams, and stock and flow diagrams.
Theory-driven inquiry	Flexible approaches to study complexity and uncover what works for who and why in a certain context and conditions, to identify underlying mechanisms and patterns of change that are transferable (not necessary generalizable, considering the differences in context). Common tools include frameworks, logic models. The realist inquiry is method-neutral, and choice of tools is guided by the question and information to construct and test Context-Mechanism-Outcome (CMO) configurations.

Tools	
5 whys	5 Whys is an iterative interrogative technique used to explore the cause-and-effect relationships underlying a particular problem. The primary goal of the technique is to determine the root cause of a defect or problem by repeating the question "Why?" Each answer forms the basis of the next question [90].
Causal loop diagrams (CLD)	CLDs are a system dynamic tool that produces qualitative illustrations of mental models, focused on highlighting causality and feedback loops. Feedback loops can be either reinforcing or balancing, and CLDs can help to explain the role of such loops within a given system. CLDs are best developed in a participatory approach. The loop can further evolve to form a stock and flow diagram by categorising the types of variables and quantifying the relationships between variables.
Iceberg model	The iceberg model helps an individual or group to discover patterns of behaviour, support structures and mental models that underlie a particular event [91]. Events are observable behaviour (10% above the water). Patterns are recurring events over time; structures are elements in a system that drive behaviour; mental models are held beliefs and assumptions that give rise to structures and behaviour.
Innovation for change management history	Innovation or change management history generates knowledge about a system by compiling a systematic history of key events, intended and unintended outcomes, and measures taken to address emergent issues. It involves in-depth interviews with as many key stakeholders as possible to build and understanding of the performance of the system from a number of different points of view. Results can be presented in a behaviour over time (BOT) graph that describes system changes over time and stimulates reflection on what has happened and why.
Mind mapping	Mind maps visually organize information showing relationships among pieces of the whole. They help make explicit mental models that are internal pictures about how we view the world (or the study topic), often influenced by the context (culture, values and norms). Fishbone diagrams (Ishikawa diagram) show cause and effect.
Process mapping	A set of tool-like flow charts to provide a pictorial representation of a sequence of actions and responses. Their use can be quite flexible, such as to make clear current processes, as a basis for identifying bottlenecks or inefficient steps, or to produce an ideal map of how they would like them to be.
Rich pictures	Rich pictures are pictorial representations of environmental or social systems. They can help to organise complex situations and identify underlying problems by including all relevant elements and <i>stakeholders</i> of a system. Any technique may be used in drawing a rich picture, and they may be used in any situation, regardless of its complexity or the initial level of understanding of the problem. When done as part of a participatory planning approach, rich pictures can be a tool for encouraging discussion, interaction and attaining a holistic understanding of a system by the <i>stakeholders</i> involved. They may be used at the beginning of participatory planning to better understand the system, or throughout to evaluate progress and monitor change [92].
Stock and flow diagram	Stock and flow diagrams are quantitative system dynamic tools used for illustrating a system that can be used for model-based policy analysis in a simulated, dynamic environment. Stock and flow diagrams explicitly incorporate feedback to understand complex system behaviour and capture non-linear dynamics.
Strengths, weaknesses, opportunities and threats (SWOT) analysis	SWOT analysis is a communication tool to identify strengths and weaknesses inherent to the study topic from within, and opportunities and threats that are outside the study topic and may influence it. Strengths and opportunities are positive forces to maintain or continue to promote, and weaknesses and threats the negative forces to change or create preparedness or resilience for.
Systems archetypes	Systems archetypes are a number of generic structures that describe common behaviours between the parts of a system. They provide templates to demonstrate different types of balancing and reinforcing feedback loops, which can be used by teams to come to a diagnosis about how a system is working, and how performance changes over time.

Case study

A case study is an empirical study to answering questions about 'how' or 'why', and where the researcher has little control of events that are happening [94]. It has a logical design, pre-described data collection techniques, and pre-determined data-analysis methods [93]. It helps form judgements about the appropriateness of an intervention or policy change, and whether their inputs and processes justify the outputs and outcomes [93, 94]. It is a valuable method to study change that occur in a messy world, and when it is useful to understand why interventions succeed or fail [94].

Case studies may use different analytical methods and tools, but have common features [94]. First, the identification of the research question is based on early fieldwork that generates data that is then used to identify and refine research questions inductively. The data can have been used to develop a conceptual framework to capture essential features, and describe and explain progress. Second, site selection is based on qualitative sampling (not statistical sampling) to address a research question that may be either purposive sampling (sites selected on the basis that they are typical for the study topic being investigated, showing a maximum variation) or theoretical sampling (sites selected on the basis to refine or refute the theory). Case studies are constructed to compare and contrast to help answer the research question. Third, multiple methods and sources of evidence ensure comprehensiveness of findings and strength of their validity using triangulation. Fourth, the data collection and analysis is an iterative process that results in the development or adjustment of an analytical framework. The framework then describes and explains how the different elements studied fit together and facilitates the interpretation of the findings. Finally, judgement of the findings and determining its wider implications, with an evaluation of bias enable to estimate internal and external validity and make comments with assurance or reservations.

Case studies use a range of methods that combine qualitative and quantitative methods (mixed methods). Methods applying a systems lens are compatible with the case study design. The following methods of interest for our study were (in alphabetical order):

- **Expert elicitation** uses the cognition of experts as 'educated guesses' based on implicit tacit knowledge of individuals or a collective, articulating mental models. The 'elicitation cycle' is built on responses to designed trigger questions [77].
- **Framework approach** is a flexible tool appropriate to study complex concepts because it allows themes or concepts that have been identified a priori as coding categories from the outset, but it also allows these categories to combine with other themes or concepts that newly emerge by subjecting the data to abductive reasoning [95, 96]. A framework therefore may be modified in response to the evidence so that the final product is a revised framework that includes old and new factors that were not anticipated in the initial model.

- **Innovation for change management history (innovation history, behaviour-over-time graph)** generates knowledge about a system by compiling a systematic history of key events, intended and unintended outcomes, and measures taken to address emergent issues. It involves in-depth interviews with as many key stakeholders as possible to build and understanding of the performance of the system from a number of different points of view. It provides causal explanations for two outputs: 1) an innovation timeline that sequentially lists the key events (and any effects on the relationships between stakeholders); and 2) actor network matrices and maps that show the links between stakeholders and events. Both outputs develop and change as the process unfolds. Views are based on a discussion of the timeline and actor network maps [97].
- **Mind mapping** is a participatory exercise to organize information from tacit knowledge by showing relationships among pieces of the whole and help make explicit mental models that are internal pictures about how the world is viewed.
- **Participatory information mining and perception harvesting** may use different tools and techniques to make explicit an internal picture about how participants view the world or the study topic. Mental models are influenced by one's culture and influence human behaviour and systemic structures. Tools may be brainstorming, mind mapping, individual or group discussions, and more.
- **System-dynamics modelling** uses a set of tools to describe, test, or understand the behaviour of complex systems over time, designed to solve the problem of simultaneity (mutual causation) by being able to change variables over small periods of time while allowing feedback, interactions and delays. It simulates system behaviour under explicit assumptions. It can be used in health systems for hypothesis testing and generation of scenarios, as well as joint thinking, group learning, and shared understanding of problems.

A **causal loop diagram** (CLD) is a visual analytical tool that describes the relationship among one or more variables that influence each other and analysis feedback loops relevant to the story. The influence of the feedback will always create either a reinforcing (positive or negative) or balancing dynamic in the system. CLD can be used to further build upon in stock and flow diagrams or computer simulation modelling.

Agent-based modelling (ABM) develops a simple computer simulation model that mimics a real world system by defining agents and their interactions based on simple pre-defined rules. The model allows exploring the behaviour of the system with feedback loops and delays over time and evaluating various intervention strategies [98].

Other methods that we used in the case studies that contributed in the understanding of the study topic are [94] (in alphabetical order):

- **Consensus** solicits and discusses individual members' views to evolve as a group to a common, generally accepted opinion or decision.
- **Focus group discussion (FGD)** is a form of group interview with subjects selected by a sampling method that capitalises on the communication between researcher and participants to generate data. The group interaction generates the data of interest that can be on behaviours, beliefs, perceptions, or tacit knowledge of the study topic.
- **Key informant interview (KII)** is a structured, semi-structured or in-depth interview with a key health actor who is targeted because of his/her position or opinion in relation to the study topic, and selected based on a sampling method.
- **Qualitative observation** involves the systematic, detailed observation of behaviour and talk by watching and recording what people do and say that takes place in their natural settings.
- **Situational context mapping** summarizes relevant information from published reports or accessible data repositories to map a contextual background of, e.g., characteristics, trends, capacities, and structures related to the study topic and its environment.
- **Triangulation** compares and contrasts or complements data obtained from different methods to evolve towards comprehensiveness. Agreement is sought through looking at patterns of convergence. Validation of findings through reflexive analysis may be obtained in participatory discussions involving the study subjects.
- **Participatory group work (workshops)** in which the group through participatory discussions, iterative thinking and consensus building evolves towards learning, exploring, understanding and decision-making. Group interactions generate the data of interest that can be on behaviours, beliefs, perceptions and uses tacit knowledge and evidence to study the topic. All sorts of system thinking tools can be applied, and often the workshop process, and the discussions and understanding that it generated, is as important as the result.

iii. Study design

The designs of the various sub-studies were not defined from the outset of the research study but evolved. Nevertheless, prior knowledge of the literature and experience exploring the SAM interventions in various countries indicated which paths to explore. The scoping study at the beginning guided refinement of the theory, questions and methods to be explored empirically. Therefore, this section provides an overview of the components of the study design—approaches, methods and tools, summarized at the end of the section in Table 2.4. Detailed descriptions of the different elements of the study design, methods and tools are provided for each study in the respective chapters as they were adapted to the research question, study design, study population and context.

Study setting

SAM in children 6–59 months in primary care in low-income settings

The study focused on SAM services delivered in primary care for children 6–59 months of age for several reasons. First, outpatient case management was a relatively recent intervention that enabled expansion to reach and treat more children. This care model accorded with primary healthcare as defined in the 1978 Alma Ata Declaration [99] and adopted by governments, promoting essential healthcare at the community for improved access and coverage of first-line care. Second, focusing on primary care encouraged exploration of a system in which health workers, individuals and communities can be empowered to promote health at the grassroots level and reach remote or underserved vulnerable populations. Community-based primary care and facility-based primary care were considered separate delivery platforms, but this split may be artificial in some contexts; in some contexts, the former did not exist or was not operational for curative care. Also, for simplification, outreach services were considered part of facility-based primary care from where they were organised. Third, most studies on strengthening the health system recommended a focus on decentralised primary care covering a large child population through which specific goals can be achieved quickly and cost-effectively.

Population selection

The study targeted SAM interventions and their implications at all the tiers of the national public health system, including the contributions of financial and technical partners and other key health actors (See Chapter 1, Figure 1.3).

Description of health service activities

As a start, it was useful to map the specific health service activities of SAM case management in detail by care function to indicate what was provided where. The map served as a tool to compare and contrast health service activities to learn from. Table 2.3 lists SAM service activities by five care functions: 1) health promotion and disease prevention, 2) case finding, 3) diagnosis and triage, 4) treatment and 5) follow up.

Table 2.3. Map of SAM services activities by care function in the service delivery platforms

	Promotion, Prevention	Case finding	Diagnosis	Treatment		Follow-up
CB PHC	• Counselling • Community engagement	• Active case finding • Referral	• (CCM/iCCM) • Anthropometric assessment • Clinical examination • Appetite test • IMCI danger signs • Referral	• (CCM/iCCM) • Registration, monitoring and reporting	• (CCM/iCCM) • Treatment initiation • (CCM/iCCM) • Treatment progress	• Home visits • Referral
FB PHC	• Counselling	• Passive case finding	• Anthropometric assessment • Clinical examination • Appetite test • IMCI danger signs • Referral	• Registration, monitoring and reporting	• Treatment initiation • Treatment progress	• Counselling • Referral
SHC	• Counselling	• Passive case finding	• Anthropometric assessment • Clinical examination • ETAT	• Registration, monitoring and reporting	• Treatment initiation • Treatment progress	• Counselling • Referral

CB PHC Community-based primary health care; FB PHC Facility-based primary health care; SHC Secondary health care; ETAT Emergency triage, assessment and treatment; IMCI Integrated management of childhood illness; (i)CCM (Integrated) community case management.

Sampling strategy

The research targeted households, communities, health facilities, district health management offices and national health systems with the respective health actors and the child with SAM and his/her carer at the centre. Because the study applied different methods to answer the sub-questions of the research from various perspectives in various settings, the research methods, sampling frame and selection of participants were specified for each step.

Niger was selected for case studies (Chapter 5) mainly because of the author's engagement in SAM interventions there from 2006 to 2015 and the interest of Save the Children in studying SAM integration in the country. Nepal and Burkina Faso were selected for case studies (Chapter 6) based on global mapping of SAM integration (described in Chapter 3). Both countries met the criteria of a high burden of SAM and more than 2 years of experience introducing SAM in outpatient care. In addition, partners of both countries expressed interest in exploring integration, and financial support was made available. The respective chapters 5 and 6 describe in detail the procedure for purposively selecting the study districts.

Data type

Each study collected primary and secondary data, both qualitative and quantitative, guided by the respective methodological approach. The type of data collected was conditioned by the guiding theory and conceptual frameworks (see Chapter 4). Data covered what (intervention, situation), how (process), for whom, by whom (health actors),

in what circumstances (context), where (geographical coverage) and when (time frame). Quantitative information provided measurements of inputs and outcomes. Qualitative information indicated processes and perceptions and facilitated the interpretation of the quantitative outcomes. Together they provided a broader understanding of the dynamics of integrating SAM interventions. Linkage between research components that provided qualitative and quantitative information was iterative.

Data collection

For primary data collection, a pluralist, multi-method approach was applied that consisted of the following methods:

- Behaviour-over-time (BOT) mapping;
- Causal loop analysis;
- Consensus development;
- Electronic interview;
- Expert elicitation;
- Focus group discussions (FGD);
- Key informant interviews (KII);
- Observations;
- Participatory information mining and perception harvesting;
- Policy mapping;
- Simulation models;
- Situational context; and
- Stakeholder mapping.

Primary data collection tools were therefore also diverse and adapted to each study and data collection method and context. They included:

- Causal loop diagrams;
- Checklists, forms and matrices;
- Indicators lists;
- Interview guides;
- Mind mapping matrices and diagrams;
- Questionnaires;
- Simulation model results; and
- Voice recording.

Secondary data collection methods and tools were adapted to the data source and developed for each case depending on the retained variables, based on the conceptual frameworks. Despite the adaptations and evolution of the tools, the conceptual frameworks that were identified in the scoping study were consistent throughout this research.

Data from observations, interviews, FGD and participatory discussions were transcribed in a spreadsheet. All raw data and data collection tools were deposited in a repository. Annex 9 provides an overview of data organisation and the electronic access.

Data analysis

The various study methods applied led to different data analysis approaches. In some cases, the analyses simply described the findings, while in others, explanations were provided that uncovered typologies, patterns, linkages, relationships, models or theories.

Inductive versus deductive versus retroductive reasoning

In most cases, the analyses moved back and forth between the raw data and emerging interpretations, and between deductive approaches (finding data to support an argument) and inductive approaches (making an argument to explain the data) in the same analysis. Thus, the analytical approach may be comparable to abductive analysis [100], in which the logic of interference comes from pragmatic theorizing, diverting from the initial theory, or to retroductive analysis [65, 101], in which one starts from empirical events and moves back and forth to uncover patterns or regularities of causality (mechanism) at work. The analytic approach aimed to expand understanding and invited creative thinking at every stage to uncover the different layers of the reality and causal pathways. It opened the black box of 'why this worked here but not there, and why'.

Thematic analysis versus framework approach

The data analysis steps entailed reading and re-reading the data to identify an initial set and subsequent sets of themes or categories, searching for recurring themes or elements of interest that emerged. Mainly predefined themes (deductive approach) guided the questions that directed the search. Themes were coded or labelled and linked items or subjects, or in later stages, regrouped them.

Thematic analysis is an inductive process that groups data into themes and examines all cases in a study to make sure that all manifestations of each theme have been accounted for and compared [94]. It first describes themes and then uncovers their interconnectedness to identify the relationships among them. Thematic analysis may include themes that are anticipated or themes that emerge during fieldwork. Another method, grounded-theory (which was not used in this study) mixes inductive and some deductive processes—moving between data and theory—that codes incidents as they emerge from the data rather than defining them in advance [94]. The researcher builds theory or explanations along the way and at the same time tests emerging ideas.

A framework approach was applied in the case studies for exploring the integration of SAM into national health systems. A conceptual framework provided the pre-set elements of the investigation. These elements were then investigated in a deductive research process informed by a priori reasoning rather than emerging from reflexive reasoning [94].

Notwithstanding, the initial thematic framework and index terms allowed refinement as the analysis progressed, and recorded changes or adaptations. Data were mapped and summarised in matrices that described the themes. The mapping and interpretation provided a summary of the range and nature of phenomena, created typologies and found associations between themes with a view to providing explanations.

Triangulation

Findings from the different methods were compared and contrasted, and differences and similarities were considered useful and complementary. The triangulation of findings therefore explored convergence, divergence or contradiction to provide a more complete picture leading to valuable insights. Our study aimed to explore the difference, thus to uncover and understand them instead of masking or generalising them aiming to accumulate knowledge to refine or refute the initial programme theory.

Other analytical methods have been applied when appropriate, such as a sensitivity analysis to test the uncertainty in ABM (i.e., of how the output of the final model can be assigned to different sources of uncertainty in its inputs).

Synthesis and reporting

The research study applied a stepwise, evolving sequencing of study methods and designs that were not chronologically implemented (Figure 2.10). Each step brought learning about both the application of the study method and the topic of integration, and evolved with iteration, therefore influenced each other.

The syntheses of learning were interested in both uncovering generalisations and specifications from the sub-studies'. The validity, feasibility and transferability of the study methods were also of interest. Opportunities to apply the methods in different setting and improve them were created on different occasions. In collaboration with UNICEF, the case study method was applied to integrating childhood tuberculosis in Malawi [102] and Uganda [103] and integrating SAM into a national health system in Mauritania [104]. We also had the opportunity to apply the SAM integration exploration method in a regional health system in Northern Nigeria [105], and in a district health system in South Sudan [106]. Moreover, we were fortunate to do the studies through iterative learning involving key health actors who were both the target audience of investigation and collaborating researchers.

Internal sharing and validation were possible through validation and discussion workshops at the national level (Kathmandu, Niamey, Ouagadougou) and subnational level (Gulariya, Gorusinge, Gourma, Manga, Nepalgunj, Zinder) in Burkina Faso, Nepal and Niger.

Findings were shared externally in five publications in peer-reviewed journals and presentations and discussion in international conferences (Bangkok, Delhi, London and New York). The synthesis of integration of SAM based on the scoping study and Burkina

Faso and Nepal case studies will be the basis of a synopsis as guidance for decision makers and health managers.

Limitations and opportunities

Overall and specific study limitations are discussed at the end of the study and each sub-study. This section describes limitations and opportunities identified a priori.

First, the study is not an intervention study and does not compare or evaluate outcomes. Instead, it is an exploratory inquiry of a problem studied in a complex context with limited but widespread evidence. In other words, in a complex health system context, it attempts to understand how certain support interventions (inputs) affect a multitude of health system functions and structures to create change in expected and unexpected, intended and unintended, linear and non-linear ways (process) with complex results that are disease-specific for SAM and beyond, affecting other health system elements (outcome). Therefore, various health actors will have different perceptions and perspectives and different possible explanations. Does this sound like looking for trouble? Indeed, the study problem falls into the category of a wicked problem (a problem that is difficult to solve) [46], and the road will be challenging.

Second, we formulate a programme theory and logic model of how the research problem will be explored. The research will therefore contribute to the theoretical framework that underpins a much broader scale of resolution, findings of numerous investigations on how phenomena occur. We hope to contribute to the epistemological context (how things are known) with a number of limitations, by taking on the challenge of aligning with the ontological context (how things are).

We accepted the challenges, not knowing where to start, where to go and how or where to end. Somehow, the uncertain start sustained our enthusiasm for gradually clearing the fog on integration of SAM.

Ethical considerations

For none of the sub-studies was an institutional review board asked to approve the study protocol because the inquiry was not biomedical or intervention research involving individual patients. However, study concept papers were shared with all the respective ministries of health and their permission requested to conduct the study before arrival in the countries. All government and partner agencies teams were sent written consent forms, and laissez-passers were sent to all government teams in the periphery. Formal introductory and debriefing visits were conducted at the regional and district offices of the ministry of health, UNICEF and Save the Children. Most of the time, government representatives and national UNICEF and/or Save the Children staff participated in the field visits, interviews and workshops. Consent was received from all health actors that

participated in the discussions or inquiries, and when appropriate in the recording of the discussions.

All health actors received all raw data and draft reports and were asked for their inputs and validation before national reports were completed. Where and when possible, we invited key health actors to involve in writing papers for publication. We also ensured that the field activities were learning opportunities for all involved, and time was allocated to strengthen skills and share knowledge on new topics or evidence.

Note on funding

Save the Children and UNICEF supported the fieldwork and data collection by facilitating travel and involvement of health actors. They did not interfere with the data collection, interpretation and reporting, but participated in the study along the other health actors.

Table 2.4 Overview of study specifications

Study design	Study method	Sampling frame	Sampling method	Sources of data	Type of data	Data collection method	Data collection tool
Scoping study	Literature review of evidence, policies and practices;	Published evidence, practices and policies;	Inclusion/exclusion criteria;	Secondary;	Qualitative;	Literature search; Snowballing; Pearl harvesting;	Search strings; Matrices with selected variables;
e-Survey	Framework approach;	National health systems supported by UNICEF for SAM services in primary health care;	Exhaustive;	Primary;	Quantitative;	Electronic interview;	Questionnaire; Indicator list;
Case study on integration extent in Niger	Multiple framework approach;	National health system, district health system, health facilities, communities, children with SAM and their carers;	National health system; Purposive sampling of two health districts, in two regions, with high-burden;	Primary and secondary;	Qualitative;	Situational context and policy mapping; Key informant interviews (KI); Focus group discussions (FGD); Observations; Behaviour over time mapping;	Questionnaires; Interview guides; Indicators lists; Checklists, forms and matrices; Voice recording;
Case study on integration factors in Niger	Multiple framework approach;	National health system, district health system, health facilities, communities, children with SAM and their carers;	National health system; Purposive sampling of two health districts, in two regions, with high-burden;	Primary and secondary;	Qualitative;	Situational context and policy mapping; KI; FGD; Observations; Policy mapping; Stakeholder mapping; Behaviour over time mapping;	Questionnaires; Interview guides; Checklists, forms and matrices; Voice recording;
Case study on extent, factors, interactions in Burkina Faso and Nepal	Multiple framework approach; System dynamics modelling;	National health system, district health system, health facilities, communities, children with SAM and their carers;	Purposive sampling of two national health system; Purposive sampling of two health districts, in two regions, with high-burden;	Primary and secondary;	Qualitative;	Situational context and policy mapping; KI; FGD; Observations; Stakeholder mapping; Participatory information mining and perception harvesting; Consensus development; Causal loop analysis;	Questionnaires; Interview guides; Indicators lists; Mind mapping matrices and diagrams; Checklists and forms; Voice recording; Causal loop diagram;
SAM population simulation study	Agent-based modelling;	Model with agents and characteristics;	Simulation based on low-income values and assumptions;	Primary and secondary;	Quantitative;	Simulation models; Expert elicitation;	Simulation model results;

iv. Study overview

To answer the research question, which pathways improve the integration of SAM interventions into national health systems, our study applied in distinct but evolving steps various methodological approaches to build and propose the refined programme theory.

First, a scoping study explores concepts of integration, policies and practices and maps the knowledge base. Learning from this step informs the second step of building the initial theory and developing initial conceptual frameworks and methodological tools for theory testing. Third, integration attributes were studied in an empirical, descriptive investigation through case studies by applying a framework approach and a qualitative system dynamics approach (Causal loop analysis or diagram, CLA or CLD). Finally, agent-based modelling (ABM) simulating a SAM population with system dynamics characteristics studies SAM integration at the micro level and uncovers implications of mechanisms that introduce change at the higher (meso) level. The discussion then summarizes learning and reflects on the appropriateness of the methods used. The various steps of the study are intrinsically linked and iteratively developed.

The research question and initial theory are central to the study design and methods (Figure 2.10) that evolved in distinct steps and applied select approaches (Figure 2.11).

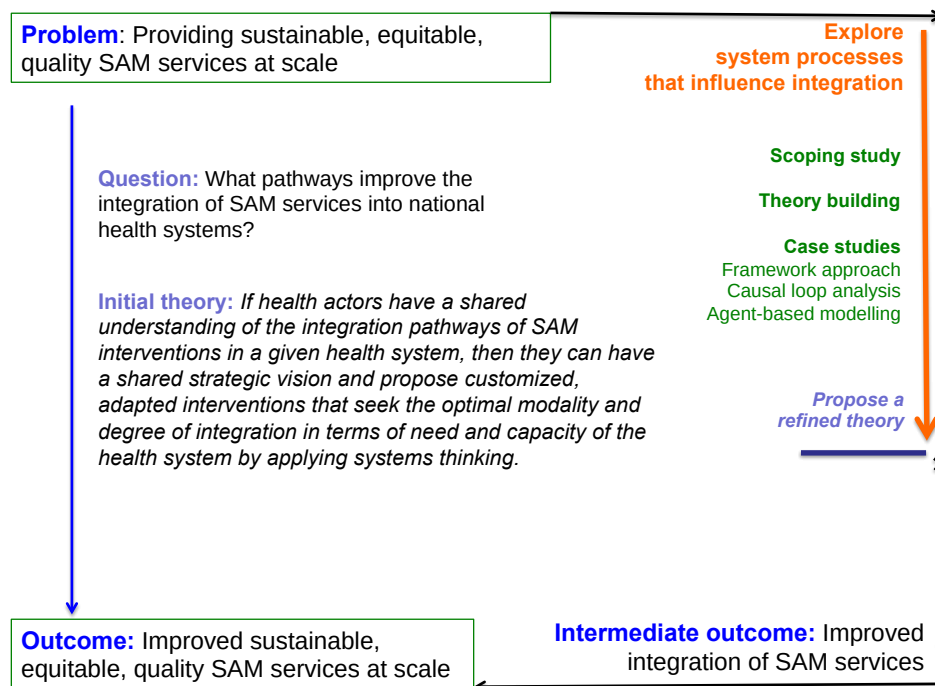


Figure 2.10. Research question and initial theory with study design and steps



Figure 2.11. Evolving applications of study approaches

PART II. STUDY RESULTS

CHAPTER 3.

Exploring severe acute malnutrition integration: a scoping study

This chapter provides the methods and results of a scoping study that explored the current knowledge about integration of health interventions in general and of SAM services in specific. Results cover first key concepts of integration, setting the scene for understanding integration in depth and breadth. Next, policy documents and events that facilitated the integration of SAM services are mapped. Then, a summary of the evidence on the integration of health interventions is followed by a closer examination of evidence from SAM-specific integration interventions and global progress. The chapter ends with a synthesis of learning for studying the integration of SAM.

This scoping study of SAM integration was preceded by another scoping study on health system strengthening for improved SAM interventions, which was a necessary first step to understand the study field and narrow the research question on the integration of SAM. The initial scoping study (Annex 2) examined concepts of health system strengthening for improving SAM services and consolidated learning from disease-specific health system strengthening with a system-wide approach. It also suggested that scale-up of a health service is a special case of integrating a novel intervention, with scale-up as the horizontal spread and the organisational changes and processes of adoption that accompany scaling up [107], that we then adopted.

i. Introduction

When SAM outpatient care was introduced in 2000, SAM services were typically delivered by emergency health actors operating parallel to national health systems. Realising that the high burden of SAM persisted after emergencies subsided, emergency-affected high-burden countries shifted their policy to offer SAM in routine child healthcare. SAM services were often called ‘integrated management of (severe) acute malnutrition (IMAM)’, mimicking integrated management of child illness (IMCI), indicating that the components of the IMAM package were in place and linked with a referral system (Table 1.1). It also indicated that SAM services were provided in public health facilities and managed by national governments. Gradually, outpatient case management of SAM was added to child health policies and plans [21], and SAM services expanded with technical assistance and supplies support at different rates within and across countries.

While integration was implicit, as the concept of IMAM suggested, it was neither defined nor considered as a process that needed reflection on whether integration was desirable but assumed achieved; thus, integration-specific interventions were neither identified nor strategically planned. The term ‘integrated’ evoked solutions for the challenges of scarce resources, poor quality of care, limited scale and unsustainability, and poor government ownership and accountability. Since the evidence on integration was neither explored nor expanded, global or national guidance for the introduction and scale-up of SAM focussed on adding SAM into policies, budgets and information systems and strengthening capacities for coordination of activities and service delivery. On numerous occasions a need was expressed to define ‘integration’ of SAM but guidance on when to integrate and when not was not addressed [108, 109]. The dearth of understanding of the concept of integration and the limited evidence for SAM integration inspired this scoping study. The study aimed to contextualise knowledge on integration in the current state of understanding, identify or map the ‘knowns and unknowns’, and set this within policy and practice contexts.

The scoping study addressed the following questions:

1. *Concept map (including conceptual frameworks):* What does integration mean, and what is expected from integrated health services?
2. *Policies and guidance map:* What policies and strategic advice exist for integrating or not integrating health services? What policies have been influential for introducing and expanding SAM interventions?
3. *Evidence map:* What do we know about the effectiveness of integrating health services? What do we know about the effectiveness of integrating SAM into routine primary healthcare (PHC)?
4. *Progress map:* What do we know about SAM integration progress to date?

Based on this learning, questions were formulated to explore empirically if the integration of SAM services was strategized and how and why worked (or not) in real world settings.

ii. Methods

A scoping study of published and grey literature, policies and practices helped synthesise the vast field of scarce and scattered evidence on the integration of health services including for SAM into national health systems and the complex subject of integration. Typical for scoping studies is that the study selection methods does not discriminate among studies based on methodological criteria [84]. In this way, knowledge, guidance and practices are displayed, and knowledge gaps are identified, preparing the next steps for expanding the evidence base (See also Chapter 2, page x).

We applied different search methods to study integration of health services that are comparable to SAM, and SAM integration itself. Searches and findings were categorized in the following subheadings:

- Concepts and conceptual frameworks;
- Policy papers and guidance; and
- Evidence from intervention studies.

Evidence on integration and health services integration

For the concept map and the policy map on integration of health interventions, we reviewed the published peer-reviewed and grey literature by searching the on-line libraries of PubMed, Cochrane, Google Scholar, WHO, UNICEF, the World Bank, the CORE Group and websites of other non-governmental organisations (NGOs) and projects. Further references were identified by snowballing. The concept map on integration is reported on in this Chapter 3, and the policy map is reported on in Annex 3.

For the evidence map, we decided to only include systematic reviews on integration of health services set in low and middle-income countries (LMICs), because we aimed to give a quality synopsis of the evidence on integration of other health services (and not get lost in the over 15,000 references). This limitation came at the cost of excluding relevant new studies, but with the gain of selecting quality studies to learn from for SAM integration. The evidence map on integration of health interventions is summarized in this Chapter 3 (and Annex 4).

Search terms (string) for the systematic reviews included:

Search terms

- Integration, scale-up, vertical, horizontal, coordination, link, merge, coverage
- Program* OR care OR service* OR 'delivery of healthcare'
- 'Child health services' OR 'immunization' OR 'family planning' OR 'maternal health services' OR 'maternal child health centers' OR 'community health centers' OR immunization OR 'reproductive medicine' OR 'health services' OR 'sexually transmitted diseases' OR malnutrition OR diarrhoea OR pneumonia OR malaria OR 'IMCI' OR 'CCM' OR 'community case management'

- LMICs
- English OR French
- 2000 onwards
- Reviews

Inclusion criteria for the systematic reviews were studies on integrating health services in PHC, set in or targeting a low-income country (LIC), with full text availability in English or French. Exclusion was based on reviews of clinical or biomedical trials and interventions for medical or dietary treatment.

Published literature for the evidence map:
 Retrieved: 1521 (October 20, 2016)
 Selected based on title and abstract: 38
 Retained based on full text: 18

Concept and policy documents from the literature search, harvesting and snowballing: 55

All publications were entered into a bibliographic reference database (EndNote 7.1®). Duplicates were removed. They were first screened by title and abstract, and next by verifying the full articles. Two reviewers decided on the inclusion of documents.

Evidence information was extracted and synthesized by the following themes identified in the first part of the scoping study and adapted along the way:

Themes:

- Authors (reference)
- Study aim
- Country; geographic coverage or extent
- Number and type of studies
- Type of health service, disease or initiative
- Quality appraisal of the studies
- Integration intervention or approach (mode or model):
 - Add on (unidirectional), merged (bi-directional)(integrated)
 - Introducing, expanding (scale-up), linking, coordinating, other
 - One-stop shop, referral-based (stand-alone)
- Components of activities to be integrated
- Outcome or improvement effect:
 - Access, coverage, cost/efficiency, equity, quality of care, sustainability, health status, other
- Strength of the outcome
- Conclusion
- Recommendations

Evidence on SAM integration

For the concept, policy and evidence map on SAM interventions we reviewed documents of international and professional bodies that were influential in the introduction, integration and expansion of SAM and studied and reports on integration of SAM interventions. We searched the on-line libraries of PubMed, Google Scholar, WHO, UNICEF, the World Bank, CMAM-Forum, Emergency Nutrition Network (ENN), Institute of Development Studies (IDS) and websites of NGOs and health and nutrition projects. Further references were identified by snowballing and tacit knowledge of grey literature sources. Search terms were adapted to the data sources. The concept map on SAM interventions is reported on in Chapter 1. The policy map on integration of SAM interventions is summarized in this Chapter 3.

For the evidence map, we did not discriminate among studies based on methodological quality criteria because of the lack of studies on SAM integration interventions (already identified in the scoping study prior to this one, see Annex 2). Results of the evidence search therefore displayed the knowledge to date from all sources confounded. The evidence map of peer-reviewed studies is summarized in this Chapter 3, and a description of all studies organised by source is provided in Annex 4.

Search terms (and string) for the published literature included:

Search terms

- 'Severe acute malnutrition' OR 'severe malnutrition'
- Health (system* OR service*)
- Strengthen* OR support* OR perform* OR scale OR scaling OR integrate*
- Child*
- 2000 onwards

Inclusion criteria for the evidence map were studies on SAM-specific services for children under 5 in PHC, discussing effectiveness of support, strengthening, scale-up or integration interventions, set in a LMIC and full text availability in English or French. Exclusion was based on clinical or biomedical trials and interventions for medical or dietary treatment of SAM.

Published literature for the evidence map:

Retrieved: 382 (7 PubMed, 194 other sources)

Selected based on title and abstract: 61

Retained based on full text: 35

Concept and policy documents from the literature search, harvesting and snowballing: 98

All publications were entered into a bibliographic reference database (EndNote 7.1®). Duplicates were removed. Articles were first screened by title and abstract, and next by verifying the full articles. Four reviewers participated on the inclusion of documents.

To complete the understanding on the global progress of SAM integration to date, an e-

survey was conducted. The methods and results specific to this study are shared in Annex 5, and results are summarised in this Chapter 3.

Evidence information was extracted and synthesized by:

Themes:

- Authors (reference)
- Study aim
- Country; geographic coverage or extent
- Integration intervention or approach (mode or model):
- Components of activities to be integrated
- Outcome or improvement effect: Access, coverage, cost/efficiency, equity, quality of care, sustainability, health status, other
- Strength of the outcome
- Conclusion
- Recommendations

Learning for SAM

Interpretation of the evidence base on integrating 'other' health services or initiatives for integrating SAM into primary care may be difficult because of the great variety of health interventions and contexts. To facilitate information extraction and synthesis, understanding the relevance of lessons from other health interventions, we used the following description and tools for classifying and describing the various components of integration activities by level:

- For the community level (demand generation, involvement, incentives) and clinical level (promotion, prevention, case finding, referral, diagnosis, treatment, follow-up), Table 3.1 that maps the SAM service activities by care functions helped for identifying commonalities and differences of services;
- For the professional level, we looked for any reporting on teamwork, coordination, collaboration, champions, purveyors, task shifting or task sharing and other strategies;
- For the organisational level, we looked at elements of planning, resource allocation and supply management, human resource support, infrastructure, monitoring and reporting or other;
- For the institutional level, we identified whether consortia or alliances of partners work together and how their activities are coordinated; and
- For the systems level, we based selection on the health system domains of governance, financing, information, workforce, supply, service delivery systems, that has been described from SAM support in Table 1.2.

Table 3.1. SAM services activities by care function in the service delivery platforms

Promotion, Prevention	Case finding and referral	Diagnosis, triage and referral	Treatment	Follow-up
CB PHC	• Counselling • Community engagement	• Enhanced case finding • Active case finding • Referral • Self-referral	• (CCM/ICCM) • Anthropometric and clinical examination • Appetite test • IMCI danger signs • Referral	• (CCM/ICCM) • Treatment initiation • Treatment progress • Home visits • Referral
	• Counselling	• Passive case finding	• Anthropometric and clinical examination • Appetite test • IMCI danger signs • Referral	• Treatment initiation • Treatment progress • Counselling • Referral
FB PHC				
SHC	• Counselling	• Passive case finding	• Anthropometric and clinical examination • ETAT	• Treatment initiation • Treatment progress • Counselling • Referral

CB PHC Community-based primary health care; FB PHC Facility-based primary health care; SHC Secondary health care; ETAT Emergency triage, assessment and treatment; IMCI Integrated management of childhood illness; (i)CCM (Integrated) community case management.

iii. Concept map

This section clarifies key concepts of integration and describes analytical and methodological approaches suggested in the literature.

The goal of a health system is to balance population health, client satisfaction and social and financial risk protection [62]—aka the triple aim of health, care and cost [29]—through intermediate goals of equitable access, coverage, choice, efficiency, quality and sustainability [62]. Within the health system, multiple health actors—individuals, agencies or institutions—operate and involve in promotion of healthy behaviours, demand generation of services, offering clinical care, organisation and planning of services, governing public health and social services and ensuring (multi)sectoral linkage and collaboration. Because the health system is an open and adaptive social system (see Chapter 2), it is influenced by internal and contextual changes and looks for a new balances when a change is introduced. The dynamics of the health system in adopting and expanding a new health intervention is discussed within this complexity frame.

A health intervention is a broad umbrella term that may be a clinical, public health or policy intervention that is a single activity or set of activities aimed at modifying a process, course of action or sequence of events to change one or several of their characteristics (e.g., individual or population treatment process and outcome, population health outcome, clinical quality of care, services performance) [24]. An intervention can therefore be simple, complicated or complex. A complex intervention involves a combination of technologies, inputs into service delivery, organisational changes and modifications in processes related to decision making, planning and service delivery [107], and their interactions. The integration of a complex health service into a complex (sub)health system will have to consider the diversity of actors at the different levels and service platforms, the close and interwoven entities and actors, the influences actors may undergo, and the ability to create a new or maintain the equilibrium (Figure 2.9).

Key definitions and characteristics of integration

Definition of integration

‘Integration’ is a term that is used variously across the health sector to describe arrangements and processes of health organisation programmes, services and care. WHO proposes as a working definition of integrated health services ‘the management and delivery of health services so that clients receive a continuum of promotive, preventive, curative and rehabilitative care according to their needs over time and across different levels of the health system’ [110].

Integration aims to address fragmentation or duplication, enable coordinated and continuous care and better manage population needs and resource constraints. Attention to integration grew in response to the rise in major single-disease or population-group-

specific programmes that were vertically driven in parallel systems. Applied to the integration of SAM, this definition implies that child-centred healthcare provides comprehensive continuity of care across time and services with no missed opportunity for a child, at any contact with the health system, to be diagnosed and start treatment for any disease, including SAM. This definition is not set in stone, and in the published literature, 'integration' is used interchangeably with, e.g., alignment, collaboration, coordination, horizontal, linkage or scaling-up, to contrast with, e.g., stand-alone or vertical. The integration process may be called, e.g., adding, adopting, mainstreaming or merging. Integrated care may be called, e.g., comprehensive care, continuity of care, coordinated care, delivery networks, package of care or routine care, to contrast with, e.g., fragmented, segmented, segregated or specialised care.

Different perceptions of integration

Because health interventions involve all tiers of the health system—(global), sub-national, national, local and patient levels—different health actors have different perceptions of integrated health services. From the patient's perspective, integration may mean receiving comprehensive person-centred care with continuity in time and place, regardless of the disease. From the health worker perspective, integration may mean providing comprehensive person-centred care by collaborating with colleagues and services and ensuring continuity in time, place and services. From the health manager and policy maker perspective, integration may mean inclusion in the basic package of healthcare, therefore ensuring adapted and comprehensive policies, guidelines, budgets and action plans [107, 111]. Despite the different perspectives, all have in common to achieve comprehensive care for the individual that responds to his/her needs and expectations.

The health intervention that is being integrated, may be a new idea, initiative, practice, procedure or institutional arrangement that is being introduced and perceived as different, new or innovative. Or, the intervention may have been previously delivered at small scale and is now scaled up or has increased in intensity, thus brought to a level of mainstream or routine practice [107, 111].

Modes of integration

Various integration modes (models or approaches) have been described in the literature from the integration output perspective of 'coherent service integration' [110] that may be compatible or overlap:

- **Package of health interventions**, (e.g., IMCI) with the aim of providing appropriate care for an individual or target group at the same time at one site (aka 'one-stop shop');
- **Multi-purpose service delivery point**, where a range of services is provided at one location under one manager (e.g., multi-purpose outreach visits, multi-purpose clinics);

- **Continuum of care** over time for chronic conditions (e.g., life-long care for HIV), or at different stages in the life cycle (e.g., pre-post natal and newborn care), across different levels of care (e.g., linking care at the community, primary care and secondary care levels);
- **Vertical integration of different levels of care (or programmes)**, with an overall manager having a strategic overview and a well-functioning referral system to move up and down the levels of care (e.g., SAM interventions in the community, linked to SAM in outpatient care with SAM in inpatient care), aka referral-based model of service delivery. Vertical programmes often have a focal-point appointed at the various levels to assure horizontal coordination or linkage);
- **Horizontal integration of care (or programmes) at the same level or care platform**, bridges various expertises of different health actors who collaborate and coordinate different aspects of care (e.g., a child with SAM referred to the vaccinator to update the vaccination status);
- **Integrated policy making and management** brings together decisions, support functions and coordinated actions for improvement across parts of the health system (e.g., a health manager responsible for the health of a population coordinates interventions offered by the public, private and voluntary sectors);

Other modes have been describing the *process* of service integration that evolved from segregated, fragmented care toward **adding, coordinating, linking** a health intervention to another or others (**unidirectional**), **merging** health interventions (**bidirectional**), or introducing and expanding (**scale-up**) a (new) health intervention; and

Other modes differentiated the *strategies* for integrating within and across system functions or care domains as a continuum of **non-integrated** (segregation or fragmentation, or stand-alone), **partially integrated** integration, and **fully integrated** (mergers and acquisitions) [112]. The continuum of integration can also be plotted on a graph to show an overall appreciation of integration process, with the extent of shared decision making from none to high on the x-axis and the duration of commitment from short to long on the y-axis [113], to show an overall appreciation of integration process.

Vertical versus horizontal paradigm

Often integration is used as synonym for horizontal care, in contrast to the vertical approach. Disease-specific interventions are mostly top-down, vertically managed and funded and sometimes offered in parallel systems. They have had a major impact on disease-specific health, but have not significantly improved health systems [114]. Such interventions also risk overlooking other public health priorities or unintentionally affect them as they rarely consider systems effects. Arguments for horizontal integration have been driven by the desire to provide people-centred continuity of care.

Common sense suggests that integrated care may be more effective in dealing with the person as a whole, more cost efficient by increasing rational use of pooled resources and more locally owned and demand driven, improving access and uptake [110, 115]. Arguments against integration are driven by the need to show disease-specific results in short time frames, implement high-quality standards, control financial resources, manage exceptional cases for rapid change or save lives (e.g., AIDS epidemic, Ebola response). A 'diagonal' or 'oblique' approach was added to the spectrum to defend the idea that vertical and horizontal approaches have both strengths and weakness and may co-exist to deliver more effective health interventions [116]. Integration therefore is not a *sine qua non* but should rather a strategy that seeks to identify the most optimal modality and extent of integration depending on the need and capacity of the health system.

Dimensions of integration

Valentijn et al. (2013) [113], based on work of Fulop (2005) [117] and Lewis (2010) [118], presented dimensions of integration as concentric circles at the micro, meso and macro levels of the health system that are built around person-centred care (Figure 3.1):

At the micro level:

- **Clinical integration:** Comprehensive care is provided to the patient by coordinating actions of various professionals and providers in a single and coherent process with a continuum in time and place;

At the meso level:

- **Professional integration:** Professionals both within and between services or organisations have a collective responsibility to provide comprehensive and coordinated continuum of care;
- **Organisational integration:** Organisations are formally brought together by mergers or collectives, or virtually through provider networks, or via contracts, to work together to reach a common goal;

At the macro level:

- **Systemic integration:** Policies, rules and regulations and system functions are coherent and comprehensive;

Across levels:

- **Functional integration (or administrative integration):** Non-clinical support and back-office functions and financial systems are aligned across units and levels;
- **Normative integration:** Values, culture and vision are shared across organisations, professional groups and individuals, by for example, developing common integration goals, identifying communication gaps, building clinical relationships and trust through local events or involving service users and the wider community; and

- **Horizontal and vertical integration:** System functions are vertically linked at the different levels and actors of the health system, and horizontally linked at similar levels and actors of the health system.

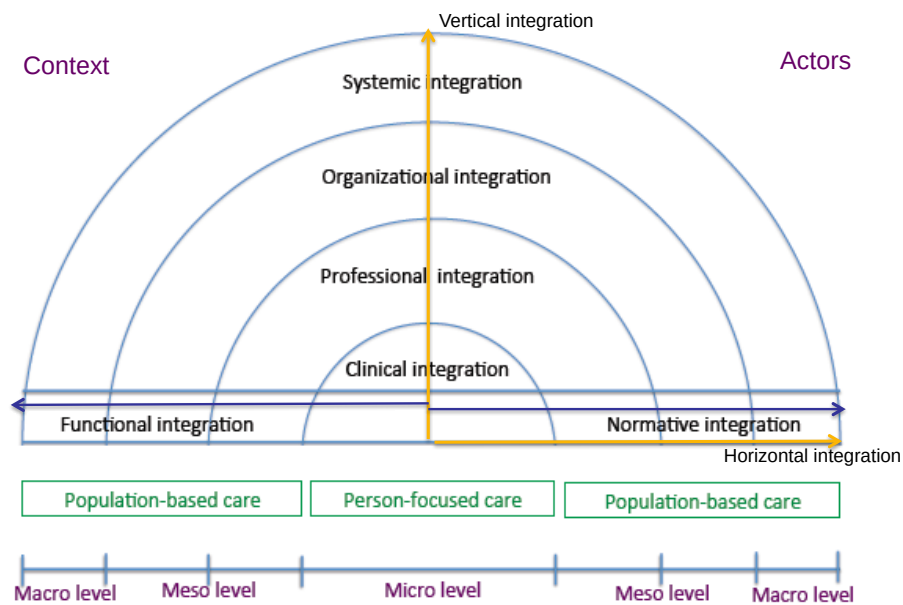


Figure 3.1. Dimensions of integrated care at the micro, meso and macro level of care [113]

Integration is a process

This section provides arguments in favour of the dynamic nature of integration.

Introducing a new intervention

The introduction and integration of a health intervention is a complex process because of the many interacting elements of the health system and its actors that are involved and need to change behaviours. A starting point is the study of diffusion (spread) of innovation in service organisation by Rogers (1993) [119]. This has been much used, applied and refined to explain the complex interactions of introduction, integration and expansion of health services [120]. Rogers described the innovation-decision process as a model of five stages through which an individual (or other decision-making unit) passes from 1) knowledge of an innovation to 2) formation of an attitude toward the innovation to 3) a decision to adopt or reject to 4) implementation of the new idea to 5) confirmation of the decision. (Note that these steps are similar to Prochaska's stages of behaviour change of pre-contemplation (not ready), contemplation (getting ready), preparation (ready), action and maintenance [121]).

An innovation may spread spontaneously or in an organised way when a strategy is put in place [119]. The rate of adoption of innovations, according to Rogers, is determined by the 1) perceived attributes of innovations (e.g., relative advantage, compatibility with existing health interventions, trialability, observability, complexity), 2) type of innovation-decision (e.g., optional, collective, authoritative decision-making), 3) communication channels used at the different stages (e.g., mass media, interpersonal) and 4) extent of a change agent's promotion efforts. However not all variables have been found to explain the adoption rate (which probably hints at the complexity characteristics of interactions). Health actors involved in the diffusion of innovation may fall into the categories of 1) innovators, 2) early adopters, 3) early majority, 4) late majority or 5) laggards, following a bell-shaped distribution [119]. They may also be (intentional or unintentional) blockers.

Greenhalgh et al. (2004) [120] studied the diffusion of innovation theory in a large systematic review. The study identified five key systems that are at play in the evolving stages of innovation–diffusion (informal spread), dissemination (planned spread), adoption (decision to take on) and assimilation (action to take on): 1) the user system, 2) the resource system, 3) knowledge purveyors, 4) the change agency and 5) the outer context, where system antecedents and system readiness played a role [120]. Features of spread evolved along a continuum from 'let it happen' (characterised by unpredictable, un-programmed, uncertain, emergent, adaptive and self organising features), through 'help it happen' (characterised by negotiated, influenced, enabled features), to 'make it happen' (characterised by scientific, orderly, planned, regulated, programmed systems with 'properly managed' features).

Extent of integration

The integration of a health intervention into health systems can take different forms. Shigayeva et al. (2010) [122], building on learning from others, conceptualized integration along a continuum from no formal interactions (no integration), through linkage of informal cooperation and coordination of activities (partial integration) to formal merger (full integration) (Figure 3.2) [122, 123]. (Note that to not confuse level of integration with level of the health system, we replaced 'level' with 'extent').

There is usually considerable variation across and within system domains, and the integration process may be a patchwork of 'no, partial or full integration', or as some have proposed, of 'vertical, horizontal or mixed spread'. Mapping the extent of integration is useful for health actors to understand the variation of integration, prioritise system functions for integration, set a time frame, identify resources, implement activities and monitor progress [107]. The integration map is also a tool that can be used to decide whether or not integration is desirable, depending on the need and capacity, and accordingly plan, regulate and coordinate outsourcing or collaboration.

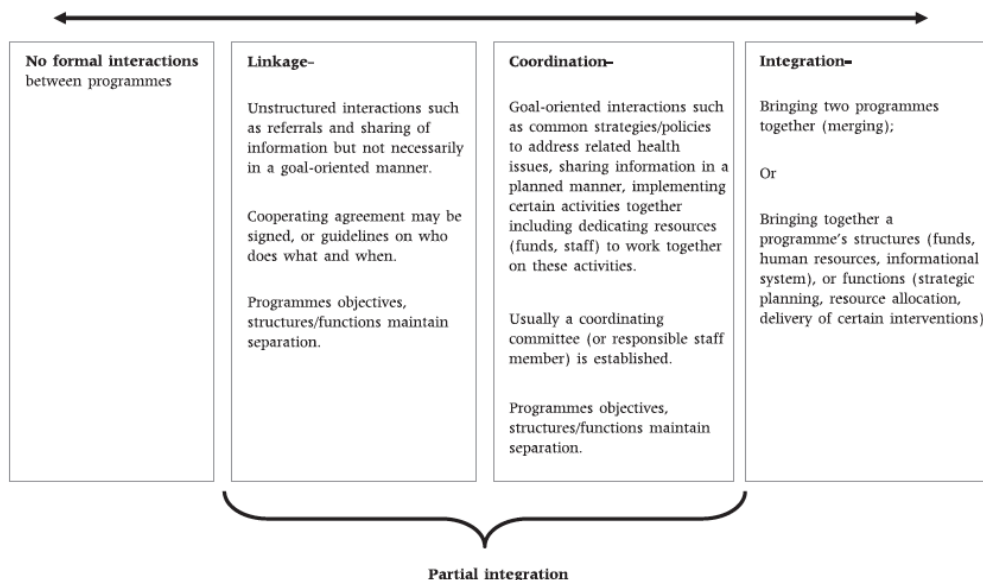


Figure 3.2. Levels of integration examined through the lens of interaction [122]

Factors influencing extent and speed of integration

Atun et al. (2010) [107] studied factors that influence the extent and speed of integration and summarised empirical evidence suggesting that

‘... diffusion and adoption of innovation in health systems is influenced by the nature and complexity of the innovation, how it is perceived by the adopters, contextual circumstances, and health system factors. Further, adoption and diffusion of these innovations are influenced by the prevailing cultural norms, beliefs and values of the key actors and institutions within the adoption system, in particular professional groups and opinion leaders, social networks, systems and structures that enable learning within an organisation and the absorptive capacity for new knowledge within adopting organisations’.

The factors that influence the integration process interact in ways that is not always predictable or desirable and therefore need to be considered from a systems approach. Knowing the key factors and their interactions that influence the integration process can help health actors plan interventions to accelerate the integration process. The conceptual framework in Figure 3.3 shows the five factors of 1) problem, 2) intervention, 3) adoption system, 4) health system characteristics and 5) broad context that interact and influence the integration process of a health intervention into a health system [107].

The conceptual framework considers integration as a dynamic process in which the interactions of different factors simultaneously affect and are shaped by the elements of the system. The framework invites exploring patterns of interactions and synergies among factors that induce change but are not always predictable or intended.

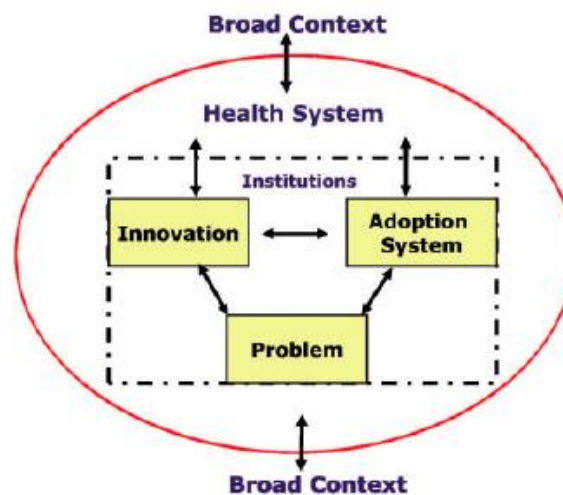


Figure 3.3. Conceptual framework for analysing the integration of health interventions into national health systems [107]

Atun et al. suggested that the application of the framework and the analysis of influencing factors need the involvement of knowledgeable key actors to deliberate collectively on causal linkages and system-wide effects, map pathways of change and set priorities based on feasibility and resources [107].

Table 3.2 provides examples of factors that influence the speed and extent of integration to explain the framework, based a review of the literature.

Table 3.2. Examples of factors that influence integration: the framework explained

Categories	Characteristic	Examples of factors
The problem	Perceived necessity of a robust response [107, 124]	Knowledge of the causes and consequences of illness and treatment pathways; Severity and trend; Urgency; Scale of economic burden and long-term consequences; Communication channels and communication behaviour;
The intervention	Perceived attributes of innovation for rapid realisation [107, 124]	Relative advantage; Compatibility with existing health interventions; Triability; Observability; Complexity;
Adoption system	Receptivity to adopt and assimilate the novel intervention [107, 120, 124, 125]	Extent of promotion efforts by knowledge purveyors and/or change agents; Conformity of the novel intervention with norms, beliefs and values; Coherence of the novel intervention; Cognitive participation in the novel intervention; Optional participation in the novel intervention; Collective action for the novel intervention; Reflexive monitoring (conformity with expectations of the novel intervention); Authority decision for the adoption of the novel intervention;
Health system characteristics	Regulatory, organisational, financial, relational, functional and clinical changes at various levels to adopt and assimilate the novel health intervention [107]	National governance and leadership for integrated care; District management and operational leadership for integrated care; Social participation; Health financing; Human resources management; Health information management; Medical products management; Service delivery;
Broad context	Broad context in which the adoption and assimilation process of the novel health intervention occurs [107]	Political, legal, socio-economic environmental, demographic stability; Donor mandated financing; Interactions with national initiatives; Contingency planning and capacities, resilience to shocks; Advocacy mechanisms;

Integration is a strategy

Integration is considered a key strategy of health system strengthening to improve service delivery for which primary healthcare is central. Frenk (2009) [126] called for

‘... to focus on developing primary care networks that are seamlessly integrated into the rest of the health system ... to finally unlock the full potential of Alma Ata ... to assure that high-quality services are provided on the basis of a defined population, through proactive strategies, favouring continuity of care, guaranteeing an explicit set of entitlements, and assuring universal social protection in health’.

The integration strategy is informed by the capacity of the health system, and the actual and desired status of integration in line with the health needs and priorities. It is important for key actors to explore strategies that promote integration and improve efficiency and impact and to consider whether integration is desirable and feasible given national capacities, resources and overall health priorities or needs [107, 127]. The strategy therefore sets long-term goals and considers what functions and integration interventions to prioritise. Applying system thinking, exploring possible scenarios and discussing mitigating strategies are therefore useful for the planning health services and their integration into complex adaptive health systems [128].

Suter et al. (2009) [129] reviewed 190 health sciences and 29 business papers and found no unified or commonly agreed upon conceptual model for health systems integration. The authors could not propose a one-size-fits-all model or process for successful integration because a firm empirical foundation was missing. However, they found that a number of principles were associated with successful integration processes and models. They retained ten principles that were independent of type of integration model, healthcare context or patient population:

1. Comprehensive services across the care continuum
 - Cooperation between health and social care organizations;
 - Access to care continuum with multiple points of access;
 - Emphasis on wellness, health promotion and primary care;
2. Patient focus
 - Patient-centred philosophy; focusing on patients' needs;
 - Patient engagement and participation;
 - Population-based needs assessment; focus on defined population;
3. Geographic coverage and rostering
 - Maximize patient accessibility and minimize duplication of services;
 - Roster: responsibility for identified population; right of patient to choose and exit;
4. Standardized care delivery through interprofessional teams
 - Interprofessional teams across the continuum of care;
 - Provider-developed, evidence-based care guidelines and protocols to enforce one standard of care regardless of where patients are treated;
5. Performance management
 - Committed to quality of services, evaluation and continuous care improvement;
 - Diagnosis, treatment and care interventions linked to clinical outcomes;
6. Information systems
 - State of the art information systems to collect, track and report activities;
 - Efficient information systems that enhance communication and information flow across the continuum of care;

7. Organizational culture and leadership
 - Organizational support with demonstration of commitment;
 - Leaders with vision who are able to instil a strong, cohesive culture;
8. Physician integration
 - Physicians are the gateway to integrated healthcare delivery systems;
 - Pivotal in the creation and maintenance of the single-point-of-entry or universal electronic patient record;
 - Engage physicians in leading role, participation on Board to promote buy-in;
9. Governance structure
 - Strong, focused, diverse governance represented by a comprehensive membership from all stakeholder groups;
 - Organizational structure that promotes coordination across settings and levels of care;
10. Financial management
 - Aligning service funding to ensure equitable funding distribution for different services or levels of services;
 - Funding mechanisms must promote interprofessional teamwork and health promotion;
 - Sufficient funding to ensure adequate resources for sustainable change.

The authors suggested that the ten principles provided guidance for decision makers to plan for and implement integration efforts as they define the key areas for restructuring health services organisation and allow for organizational flexibility and adaptation to local context.

WHO (2015) [130] confirmed the absence of one strategic model for integration, and proposed to view integration as **a service design principle** for strategies **to enhance access and sustainability** to encourage universal health coverage and primary and community-based care [130]. They identified five critical and interdependent shifts that health systems need to make to become more people-centred and integrated (Figure 3.4):

1. **Empowering and engaging people** by providing the opportunity, skills and resources;
2. Strengthening **governance and accountability** by promoting transparency in decision-making and creating robust systems for the collective accountability of health providers and health system managers that align governance, accountability and incentives;
3. Reorienting the model of care so that efficient and effective healthcare services are purchased and provided through models of care that prioritize **primary and community care services** and the co-production of health;
4. **Coordinating services around the needs of people** at every level of care, as well as promoting activities to integrate different healthcare providers and create effective networks between health and other sectors; and

5. Creating an **enabling environment that brings together the different stakeholders** to undertake the transformational change needed. This involves making changes in legislative frameworks, financial arrangements and incentives, and the reorientation of the workforce and public policy-making.

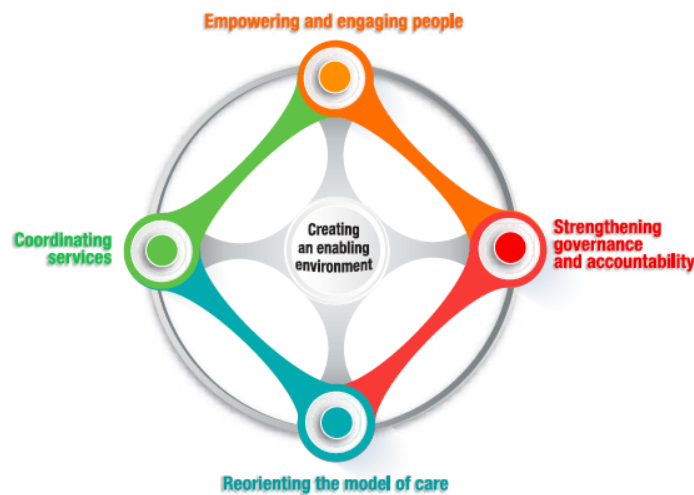


Figure 3.4. The interdependency of five strategic directions to support people-centred and integrated health services [130]

The report proposed a conceptual framework (Figure 3.5) that 'maps the relationships between the different parts of the health system that provides the context for people-centred and integrated health services, presenting individuals, families and communities at its centre, placed within a service delivery context that supports universal, equitable, people-centred and integrated health services' [130].

The framework encourages viewing health services being delivered through integrated networks of the health sector with direct inputs from communities and within a context of governance, financing and resources. Moreover, the framework shows the need for intersectoral action in tackling structural determinants of health and close collaboration between health, social care, education and local services to contribute to better health for all.

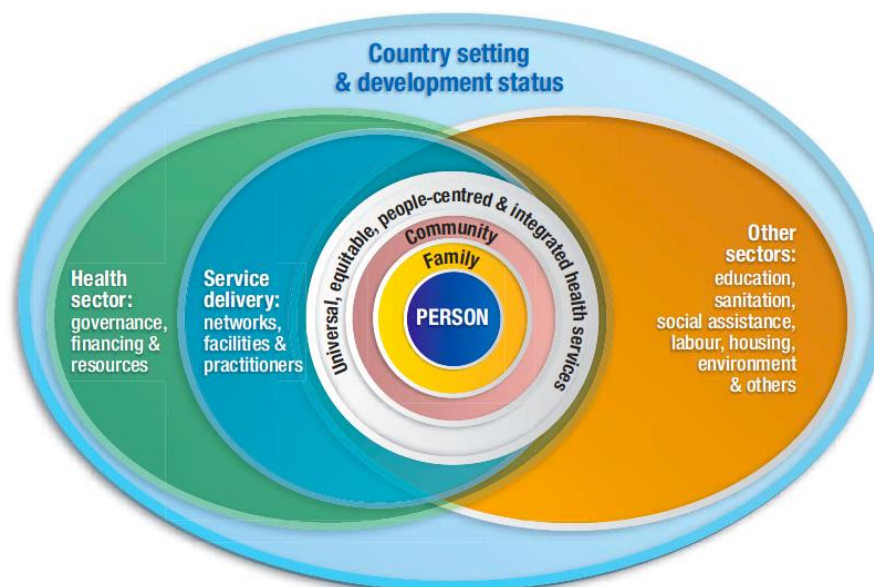


Figure 3.5. Conceptual framework for people-centred and integrated health services [130]

Scale-up, a special form of integration

We propose scale-up as a special form of integration because the concepts overlap and guidance for one may be covered by the other. Both integration and scale-up include the 'introduction' of a new intervention that affects different levels and various actors, thus inducing a 'change process' that needs to be initiated, led, managed and monitored.

The term 'scale-up' is widely used in the published literature, but there is no agreed definition. WHO defined scale-up of a health intervention as the deliberate effort to increase the impact of a health innovation, successfully tested in a pilot or experimental project, to benefit more people and foster lasting policy and programme development [131]. Scale-up may therefore mean 'doing something in a big way to improve some aspect of a population's health' [132]. It may aim to expand inputs (human or financial resources or supplies), outputs (access, scope, quality, efficiency), outcomes (coverage, utilisation) or impact (reducing morbidity or mortality) [133]. Scale-up is a guided process rather than a spontaneous one that involves strengthening capacities based on identified needs and a scale-up strategy that reflects the choices made and goals set.

Scale-up of a health intervention may be considered a special form of integration in which the intervention is being introduced as 'new' in a 'new' setting. The newness thus relates to the organisational changes, new financing schemes and novel processes that accompany scaling up, intensification, integration and eventual assimilation of the intervention into the health system [107]. On the other hand, integration of a health intervention may be considered a special form of scale-up, in which integration is the

spread of a health intervention across disciplines in a same setting, and scale-up is considered the replication of a health intervention in a different setting [134]. WHO (2008) [110] identified three crosscutting considerations relevant to all scale-up: 1) sustainability, 2) equity and 3) effects of scaling up an intervention on the rest of the health system. The three considerations are equally relevant for integration.

In the literature, the distinction between these two concepts is often unclear, and lessons may be relevant for both. Therefore, for the purpose of this study, scale-up is considered a special case of integration when appropriate, and then included. Any discussion of scale-up should explicitly state the type of scale-up to avoid confusion (Note that this advice is also valid for integration).

Frameworks and tools for introducing and integrating (and scaling up) a health intervention

Conceptual frameworks of integration are commonly developed for analytical purposes, representing a complex subject in a simplified way that is understandable and useful. They are developed with a specific focus, lens or purpose that may not be appropriate for other subjects or settings.

Shigayeva et al. (2010) identified 40 conceptual frameworks and 13 implementation frameworks relating to integration [122]. They found that the frameworks showed a variety of different typologies of integration into health systems that can be categorized by 1) why integration is desirable, 2) what structures and/or functions at different levels of the health structure are affected by integration (or its lack) and 3) how integration influences interactions between health system functions or health actors. The 'why' of integration referred to perceived fragmentation of functions and services, and subsequent demands and expectations. The 'what' referred to health system structures and/or functions, and convergence of health actors. The 'how' referred to dynamic interactions between health actors building strategic alliances, regulations, and service delivery by multidisciplinary teams creating networks and coordination mechanisms [122]. Annex 3 lists examples of integration frameworks for analysis and organisation of integration and scale-up used in LMIC and industrialised countries. Depending on how scale-up is defined, scale-up frameworks may also be relevant to integration.

Methods and guidance tools have been developed for introducing, integrating and scaling up health interventions. Annex 3 lists examples of methods, guidance documents and tools on introducing and integrating and scaling up a new health intervention.

When designing, exploring or evaluating an integration intervention, the following questions that relate to the goal, context, actors, type, breadth, intensity, and influences of the integration may be considered to next aid the setting of integration priorities (adapted from Shaw et al. (2011) [135]):

- **Goal:** What are we seeking to achieve by pursuing integration? Is integration the best solution?
- **Context:** Is the proposed integration programme associated with other interventions? What are competing agendas to consider? Which levels, sectors and actors are involved? What are the potential consequences?
- **Actors:** Is involvement inclusive and participatory? How can we bring in visible leaders or champions? How can we ensure dialogue and consensus? How can we change behaviours?
- **Type:** What integration processes should be prioritized? What existing structures, partnerships and processes can be built on? How will contract arrangements support and enhance integration? How can effective data sharing and management be ensured?
- **Breadth:** How will vertical or horizontal integration (across different levels and/or aspects of the health system) contribute to the success of the project?
- **Intensity:** How does the degree of integration relate to the goals and local context? How can we ensure that integration within one part will not result in inappropriate or increased fragmentation elsewhere?
- **Influences:** What factors will promote or hinder integration? How do these factors interact?

Health actors involved in integration

Health actors are individuals, groups or institutions with varied interests, values and power distributions in relation to health interventions or health system functions. Health actors involved in integration may be civil servants, financial and technical partners, education and training institutions, professional associations, private and informal health sector, community and religious leaders, community members, service providers and users. (Note that we preferred using 'health actors' instead of 'stakeholders' to underline the active role of those involved in integration). These actors play specific roles in service provision and use, and their perceptions influence service supply and demand, as well as policy and decision making and management. Moreover, their perceptions and behaviours are influenced by norms and values, and the context they operate in.

For a given health intervention, health actors' involvement and roles in health system functions (e.g., policies, regulation, coordination, management, service delivery, financing, teaching, research or auxiliary support) will vary in different contexts. Their communication and influence may play on the scale from diffusion (informal, unplanned) to dissemination (formal, planned) of new or integrated services through social networks, homophily (the tendency of individuals to associate with similar others), peer opinion, marketing, expert opinion, champions, boundary spanners and change agents [120].

Figure 3.6 shows the role of various actors in integrated healthcare, but it does not show the dynamics of interactions that health actors involve in as part of adopting a new intervention into their routine behaviour.



Figure 3.6. Child healthcare actors and their role in integrating care [135]

Health actors' interest in and influence on integration can be mapped on a matrix from low to high as blockers (low interest to high influence), bystanders (low interest, low influence), abstainers (neutral interest, neutral influence), supporters (high interest, low influence) or drivers (high interest, high influence) [136] (Figure 3.7). The mapping tool may help to identify change agents and knowledge purveyors who can be used as facilitators, or blocking and missed actors who can be targeted for behaviour change. Other methods (e.g., network analysis) for in-depth stakeholder analyses [53] would further refine the understanding of the social construct.

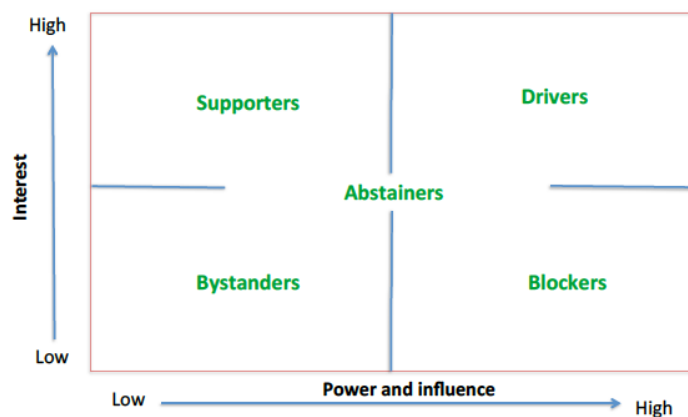


Figure 3.7. Health actors and their role in the integration of health services [136]

iv. Policy map of SAM

This section explores policy documents and events that facilitated the introduction and integration (and scale-up) of SAM case management in primary care.

Key drivers of policy change

Three developments facilitated the paradigm shift for case management of SAM:

- Major nutrition emergencies with high mortality in children under 5 drove the research agenda to improve survival by improving treatment protocols and developing a RUTF that enable decentralised outpatient care increasing coverage (innovation);
- Major nutrition emergencies created opportunities to pilot test the new intervention and generate evidence on its effectiveness (bottom-up generation of evidence); and
- Major global and national commitments to improving child survival and poverty alleviation drew increased attention to the role of nutrition in child survival and development, expanding SAM interventions (top-down spread of policies).

The key drivers that spread the innovation and integration of SAM interventions were 1) the introduction and spread of implementation, 2) the generation of evidence and 3) the adaptation of policies and development of guidelines. The evolving knowledge was spread through policy and guidance documents, events, and information networks (Tables 3.3–3.4).

Brief history of policy change

We considered as starting point the release of the 1999 WHO SAM treatment manual enabling standardised SAM care [137] (in hospitals or therapeutic feeding centres during emergencies). Shortly afterward, the development, testing and commercial availability of RUTF made SAM treatment in outpatient care possible. From then on, a few NGOs piloted SAM outpatient care during nutrition emergencies in Ethiopia, Malawi and Sudan, and evidence on effectiveness emerged. From then on, the outpatient care approach quickly expanded to cover larger areas and involved more partners in recurrent and protracted nutrition emergencies, generating evidence on large numbers of children treated as never before [16]. Numerous expert consultation meetings were needed to convince researchers and policy-makers of the effectiveness and safety of treating SAM in outpatient care. It was not until 2007 national governments and their partners supported the expansion of SAM case management beyond the emergency response. The 2007 UN Joint Statement [25] was a tipping point for expansion of efforts.

Methods and tools for policy change

Mutual learning in many debates in global workshops and conference spurred financial and technical partners to support national governments to take on SAM case management in primary care. Subsequently, health and nutrition actors collaborated to

develop and disseminate methods and tools that advanced the introduction and spread of SAM interventions by fostering knowledge expansion and skills development (Table 3.4). Moreover, various knowledge and information networks and task forces were formed to support health actors to advance learning and scale-up of SAM services. For example, in 2016 the CMAM Forum counted 2,583 members in 109 countries and offered all SAM-related evidence; the En-Net is a problem-solving platform for field practitioners that is used daily by health and nutrition actors. (Note that the SAM information platforms in 2017 will be merged into one platform called ‘State of Severe Malnutrition’).

Table 3.3. Policy map of documents and events supporting the introduction, integration and scale-up of SAM case management in primary care

Year	Document, event	Facilitation, pledge, aim, commitment
Global policies		
1999	WHO: Manual on SAM treatment protocol [137]	Standardised inpatient management of SAM with antibiotics and therapeutic milk regimens rapidly expanded knowledge and skills development for scale-up in secondary care and other outreach inpatient strategies in emergencies.
2000	United Nations: Millennium Development Goals (MDG) 2000–2015 [138]	The MDGs put SAM on the map as a determinant in reducing child mortality and diseases (MDG4 and MDG6), and contributor to reducing extreme poverty (MDG1).
2003	Concern Worldwide, Valid International: Conference on the community-based management of severe malnutrition [139]	Emerging evidence on the effectiveness of the use of RUTF and SAM outpatient treatment facilitated the adoption and introduction of a new management approach for expanded and early detection and start of SAM treatment.
2005	Concern Worldwide, Save the Children, Valid International: Conference on the operational challenges of community-based management of SAM [140]	Experience with management of SAM (detection, referral, and treatment) in outpatient care in various settings strengthened the knowledge base for scale-up.
2006	WHO: Informal consultancy meeting on SAM [141]	An expert meeting with resource documents published in the <i>Food and Nutrition Bulletin</i> consolidated evidence, advanced the research agenda and expanded partnerships and scale-up.
2007	UNICEF, UNSCN, WFP, WHO: Joint statement on outpatient management of SAM [25]	Guidance and consolidated evidence on the effectiveness of SAM outpatient care advanced the research agenda and expanded partnerships and scale-up.
2008	Concern Worldwide, FANTA, Save the Children, UNICEF, Valid International: Conference on the integration of community-based management of SAM [108]	Experience with outpatient management of SAM at scale in various settings showed pathways for integrating SAM into routine child healthcare, facilitating increased ownership by ministries of health and expanded partnerships.
2008	Lancet Series: Maternal and Child Undernutrition [142]	Summary papers on maternal and child undernutrition covering SAM, stunting and intrauterine growth restriction, which accounted for more global deaths and disability-adjusted life years (DALY) in children under 5 than any risk factor in this age group, underlined the importance of addressing SAM.
2009	UNICEF, WHO: Joint statement adapting	Guidance on the transition to the WHO 2006 Child

	diagnosis of SAM [23]	Growth Standards, with adapted anthropometric benchmarking for the diagnosis and cure of SAM, supported efficient SAM programming.
2010; 2016	United Nations: Joint initiative on ‘Scaling up Nutrition’ (SUN) Movement [143], SUN 2.0	The global SUN Movement supported national multisectoral scale-up of nutrition, with management of SAM as a key intervention in high-burden countries.
2011	Emergency Nutrition Network (ENN): Conference on government experiences of scale up of management of SAM, Addis Ababa [144, 145]	Twenty-two country representations and technical and financial partners debated SAM scale-up challenges and provided recommendations and guidance on financing, capacity strengthening and governance.
2012	World Health Assembly (WHA): Global Nutrition Targets [146]	The WHA Resolution 65.6 comprehensive implementation plan contained six Global Nutrition Targets on maternal, infant and young child nutrition, with Target 6 to reduce and maintain childhood wasting to less than 5%; this increased attention to, investment in, and action for a set of cost-effective interventions and policies to help Member States and their partners reduce and maintain childhood wasting.
2012	UNICEF, WHO: Joint statement on integrated community case management [26]	An equity focused strategy to improve access to essential treatment services for children to encourage decentralized care that may include SAM and reach underserved communities.
2013	Lancet Series: Maternal and Child Nutrition [147]	Summary papers on evidence-based interventions to improve mother and child nutrition underlined the management of SAM as a key effective intervention.
2013	WHO: Guideline update on the management of SAM [3]	Evidence and WHO recommendations related to prioritized areas of SAM care improved SAM treatment and procedures and supported scale-up.
2016	United Nations: Sustainable Development Goals (SDG) (2016–2030) [148, 149]	National governments and global partners committed to preventing and reducing SAM to reduce child mortality and extreme poverty (SDG1) and to promoting active health and wellbeing at all ages (12 of the 17 SDGs have indicators relevant to nutrition).
2016	UN Decade of Action on Nutrition (2016–2025) to intensify action to end hunger and eradicate malnutrition worldwide, and ensure universal access to healthier and more sustainable diets – for every woman, man and child, everywhere [150]	Global roadmap to set, track and achieve SMART policy commitments to end all forms of malnutrition within the SDG Agenda 2030, supported by the new Strategic Plan of the UN System Standing Committee on Nutrition (UNSCN), the dedicated platform for open, substantive and constructive dialogue amongst UN agencies working on nutrition.
National policies		
	Ministries of health, national SAM guidelines	Many of the 80 countries providing SAM services reported having developed national guidelines with standardised SAM treatment protocols and job aids.
	Ministries of health, national nutrition action plans	As a follow-on to the SUN Movement, SDG and UN Nutrition Decade, national governments are encouraged to activate national nutrition action plans to reposition nutrition, including SAM.

Table 3.4. Key tools and global networks that advanced SAM service integration and scale-up

Year	Tools	Facilitation
2002; 2009	WHO: SAM inpatient care training modules [151]	Package for training trainers in inpatient management of SAM, enabling knowledge expansion and skills development for scale-up in secondary and tertiary care
2005; 2013 2006	WHO: Child pocket book of hospital care for children [152] Valid International: Field manual on updated SAM treatment protocol in outpatient setting [22]	Standardised paediatric care including SAM case management in secondary and tertiary care Standardised outpatient care of SAM in PHC and emergencies
2008	Concern Worldwide, FANTA, Save the Children, UNICEF, Valid International: SAM outpatient care training modules [153]	Package for training trainers in outpatient care of SAM in primary care and emergencies
2009	Infant Feeding in Emergencies (IFE) Core Group [154]	Guidance, training materials and job aids on integration infant feeding in emergencies into SAM case management
2010	FANTA: Country guidelines and job aids for SAM [155]	Guidance and job aids on SAM case management and other supportive interventions for adaptation to country contexts
2012	FANTA: CMAM costing tool [156]	Spreadsheet application for estimating the costs of establishing, maintaining and/or expanding SAM services at national, sub-national and district levels to help health managers formulate effective implementation plans, determine their financial feasibility and identify needed resources
2012	Myatt et al.: Technical reference on SAM contact coverage assessment methods [35]	Guidance on various SAM coverage assessment methods, including semi-quantitative evaluation of access and coverage (SQUEAC) and simplified lot quality sampling evaluation of access and coverage (SLEAC), which combined an array of qualitative and quantitative information with small-sample surveys. Other methods are Centric-Systematic Sampling (CSAS) and Simple Spatial Survey method (S3M).
2012	Global Nutrition Cluster: Harmonized Training Package (HTP) [157]	Guidance on nutrition in emergencies, including management of SAM, to support skills development for scale-up of SAM in emergencies
2013; 2015	Action contre la Faim (ACF): Health system strengthening for the management of SAM [158]	Nine-step guidance on a SAM-specific diagnostic of the district health system for improved SAM programming
2013	Concern Worldwide: Surge model for SAM [159]	Guidance on strengthening district capacities to effectively manage increased caseloads of SAM during predictable emergencies
2014	WHO: IMCI charts update [160]	IMCI charts with updated algorithms, including SAM case management, and comprehensive assessment and treatment guidance for childhood illness
2014	CMAM Forum: Key resources [161]	Summary map of key resources on management of SAM covering operational management support, planning, costing and surge, assessment and surveillance, community engagement, prevention, case management, monitoring and evaluation and nutrition in emergencies
2014	CMAM Forum: Technical support and information [162]	Summary map of technical support and information initiatives
2014	CMAM Forum: Research topics of	Summary database amalgamating research questions

	SAM [163]	identified in key publications related to acute malnutrition
2015	UNICEF: Programme guidance for SAM scale-up [38]	Guidance on scale-up of the management of SAM
2015	ENN and London School of Hygiene and Tropical Medicine (LSHTM): MAMI strategy [164-166]	Consolidated evidence and guidance (and research gaps) on assessing and treating infants under 6 months with SAM
2015	ENN: Community tool for MAMI [167]	Guidance for health workers on assessing, identifying, classifying and managing uncomplicated acute malnutrition in infants under 6 months in the community
2015	CMN: Assessment of community engagement for SAM and performance measure [168, 169]	Guidance on assessing and improving capacities for community engagement interventions for SAM
2016	UNICEF: Bottleneck Analysis (BNA) for SAM [170]	Guidance (and compendium of experience and learning) on assessing and improving the effective coverage of SAM at district level
2016	ACF: No wasted lives initiative, an agenda for scaling up the management of SAM by 2020 [171]	Guidance on improving access to effective treatment through six critical changes, building on lessons and experiences. This initiative will expand to become the 'State of Severe Malnutrition' involving more partners.
Start date	Information platforms	
1996	ENN Field Exchange and Nutrition Exchange [172, 173]	Publications on nutrition programme experience, learning, research and information on guidance, tools and upcoming training on nutrition and related sectors
2010	EN-Net: Nutrition knowledge and information sharing platform [174]	Technical guidance, evidence and learning from the wider nutrition and health community for supporting scale-up of quality services for the management of SAM
2011	CMAM Forum: Acute malnutrition knowledge and information sharing platform CMAM [175]	Technical guidance, evidence and learning from the wider nutrition and health community for supporting scale-up of quality services for the management of SAM
2013	UNICEF, WHO and World Bank: Joint child malnutrition estimates online (and report) [176]	Online access to updated child malnutrition estimates representing the most recent global and regional figures which allow users to visualize and export the global and regional estimates
2014	UNICEF: NutriDash online data reporting system (and report) [21]	Online annual data capture and reporting system that provides national nutrition information on infant and young child feeding, management of SAM, universal salt iodization, vitamin A supplementation and deworming, and home fortification with micronutrient powders programmes, for improving programme performance.
2015	Coverage Monitoring Network (CMN): SAM coverage knowledge and information sharing platform [177]	Technical guidance, evidence and learning from the wider nutrition and health community for supporting scale-up of quality services for the management of SAM

v. Evidence map

This section summarizes learning from literature reviews on the integration of health services and the integration of SAM services in LMICs. A narrative of the literature review on both health services and SAM integration is provided in Annex 4.

Lessons from integrating health services

Learning from 18 systematic reviews that studied effects of integrating health services into PHC on service access and use or health outcome has been synthesised (Table 3.5).

Table 3.5. Summary of evidence on the impact of integrating health services into primary healthcare on service use and/or health outcome

Type of services	Mode of integration						Strength of evidence	Number of studies	Reference
	Stand alone	Introduction	Add on	Referral-based	Merged	Continuity of care			
Reproductive health									
MNCH package and RH						X	Strong	19	[178]
STI and FP in PHC			X				Weak	62	[179]
STI and HIV care in FP				X	X		Weak	44	[180]
FP in PHC				X	X		Weak	9	[181]
FP in HIV counselling			X		X		Weak	9	[182]
FP in PHC			X		X				
STI and FP in MCH			X		X				
PMTCT in PHC	X		X				Weak	5	[112]
TB in HIV			X	X	X		Limited	63	[183]
HIV in TB			X						
HIV/AIDS in MNCHN			X				Limited	20	[184]
HIV in PHC			X		X		Limited	46	[185]
Child healthcare									
Comprehensive healthcare	child	X	X		X		Weak	5	[115]
IMCI					X		Weak	4	[186]
Community outreach									
MCH in immunization			X				Weak	27	[187]
MCH in immunization			X				Limited	32	[188]
Immunization and community outreach					X		Weak	14	[189]
CCM of malaria in CHW		X					Limited	43	[190]
CHW integration		X					NA	19	[191]
Other PHC									
Eye health in PHC			X				Weak	173	[192]
Health programmes					X		NA	55	[111]

CCM = Community case management; CHW = Community health worker; FP = Family planning; IMCI = Integrated management of childhood illness; IPTM = Intermittent preventive treatment for malaria; M(N)CH = Maternal (neonatal) and child health (and nutrition); PHC = Primary healthcare; PMTCT = Prevention of mother to child transmission; (S)RH = Sexual and reproductive health; STI = Sexually transmitted illnesses.

Much of the generated evidence came from uni-directional adding sexually transmitted illnesses (STI), HIV, prevention of mother to child transmission (PMTCT) and family planning (FP) in PHC. The overall findings from the systematic reviews suggested that various modes of integrated services were being implemented, but the add-on model was most commonly studied. Two reviews went beyond service delivery and considered other dimensions of integration [111, 191].

The current state of evidence on the benefits of integration balanced to the positive but the evidence with few exceptions was weak and remained still much in the realm of intuition. Efficiency gains from integrated services suggested decreased fragmentation of services and health workers, improved use of resources thus lower cost than stand-alone services, improved access and convenience for service users, decreased missed opportunities. Examples of identified risks were loss of visibility and overburden services and health workers. Ensuring proper planning and awareness of compatibility of service delivery requirements were found to be important.

The review revealed gaps in the evidence on benefits for service providers and users, information about cost and cost-effectiveness, comparison to non-integrated delivery, or what integration mode would work best in which context and why.

Lessons from integrating SAM services

This section summarizes results from reviewing the published literature on integration of SAM services into health systems. The evidence on how integration of SAM interventions impacted on the health system and health status was thin. Still, 50 papers were included in the review because they either discussed interventions or determinants that influenced integration, even when indirectly studied. Also, because integration and scale-up terms sometimes intermingled, papers on scale-up were included when appropriate. Table 3.6 gives an overview of twelve peer-reviewed studies that specifically relate to the integration of SAM (which included two studies that are part of this research). Only one study in Bangladesh [193] compared the impact and cost of SAM integration by adding-on SAM case management to iCCM with the referral-based model that functioned as a control. The study was conducted at small scale but found superior health and cost outcomes from adding SAM on to iCCM.

On the other hand, many evaluations of SAM interventions studied health system requirements and outcome of various approaches. Some compared SAM outpatient case management with SAM inpatient case management in terms of treatment outcome [17], cost [45], or contact coverage [40]. Studies rarely went beyond service delivery performance, barriers to access and use, and resources gaps for scale up (e.g., main indicators were limited to report on number of admissions; recovery, case-fatality in treatment and defaulter rates; contact coverage; barriers to access; cost; health workers training; and supply use).

Table 3.6. Summary of evidence on integrating SAM into primary healthcare

Study subject	Results	Scale
Integrating SAM into iCCM		
Quality of care [194] [193]	Improved health outcome and effective treatment and Improved health outcome of SAM in iCCM by CHW is possible.	Bangladesh, two sub-districts, small scale
CHW perceptions on barriers to quality of care [195]	Improved responsiveness to person's need of SAM in iCCM by CHW, but there are important barriers related to trust of health workers in CHW and cost of a quality diet.	Bangladesh, two sub-districts, small scale
Experiences on adding SAM case management onto iCCM and lessons and gaps in knowledge [196]	Importance of CHW status and skills; division of responsibilities between CHWs that provide treatment and others that do case finding, home visits and/or messaging to increase coverage; the potential for adding nutrition to immunization and antenatal care; the relevance of community-level treatment in areas with a high prevalence of SAM, low access to treatment and poor health infrastructure; the need to use shared terminology to clearly articulate the advantages of linking 'nutrition' and 'health' sectors; and the need to consider other sectors and concerns such as gender, social protection and food security. Other challenges related to coordination across MOH directorates, funding streams and lack of useful nutrition indicators included in the HMIS.	Overall
Sustainability and scalability [197]	Barriers were management by external personnel from the health system, no financial support for the scaling-up process, insufficient national advocacy and non-sustainable activities (e.g., free care).	Burkina Faso, 180 villages, small scale
Community involvement in SAM		
Barriers to access treatment for SAM [37]	Barriers were distance, high opportunity costs, knowledge of services, knowledge of malnutrition, child's refusal of RUTF, and retention in treatment for remote populations persisted.	Sind, Pakistan and Tigray, Ethiopia
Coverage appraisal of 44 surveys [39]	Low coverage persisted (mean 38.3%) thus having a limited impact that needs attention for improvement.	22 countries
Integrating SAM detection into child health days (outreach)		
Increased reliance on child health days including SAM detection and referral [198]	Neither their scale-up nor their impact has been consistently monitored or evaluated [198].	Overall
Integrating SAM case management into PHC		
Preparedness of the health system to implement SAM case management in PHC [199]	Key facilitating factors were commitment of government, adapted policy and guidelines, and functional user fee waiver for children. Key challenging factors were most funding was external for short-term interventions, and most health centres were active but half of the health workers positions were vacant and the other half present was not trained, and equipment and supplies were not operational.	Bangladesh, 44 health centres, small scale
Extent of SAM integration into the national health system [200]	Results classified full (4), partial (23) and no (3) integration of 29 health system functions, and evaluated integration progress (23) or stagnation (6) across the three years of study (even in the absence of a defined integration strategy). Governance and health information functions scored highest and financing lowest. In the absence of a clear strategy, integration had progressed and improved geographic coverage, access and under-5 mortality risk.	Niger overall, and 2 districts in depth
Factors that contribute to the speed of adoption of SAM service integration into the national health system [201]	Key facilitating factors were knowledge and recognition of SAM as a problem; effectiveness of decentralized continuity of care; compatibility with goals, support and involvement of health actors; and leadership for aligning policies and partnerships and mobilizing resources within a favourable political context driven by multisectoral development goals. Key hindering factors were misunderstanding severity, causes and consequences of the problem; limited utilization and trust in health service; high workload, and health worker turnover and attrition; high dependence on financial and technical support based on short-term external funding in a context of high demographic pressure.	Niger overall, and 2 districts in depth
Integrating HIV in SAM case management		
Integrating HIV testing and treatment in the case management of SAM [202]	Integrating HIV testing and treatment into case management of SAM and MAM resulted in initiation of ART and lower mortality.	Zambia, small scale

ART = Antiretroviral therapy; (i)CCM = (integrated) Community case management; PHC = Primary healthcare; SAM = Severe acute malnutrition.

Evaluations that studied intended outcomes discussed sometimes unintended, positive effects of SAM interventions, e.g., improved service uptake of immunization and reproductive health, increased trust in the health system and encouraged healthy behaviours. They neither studied unintended negative system effects nor included opportunity costs. The 2013 UNICEF evaluations [203] reported on integration of SAM and recommended to strengthen integration of SAM but did not provide a logic model for evaluating it, therefore missed clarity. Evaluations of SAM strategies that supported the health system to improve SAM-specific health outcomes identified bottlenecks as isolated entities and proposed intuitive linear solutions to each identified problem without considering systems effects. Hence, study outcomes focussed on effectiveness of SAM-specific interventions in isolation from other child health interventions, and did not study their impact on improving integration of SAM services, achieving comprehensive child healthcare or improving sustainability of services.

The evidence review uncovered a lack of clarity in the use of health system 'strengthening or support' taxonomy that could have helped actors understand what outcome to aim for and as such, design more appropriate intervention strategies in line with what they want to achieve. There was also a missed or incomplete interpretation of integration, as most interventions were SAM-specific support interventions. However, because all activities were implemented within a healthcare context, they certainly had system effects and promoted integration, whether or not they were intended, that were left unnoticed.

vi. Progress of SAM integration

This section describes how the integration of SAM interventions into national health systems has progressed across countries.

Since 2007, there was a steady increase in countries adopting outpatient case management of SAM (Figure 1.2), reaching 80 countries in 2014. Quality improvement, integration and scale-up of SAM interventions had been on the minds of many researchers, governments and technical and financial partners involved in SAM in high-burden countries. The evidence map revealed few studies on SAM integration. However, it also revealed that the package of SAM interventions to improve SAM service quality and scale-up (Table 1.2) had also positive effects on integration and system strengthening.

To understand better integration progress, we decided to conduct a global mapping exercise to have a snapshot of the extent of integration of SAM interventions into national health systems. Annex 5 reports on the e-survey that targetted 70 countries that had taken on outpatient case management of SAM. Because of the low response rate (39 countries responded out of 70) and the limited scope of the e-survey, only a rough indication on global integration progress was possible. Based on 20 systemic integration indicators that did not differentiate on weight of importance, countries were ranked by score (Figure A5.1). A great variation across countries was noted, with scores ranging from 2 in Pakistan and Vanuatu to 18 in Ghana and Swaziland, and a median score of 11. Countries that integrated SAM services during emergencies had progressed further, possibly because of the increased financial and technical resources made available. Despite the limitations of the quick assessment, results confirmed that in the absence of evidence or strategic guidance countries had progressed on SAM integration, but there was a great variation across countries.

The UNICEF NutriDash Global Report (2014) [21] provided also useful information on SAM integration progress, reporting on 80 countries of which 71 provided outpatient case management of SAM and 19 offered services in over 50% of their public health facilities. Out of 73 countries that reported, 45 countries had SAM guidelines in place that were updated in accordance with the 2013 WHO evidence, 27 countries had integrated HIV into SAM case management, 69 countries had integrated SAM into health and nutrition policies, 34 countries had a budget line for SAM supplies (44% compared to 64% in the e-survey) and 39 for SAM programming, 40 countries had incorporated SAM into the health management and information system, 43 countries had RUTF on the essential supplies list (42% compared to 28% in the e-survey) and 27 countries had included SAM in pre-service training.

Overall, SAM integration in many countries had started and progressed well, which indicated that governments had a desire or willingness to take on the services.

vii. Discussion and conclusions

The scoping study explored concepts, policies and evidence on integration of health intervention into national health systems that are relevant to SAM and summarised the evidence and progress of SAM integration to date. This section synthesises learning from the inquiries and tries to answer the questions we posed in the introduction, and proposes recommendations for accelerating the integration of SAM case management integration in primary care.

Synthesis of learning

What does integration mean?

The review identified different terminology and characteristics of integrated care; some terms overlapped or had different meanings. Commonly used terms that will be useful for future integration inquiries are:

- Types of integrated services, e.g.:
Package, multi-purpose delivery point (one-stop shop), continuity of care, comprehensive care;
- Mode(s) of integration, e.g.:
Added-on (unidirectional), merged (bidirectional), linked or coordinated (teamwork), referral-based model;
- Dimensions of integration, e.g.:
Clinical, professional, organisational, systemic, functional and normative integration; and horizontal and vertical integration;
- Perceptions of integration from the point of view of health actors, e.g.:
Comprehensive continuity of care received, holistic coordinated care by teamwork assured, comprehensive training provided, resources rationally pooled, policies aligned and unified;
- Breadth of integration across health system functions at the tiers of the health system, e.g.:
Vertical, horizontal, diagonal and virtual integration;
- Extent (or degree) of integration within health system functions, e.g.:
Across a continuum from no integration through linkage, coordination (partial integration), to full integration;
- Factors influencing (the speed of) the integration process, e.g.:
Elements of influence, capacity, readiness, motivation, awareness, prioritization related to the problem, intervention, adoption system, health system functions and broad context;
- Strategy of integration, e.g.:
Elements of integration prioritised and mode and extent of integration defined, adapted to the need, internal and external capacity and partnerships (including considering whether integration is desirable).

What have we learned about complexity of SAM services?

We learned that the level of complexity of a health intervention influenced the receptivity and speed of adopting and assimilating a new intervention. To define whether a health intervention is complex, its characteristics can be analysed to give an indication on its complexity (i.e., diversity, connectedness, interdependence and ability of learning). The assessment of clinical SAM interventions, aided by the mapping of SAM service activities (Table 3.1), yielded the following characteristics:

- The use of new technologies, activities or procedures:
 - Treatment guidelines for SAM differing from those for child illness, for example treatment of diarrhoea or dehydration in a child with or without SAM differ;
 - Anthropometry being part of the routine case finding, diagnosis and follow-up monitoring of treatment progress in the health facility;
 - Active case finding in the community for early detection and start of treatment;
 - Enhanced case finding by mothers or carers for self-referral;
 - Appetite test being part of the diagnosis; and
 - Treatment with a ready-to use therapeutic food that is a medicinal replacement food that has to be taken at home.
- A select target group:
 - Children 6-59 months with uncomplicated SAM are targeted for outpatient care, and with complicated SAM for inpatient care; and
 - Children of all other age groups regardless SAM severity classification are targeted for inpatient care.
- Service delivery by a special cadre of health workers, continuously and at repeated intervals:
 - Daily admissions for start of treatment, with elaborate examination;
 - Weekly follow-up visits for monitoring progress or identifying complications or non-response until cure for on average 45 days; and
 - Emergency triage, assessment and treatment (ETAT) with and 24-hour care for inpatient management of complicated SAM) for on average one week.
- Multiple interrelated and interdependent care components:
 - Covering the vast array of health promotion, disease prevention, case detection, diagnosis, classification, triage, treatment, follow-up; and
 - Delivering service activities at all platforms, from community to tertiary care;
 - Providing service activities by a multidisciplinary team of healthcare providers from mothers or carers, family members, lay or community health workers, clinical auxiliary workers, nurses, physicians,

paediatricians, pharmacists or drug dispensers, laboratory technicians, vaccinators;

- Stretching over a long period of time, with a standard treatment of 45 days on average; and
- Involving key health actors at the various levels of the health system: macro or national level for policy and decision-making, meso or subnational or district level for organisational management, micro or health facility and community level for service provision, and individual, household level.

Guided by Atun et al. (2010) [107], we plotted the characteristics of SAM interventions on three complexity scales (Figure 3.8) and found a high level of complexity based on:

- Episodes of care (a scale from single to multiple episodes) and number of service elements (few to multiple elements) (Figure 3.8a);
- Number of stakeholders involved in delivery of the intervention (few to multiple stakeholders) and levels of care (few to multiple levels of care) (Figure 3.8b); and
- User engagement in care (low to high user engagement) and importance of technology (simple, complicated) or behaviour (complex) (Figure 3.8c).

CAS characteristics that applied to SAM interventions are, e.g.: strengthening capacities for SAM implementation improved overall service use (unintended consequence); improved quality of care increased workload that then affected quality (feedback loop); interventions for raising community awareness for SAM had no immediate effect on health seeking behaviour (delay), but seeing SAM children recovering fast had a great influence (tipping point); the same support provided to health facilities or health districts with similar characteristics resulted in different effectiveness of care (non-linear relation between cause and effect); health facilities received (spontaneous) support from many (or few) community volunteers (scale free networks).

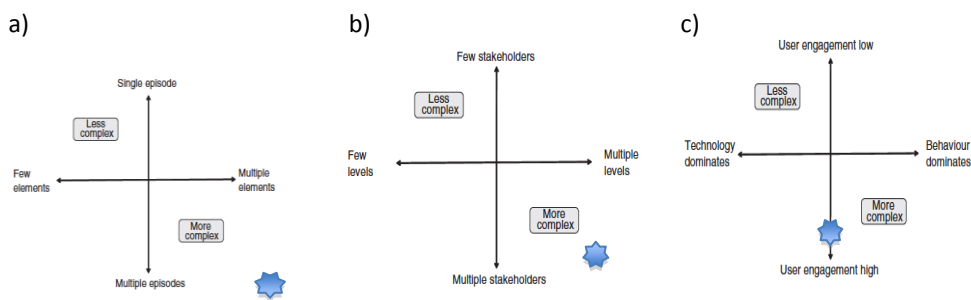


Figure 3.8. Complexity of SAM interventions mapped by episodes, stakeholder involvement and user engagement (Adapted from Atun et al. 2010 [107])
The star positions SAM interventions

What have we learned about integrating health services?

The findings of systematic reviews of integration are limited possibly because of the large spectrum of services studied, the fuzziness of the concept 'integrating health services', the context-specific character of integration, the role and influence of the various health actors, and many interacting determinants that favoured or hindered integration.

The effect of integration on access, quality, sustainability, and provider and user satisfaction has not well been studied either, but focused rather on health outcome. The lack of evidence is probably a reflexion of the multitude of causal factors that influenced integration, and thus its complexity. Challenges for integration depended on the perceived need, capacity of the health systems, and the strength of partnerships; and on both health system functions' compatibility and health actors' openness and readiness for change. Moreover, strategies for improving integration overlapped with health system support and health system strengthening strategies that had overlapping input-level interventions and the same intended outcomes (improved health, cost and care achieved by improving access, coverage, efficiency, equity, quality, sustainability of health services). In the absence of clear terminology, the overlap added to the confusion. Input-level interventions that did not target integration specifically could nevertheless improve integration spontaneously as a naturally emerging process. Unprogrammed, self-organising integration of services may achieve good results, but would not be as efficient then when designed, planned, implemented and monitored [120].

The added value of integration for patients was to receive comprehensive continuity of care that sought reducing missed opportunities, increasing efficient and rational use of resources, maximising teamwork and collaboration, ensuring referral and linkages within and across services and sectors, and reducing duplication of efforts.

Key lessons on integration from evidence and practices can be summarised as follows:

Concept:

- Integration means many things, and has many dimensions and typologies. One should define integration and specify its application when used;
- Integration is a strategy amongst others for strengthening health systems to achieve sustainable equitable and efficient patient-centred care.
- Integration is more complex than the yes–no or horizontal–vertical integration debate suggests; It is best understood as a process, a continuum; and
- The client's perspective and experience are at the centre of integrated care, and all integration interventions facilitate to achieve this.

Strategy:

- Integration needs the development of a context-adapted strategy, based on need, capacity and partnerships, that defines priorities and intensity of integration. One form of integration does not fit all contexts; no one model is suited to all health interventions; integrated services does not always mean a

- single package or the integration of all aspects;
- Integration progress has to be tracked and monitored. It is only possible to improve what you measure;
- Integration aims to minimise missed opportunities and maximise rational use of resources, but is not a cure for inadequate management;
- Competent and decentralised leadership is key to adapt policies to changing local contexts and coordinate various health actors with specific objectives, roles and capacities but a shared goal; integration opposes stand-alone, thus a systems perspective is key; integration requires commitment, guidance and skills;
- Research is needed to identify which integration models and interventions work best, how, for whom and in what circumstances; and how to decide to prioritize to integrate or not.

What have we learned about integrating SAM services?

The introduction and spread of the innovative outpatient case management of SAM followed the typical pattern of diffusion of a new intervention [119, 120]. First, innovative actors tested the intervention at small scale, and then it started to spread in response to local needs and was adapted to specific contexts. The evidence that emerged travelled upward to national and global actors. Innovators expanded the evidence base and scaled up implementation. Global and national advocates helped spread knowledge and skills. With a considerable delay, global normative guidance was developed. Once decision makers and systems were 'ready' to adopt the new intervention, pilots could expand and national policies adapted, which then spread downward to support field managers and practitioners. Lessons learned that the normative global and national policy guidance was decisive for adopting and assimilating the innovation that by itself needed sufficient quality evidence.

Commonly, integration of SAM case management was considered achieved and understood as a 'package of SAM interventions' that comprised SAM case management in inpatient care, outpatient care and community outreach (including or not the case management of MAM) that 'linked' with other health and nutrition services and social protection initiatives. The 'referral system' assured continuity of care within the package, and 'coordinated' with other services and initiatives activities to 'link' children with SAM and their families to interventions that fell outside of the package.

Integration of SAM interventions in the basic package of health services was also discussed at the policy level, to include certain SAM service activities as 'add-on' to hospital and primary care in general, and health outreach for child health days, or routine immunization, growth monitoring, or iccm in specific. As a consequence, and depending on the contexts, at the level of service delivery, SAM service activities were 'added on' to the ongoing health and nutrition activities. Certain SAM interventions remained in 'vertical' systems.

The literature identified vertical approaches (stand-alone, with variations) for, e.g., guidelines, advocacy, coordination, financing, registration, monitoring and reporting, surveillance and coverage surveys, expanded team of health workers and volunteers, procurement and management of supplies, case detection, social mobilisation and demand generation.

The review revealed that to stimulate cross learning, international and national conferences were organised to share practices and experiences on integration, but no specific guidance on integration had been developed. Moreover, the package of SAM interventions to improve SAM service quality and scale-up (Table 1.2) had also positive effects on integration and system strengthening. However, because the package of SAM interventions targeted neither integration nor health system strengthening, their effects were not measured, and therefore the negative effects could not be mitigated and the positive effects could not be encouraged or learned from.

The review revealed that health system requirements and outcome of (existing, old and new) approaches and practices of SAM case management were well studied. SAM studies focused on service performance and on identifying level and barriers to access and use that identified quality and resources gaps (e.g., main indicators were on admissions; recovery, case-fatality in treatment and defaulter rates; contact coverage; barriers to access; cost; health workers trained; supply use). The evidence on integrated SAM services or how SAM interventions contributed to integration, sustainability or system strengthening was absent. Most implementation studies compared SAM outpatient case management with SAM inpatient case management in terms of treatment outcome [17], cost of treatment [45] or contact coverage [40]. Evaluations studied intended outcomes, and assumed unintended positive effects of SAM interventions but did not study them. Positive unintended consequences were, e.g., improving integration, improving health services use of child and carer (attending healthy child clinics, immunization and sexual and reproductive health), increasing trust in the health system, and eventually changing unhealthy behaviours. Multiple UNICEF evaluations (2013) [203] studied in-depth SAM case management and reported on and promoted integration, but provided neither a definition of integration nor a theory or logic model. Thus, the findings were difficult to interpret or use in other settings. Most commonly, evaluations of SAM interventions identified quality problems as isolated entities and intuitive linear solutions were proposed without considering system-wide effects. Moreover, the effectiveness of SAM-specific interventions were studied in isolation, and therefore, it was not known whether and how the SAM interventions impacted on the overall health system performance or on other priority child health intervention processes and outcomes. Clarity of 'integration' and health system 'strengthening or support' taxonomy, and systems thinking, would help design appropriate intervention strategies and their evaluation.

Building on the literature review, we mapped system functions characteristics that hindered or promoted SAM integration and proposed interventions to overcome bottlenecks (Table 3.7). The application of a systems approach to consider interactions of factors and interventions, however, was missing.

Table 3.7. Health system function characteristics that hindered or promoted SAM integration and mitigating interventions

	Health system functions	Inhibiting factors	Enabling factors	Interventions
Governance	PHC health policy, coordination, alignment of community and health actors	Un-adapted maternal and child health and nutrition policies (e.g., clinical and operational integration without managerial integration) Non-existent, out-dated, separate national guidelines (no latest evidence or simplified procedures in line with IMCI and ETAT) Incomplete or unbalanced basic package of health services according to the epidemiological picture Uncoordinated and/or limited partnerships	Expanded and comprehensive policies and guidelines, and standardised reporting tools Basic package of health services adapted to the epidemiological picture Coordination, collaboration, communication and regulation of all health actors with community (leaders, committees, social groups, informal and private health sector)	Policy adaptation for decentralisation, continuum of care, people-centred care Coordination with district health management team Advocacy at intermediary or at decentralized (district) level Regulation of partnerships
Financing	Resource allocation, accounting and financial management	No or limited coverage in annual action plans with budget allocation Predominance of short-term and extra-budgetary (emergency) funding	Adequate budget and financial access Adequate health worker salary payment Timely reimbursement of health costs	SWAp or pooled budget Health insurance Salaries and (monetary or in-kind) incentives Community contributions Free care for children under 5 Waiver or voucher systems Conditional health care
Information systems	Information needs defined; information collected, managed and disseminated; quality assurance	Inaccurate and complicated parallel SAM-specific surveillance system with limited information and communication technology (ICT) Acute malnutrition not covered in the national health information system	Information sharing between all level health actors and community Participatory monitoring and reporting	Information and communication system with innovative technology Integrated (digitised) registration and medical records
Workforce	Human resources planning, pre-service education, supervision, continuous professional development, accreditation	Shortage of trained health workers affected by high attrition and low motivation Inadequate adaptation of the pre-service education curricula Inadequate continuing professional/medical education Under-sourced and irregular supportive supervision Lack of job descriptions and/or weak personal appraisal system with limited accountability Lack of benefits or other motivators Absenteeism, justified (e.g., for training, meetings, illness) and unjustified Unequal rural/urban distribution Recruitment from outside communities	Adequate, skilled, qualified, motivated, proximate to the community Continuous education and learning	Mentoring, supportive supervision, job aids Pre-service curriculum adaptation Learning sites with internships Peer support e-Learning, continuous professional development Task shifting Benefits Pay for performance (P4P) Public private partnerships (PPP)
Supplies	Procurement, forecasting, transport storage system Transportation system	Equipment and supplies not included in the national essential drugs and supplies list Weak logistic management system with limited ICT Limited supply management capacities High risk of stock outages	Availability of supplies (RUTF and antibiotics, MUAC tapes) Adequate distribution system	Community supply management system Community transportation

How has SAM integration progressed?

After the early pilots of SAM case management in outpatient care in 2000–2003, phased scale up of services through replication of experience in start-up or learning sites led to expansion of geographic coverage. Simultaneously, quality services improved community engagement and raised awareness for demand creation and involvement that led to improved service coverage. The blueprint support package that technical and financial partners provided to national governments proved efficient and effective in rapidly scaling up quality services, but it did not promote integration or system strengthening specifically.

Results on SAM integration progress showed that the support efforts had certainly promoted the integration of specific functions, but may also have hindered others. Results could not identify whether and how governments and partners made informed decisions on integration. Emergency nutrition response interventions driven by emergency funding, maintained their immediate focus on saving lives and do not consider the longer-term or sustainable consequences. However, lessons from acute (e.g., ebola) and protracted crises (e.g., SAM in Niger, Northern Nigeria) created openings for sustained strengthened capacities of health systems.

What have we learned about improving the integration of SAM?

Across the literature, various strategies (integration intervention inputs) were implemented to improve integration output (coherent service integration) and integration outcomes (access, coverage, equity, efficiency (cost), quality (including responsiveness) and sustainability and impact (sustained health outcome)).

The strategies did not much differ from health system strengthening strategies but considered the added value of integration and were designed to obtain a specific desirable integration outcome. Table 3.8 summarizes findings from the literature review on integration-specific inputs and outcomes as part of the action model (or normative theory), providing the activities that will lead to the desired outcome of improved integration (and health outcome). The column on the right identified whether the SAM support package had similar outcomes and actions, and indicates whether they were SAM-specific (SAM) or envisaged a broader approach (SAM+). This mapping exercise indeed showed that the SAM support activities covered many interventions that promote integration, but maintained mostly a SAM-specific focus (4 integration interventions out 40 had a wider scope than SAM-specific).

Table 3.8. Integration action model with examples of interventions and results

Integration action model		SAM or SAM+
Integration impact		
	Sustained overall health outcome	SAM
	Sustained disease-specific health outcome	SAM
	Increased financial protection	/
	Increased responsiveness to users	/
Integration outcomes		
Access	Expanded access	SAM
	Improved detection, referral and initiation of care	/
Coverage	Increased service uptake	SAM
	Improved effectiveness coverage	SAM
	Reduced barriers to access and uptake	SAM
Equity	Improved access for vulnerable populations	/
Efficiency (cost)	Improved resource use, increased cost savings	/
	Reduced duplication of efforts	/
Quality	Expanded family care	/
	Improved adherence to care	SAM
	Improved retention in care	SAM
	Improved client satisfaction	/
	Reduced missed opportunities	/

Sustainability	Improved follow up and referral	SAM
	Improved resilience - Improved ability to adapt to a wide range of external and internal pressures	/
	Retaining functioning and performance after mainstreaming	/
	Initiating innovations adapted to changing contexts (resilience)	/
Integration outputs		
	Clinical integration – e.g., continuity of care, comprehensive package of essential health services, no missed opportunities	SAM
	Professional integration – e.g., effective referral, effective teamwork, task sharing, task shifting	SAM
	Organisational integration – e.g., effective collaboration between agencies	SAM
	Systemic integration – e.g., comprehensive policies, funding	SAM
	Functional integration – e.g., integrated manuals and information systems shared resources	SAM
	Normative integration – e.g., shared values and accountability	/
Integration interventions		
Governance	Adapting and aligning policies and guidelines	SAM
	Adapting regulations and coordination	SAM
	Creating unified accountability frameworks	/
	Promoting joint and multisectoral financing and planning	SAM+
	Consolidating administration across health initiatives or activities	/
	Decentralising health services management	/
	Expanding partnerships with established regulations and accountability system	SAM
	Improving accountability	/
	Reforming the health system	/
	Improving technical support to government partners on strategic integration approaches and methods, strengthening skills of system thinking	/
	Identifying opportunities for governance synergies	/
	Putting in place alliances and care networks	/
	Consolidating common ownership or merger	SAM+
	Expanding policy advocacy that targets all actors at all levels	/
	Preparing for contingencies and surge capacities	SAM+
Financing	Pooling of funds through a sector-wide approach, common basket funding or budget support	/
	Prepaying capitation	/
	Analysing fiscal space	/
	Coordinating interagency planning and resource allocation	SAM
	Contracting out, franchising	SAM
	Using vouchers or conditional cash transfers (fee waiver)	SAM
	Developing inclusive budgeted actions plans	/
	Strengthening providers payment mechanisms	SAM
Information	Expanding surveillance and surveys	SAM
	Expanding comprehensive health management information system	SAM
	Using mhealth or other innovative information and communication technology	/
	Establishing comprehensive data collection, recording, analysis and reporting systems, and its use	SAM
	Using shared indicators	/
	Tracking service performance	/
	Tracking progress of integration	SAM
	Evaluating barriers to implementation	/
	Modifying data collection, monitoring and reporting systems	/
	Assessing vulnerabilities of populations	SAM

Workforce	Expanding health workforce	SAM
	Expanding lay health workers involvement	SAM
	Adapting human resources functions and tools, e.g., job aids, training	SAM
	Building technical and management capacity jointly	/
	Ensuring comprehensive supervision	SAM
	Adapting pre-service curriculum	SAM+
	Sharing or shifting tasks	SAM
	Coordinating tasks and referral	SAM
	Promoting teamwork and quality improvement teams	SAM
Supplies	Establishing common performance management systems and performance expectations	/
	Expanding procurement and logistical systems	SAM
	Preventing stockouts	SAM
	Strengthening local procurement (and production)	SAM
	Ensuring essential supplies through local standard setting	/
Service delivery	Strengthening public private partnerships for supply chain management	/
	Supporting the design of local planning that is evidence-based and has local management tools, including systems thinking	/
	Pooling and sharing resources	/
	Decentralizing care	SAM
	Improving quality of care with peer involvement	/
	Clarifying service procedures	/
	Reorganising use of space	/
	Strengthening referral systems	SAM
	Strengthening case detection and diagnosis	SAM
	Ensuring non-discriminating, stigma-free settings	/
	Identifying opportunities for service delivery synergies	/
	Co-locating services	SAM
	Putting in place discharge and transfer agreements	SAM
	Sharing clinical records	/
	Centralising information, referral and intake	/
	Standardizing diagnostic criteria and treatment protocols	SAM
	Making uniform comprehensive assessment procedures	/
	Establishing continuity of care and patient monitoring	/
	Putting in place common decision support tools	/
	Managing regular patient and family contact and ongoing support	SAM
Demand generation and involvement	Promoting combined health behaviours	SAM
	Combining health education and behaviour change communication	SAM
	Coordinating addressing barriers to access	SAM
	Involving male carers, and other influential people who enable or inhibit change	SAM
	Expanding role of health committees	SAM
	Using joint systems for financial incentives (e.g., conditional cash transfer, health insurance)	/
	Promoting community involvement for increasing community participation (in, e.g., decision-making, planning, implementing, monitoring, evaluating, research)	SAM
	Increasing social accountability	

SAM = Severe acute malnutrition; / = Not applicable;
Code: SAM-specific (SAM) or a broader approach envisaged (SAM+)

Limitations

The scoping study has several limitations. First, it is unusual to review the integration process of a large variety of 'other' health services or initiatives with different service activities and in different contexts that contribute to learning about SAM interventions. But the dearth of evidence on SAM-specific integration made this necessary, even if it felt like comparing apples and oranges. Second, the learning from 'other' health services integration was based on evidence from systematic reviews only, with the risk missing important evidence, but with the safety of relying on quality evidence. Moreover, the time frame and scope of our study did make the study of over 20,000 primary articles detected in the initial searches unrealistic. Since scoping studies do not discriminate among studies based on methodological criteria, learning from the selected evidence and practices might prompt quality concerns. The scoping study fitted our aim to summarize learning on integration from guidance, policies, evidence and practices and uncover the knowns and unknowns by reinterpreting the literature and clarifying subsequent research inquiries. Third, some reviews stated that their findings were specific and therefore not transferable. This felt like comparing apples with an apple tree, and the apple tree was standing in a botanical garden. Fourth, the lines between interventions to support or strengthen the health system for improving quality, integration and scale-up were vague and the three overlapped. Consequently, the learning was valuable but not straightforward in the absence of clear integration-inputs and integration-outcomes. It felt like eating an apple that tasted like an orange.

Promising strategies for accelerating change

SAM interventions have made major progress in a short time, but the path to reach the missed millions of children is long. The key to improving SAM health outcome lies with both curative and preventive efforts through nutrition-sensitive and nutrition-specific actions [4]. On the curative side of the discussion, equitable quality services that are cost efficient and sustainable need to expand within resource-constrained environments.

Various pathways to increase treatment capacities may be explored in different contexts and with different resource gaps. An inadequate health budget to cover SAM needs has frequently been identified as a major key health system weakness [204]. But there may be ways to improve performance within current health budget constraints. For example, improving rational use of resources, preventing fragmentation and duplication of efforts, using health information and local knowledge to adapt strategies to needs (instead of ambitious donors or development partners pushing smart global initiatives) and unlocking community capacities, may help accelerate growth and transformative change.

The scoping study contributed to the understanding of the integration of SAM services into child healthcare as one pathway to improving quality, scale-up and sustainability. Based on learning from the scoping study, promising strategies have surfaced as contributing to accelerating change and expanding effectiveness coverage of SAM to reach the missed million children with SAM. Each pathway could be a topic for further

research. We had the opportunity to study two strategies that may contribute to accelerating effectiveness coverage of SAM (Annex 6). One is to simplify detection to access treatment, and the other is to improve information and knowledge sharing [205, 206]. We decided to deepen the understanding of the integration of SAM into national health systems, which became the topic of this work.

To conclude, the scoping study framed and unravelled concepts of integration, and uncovered existing approaches and promising practices that supported the integration of health services that went beyond service delivery.

SAM-specific interventions were designed to support the health system by strengthening capacities and putting in place the resources and skills to deliver SAM services at scale. But even when SAM-specific interventions were not specifically designed for integration, they often contributed positively to its progress. A strategic plan for effective integration interventions based on an analysis of needs and capacities (or for outsourcing) might be necessary to further improve the integration and sustainability of SAM services. However the understanding of how integration works and why, or whether it is desirable was missing. The scoping study underlined the need to understand pathways of integration of SAM interventions.

The following key questions were proposed to study integration empirically study and expand learning about SAM integration:

- In which contexts is SAM integrated?
- Is integration set as a goal, and if so, why and how?
- What is the extent (and trend) of the integration process?
- What factors facilitate or hinder the integration process?
- How do factors that influence integration interact?
- What scenarios can be identified to improve SAM integration, and what strategies can be proposed to overcome unintended consequences?

CHAPTER 4.

Building the theory and the theoretical framework

This chapter presents the steps in building the theory and the theoretical framework to explore the integration of severe acute malnutrition (SAM) interventions into national health systems. First, we explain the initial theory and logic model that guided the study. Next, we share the tools the empirical exploration of the theory for use in the different study methods. Indicators are provided in Annex 7 and a causal loop diagram tool in Annex 8.

i. Initial theory

The initial theory explains, in a plausible way, how and why an intervention achieved an observable outcome in a given context. It makes explicit the assumptions that guide the pathway of linking input with outcome. For our study purpose, the initial theory guided the evidence search. By retroductive reasoning, the empirical exploration could then refine or refute the theory and help generalise how and why certain processes and outcomes occurred.

Based on the learning from the scoping review of concepts and evidence on the integration of health services in general and SAM interventions in particular, an initial theory was proposed. In this case, as the goal was to understand pathways that improve the integration of SAM interventions into national health systems, the initial theory was formulated as follows:

If health actors have a shared understanding of the integration pathways of SAM interventions in a given health system, then they can have a shared strategic vision of integration and propose customized, adapted interventions that seek the optimal modality and degree of integration in terms of need and capacity of the health system by applying systems thinking –that will contribute to improving sustainable quality services at scale.

The initial theory is presented as a logic model in Figure 4.1.

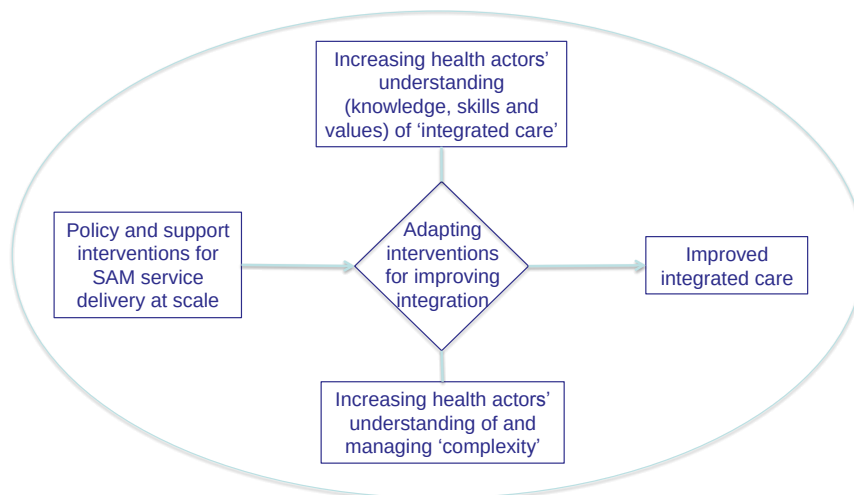


Figure 4.1. Logic model of the initial theory

Based on prior learning, we had identified factors hindering SAM implementation and integration (implementation and integration were interwoven):

- Integration of SAM had been understood in two ways. First, SAM services are being offered by the national health system (public sector). Second, a referral system links the components of SAM case management in community care, primary care and secondary care (and linkage with moderate acute malnutrition (MAM) case management and/or preventive activities). Often SAM case management was called 'integrated management of SAM' and therefore assumed to have been achieved, thus, progress of integrate care was not being monitored or measured (lack of motivation).
- While there was neither an explicit integration strategy nor interventions in place to improve integration, some progress of integration into key health system functions had happened spontaneously to a certain level. But there was no common vision or understanding of the breadth and depth of integrated SAM care (lack of a common vision).
- SAM interventions were supported from top down and often initiated and maintained because of international pressure, instead of a locally recognised need. Health actors at different levels of the health system adopted SAM interventions, but accountability and sustainability were questionable (lack of participatory leadership);
- Health systems in low-income countries (LICs) with a high burden of SAM had similar weaknesses in leadership, health budgets and health workforce. Most health programmes, including for SAM, were vertical, driven by international initiatives, and success depended on financial and technical resource inputs (top-down non-creative environment);
- SAM services were added to a resource constrained facility-based primary care and often community-based primary care was dormant. The success of SAM, built on early detection and referral for treatment of uncomplicated cases, relied on the weakest link of the health system (weak care model at the periphery); and
- SAM services were heavily supported by non-governmental partners, but coordination was challenging, activities were fragmented, partnership was incomplete, efforts were duplicated, and local capacities were left untapped (difficult coordination of activities and resources).

Therefore, we assumed that improving the integration of SAM interventions may contribute to the desired outcome of sustainable quality services at scale because:

- Understanding integration empowers (motivates) health actors to have a common goal to advocate for, and develop or adapt strategies to improve SAM integration that align with the norms, values and needs of their specific context (by strengthening their knowledge and skills on integration); and
- Understanding health system complexity empowers (motivates) health actors to consider system dynamics to improve SAM integration as part of the whole set of health priorities that align with the norms, values and needs of their specific context, and avoid creating adverse effects (by strengthening their knowledge and skills on systems thinking and methods).

To explore understanding and complexity of integration, the following questions, had been identified in the scoping study for empirical testing:

- In which contexts is SAM integrated?
- Is integration set as a goal, and if so, why and how?
- What is the extent (and trend) of the integration process?
- What factors facilitate or hinder the integration process?
- How do factors that influence integration interact?
- What scenarios can be identified to improve SAM integration, and what strategies can be proposed to overcome unintended consequences?

Guided by the above questions and learning from the scoping study, we built a conceptual framework of the initial theory and explained the subsequent steps (Figure 4.2).

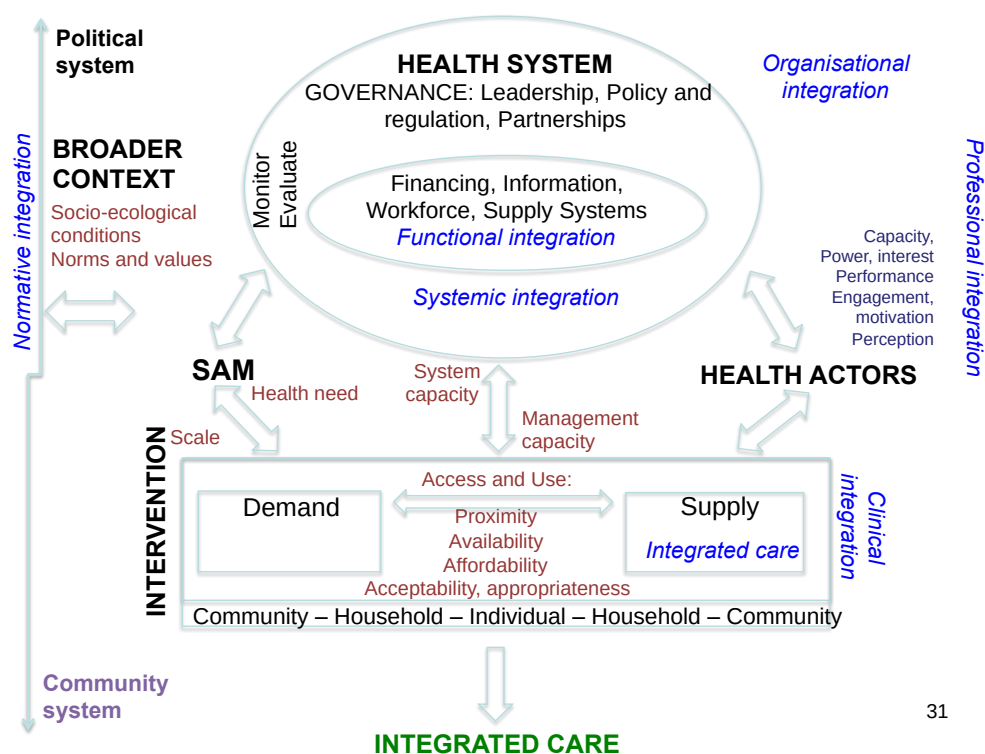


Figure 4.2. Conceptual framework of the initial theory
SAM = Severe acute malnutrition.

First, dimensions of integrated care at the micro, meso and macro level are considered. The model describes the extent of the clinical, professional, organisational, functional, normative and systemic integration of SAM interventions and the breadth of their horizontal and vertical integration (conceptual framework adapted from Valentijn et al. (2013) [113] (Figure 3.1). Second, factors that influence the speed and outcome of integration are considered. The model describes factors related to the problem, the intervention, the health actors, characteristics of the health system, and the broader context (conceptual framework adapted from Atun et al. (2010) [107], Figure 3.3). Third, the interactions between factors that influence integration are considered. The model describes the connectedness and interdependence of the factors in the process of integrating SAM interventions.

The expanded logic model presents the overall scope of the study that explores the causality of integration of SAM interventions by considering the complexity of the health system (Figure 4.3). In each step of the empirical exploration of the initial theory, a set of key questions will search for underlying patterns that may explain the outcomes that we find in the specific contexts (Box 4.1, Questions 1 to 5).

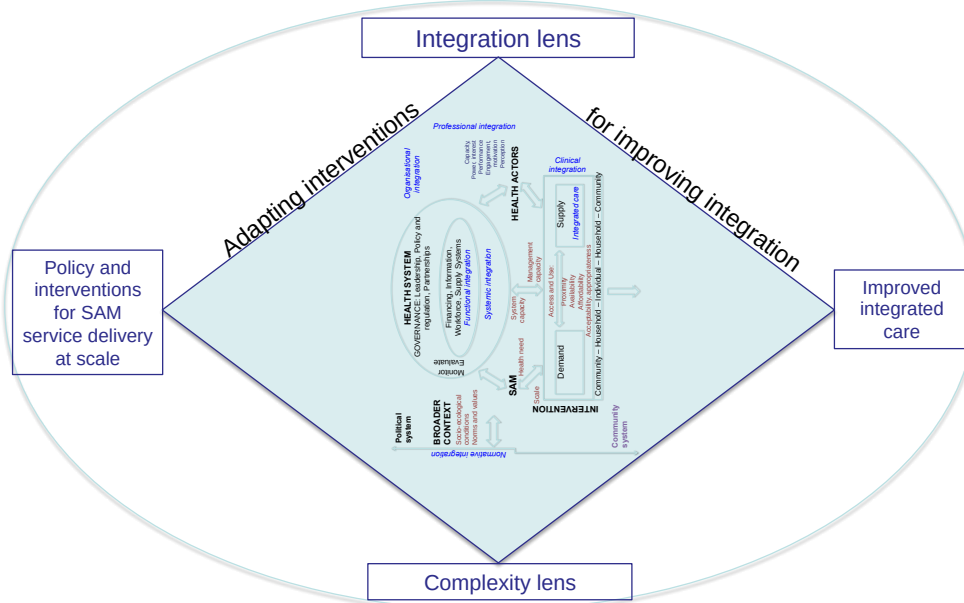


Figure 4.3. Expanded logic model of the study

Box 4.1. Study domains with key questions in each step of the empirical exploration of the initial theory in the case studies

- 1. In which contexts is SAM integrated? (Situation analysis)**
What is the current SAM burden? What SAM interventions are currently implemented, and what is their performance? What is the current health and nutrition policy context? Who are the stakeholders (health actors), and what is their role and influence?
- 2. Is integration set as a goal, and if so, why and how?**
Has integration of SAM into the national health system been defined? Has it been translated into a strategic plan? What are its objectives and expected results?
- 3. What is the extent (level) of the integration process?**
What integration has been achieved to date: at the clinical care (micro) level, at the organisational and professional (meso) level, at the systemic (macro/meso) level?
- 4. What factors influence the speed of the integration process?**
What factors hindered or facilitated/promoted the integration process?
- 5. How do factors that influence integration interact?**
What can we learn from the interactions of these factors?
- 6. What policy guidance can be extracted to improve the integration process?**
What scenarios can be identified to improve SAM integration, and what strategies can be proposed to overcome unintended consequences? How can integration be fostered? How can challenges be overcome? Can we learn from previous challenges that were overcome? Can we test scenarios for learning?

ii. Tools for collecting and analysing the data

This section shares the initial frameworks and models that were adapted as tools to collect and analyse data. The frameworks and models are discussed by study question domain, exploring the key questions in each distinct step of the empirical studies (Box 4.1). As a reminder, conceptual frameworks are developed for analytical purposes to capture system complexity in a way simple enough to understand. The caveat is that simplification may overlook factors that are important, or not explain well what is actually meant. Moreover, the tools are developed for a specific focus or lens and may not be appropriate for certain settings. Thus, the proposed frameworks, as well as the indicators, have to be adapted to each context and purpose of use.

We provide an overview of the various frameworks and models that were used as tools, by study question domain (some study questions used the indicator framework directly). Generic indicators (and questions) are developed for adaptation to the country contexts, levels of the health system and target audiences (Annex 7). The data collection methods are discussed in the case studies in Chapters 5 and 6, and the data collection tools, and raw data are provided in the repository (Annex 9).

Tools to study the integration context

To study the integration context, the following tools were selected and adapted for use:

- Demographic and health indicators mapping to understand the health context;
- Organogram of the national (public) health system and child healthcare pyramid mapping (Figure 1.3) to understand the structures and services involved in SAM;
- Policy mapping to understand the position of SAM services in current health, nutrition and multisectoral policies;
- Stakeholder mapping to understand the role and influence of health actors involved in SAM (Figures 3.6 and 3.7);
- Health system and SAM services performance mapping to understand the burden and capacity of the health system; and
- History of introduction, scale-up and integration of SAM services in the country.

Tools to study whether integration was a goal, and if so, why and how

Questions were formulated to probe at the national, district and health facility level whether policies, strategic plans or implementation action plans considered aspects to improve integration specifically. Questions also probed perceptions of health actors about the need, level and expected outcomes of integration.

Tools to study the extent of integration

Indicators to measure the extent of systemic integration at the macro and meso levels were based on the framework of SAM-specific health system functions that was the outcome of multiple reviews [207, 208] (Table 4.1). Questions were expanded to further probe the dimensions of clinical, professional, organisational, functional and normative

integration (Figure 3.1). The extent of integration was examined through the lens of interaction (Figure 3.2).

Tools to study factors that influence the extent and speed of integration

The framework used to explore factors that influence the SAM integration process (Figure 3.3 and Table 3.2) was adapted based on the learning from the scoping exercise. Figure 4.4 presents the generic factors that may facilitate or hinder integration.

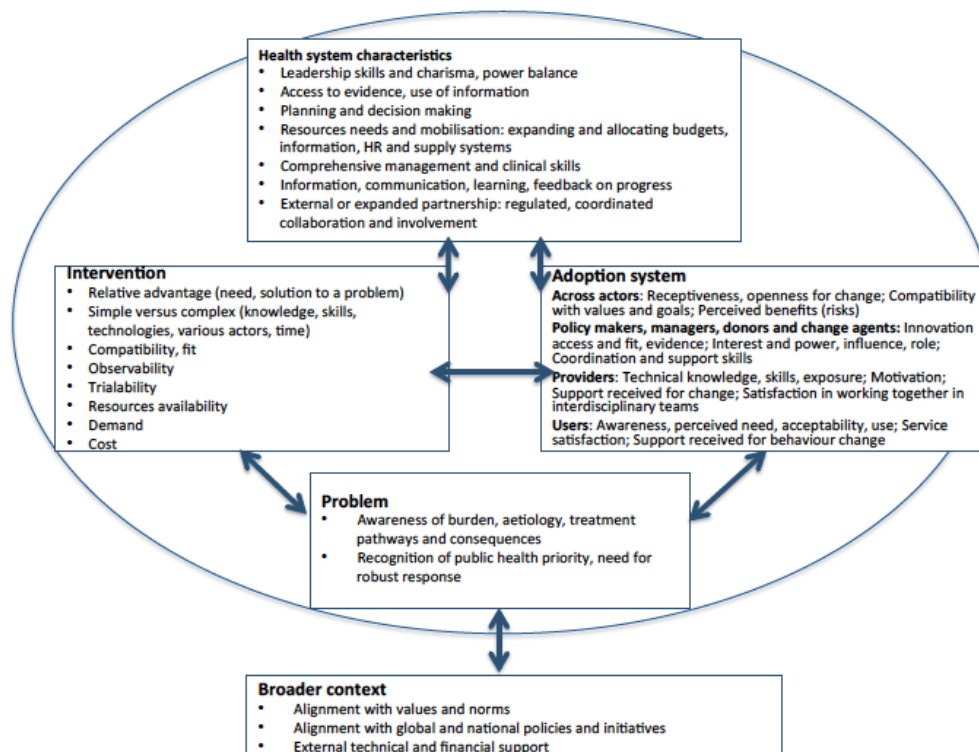


Figure 4.4. Conceptual framework for analysing factors that influence integration of SAM interventions, populated with generic factors

Tools to study how interactions impact integration

To study how interactions between system functions impact integration, we applied two system dynamics methods that allowed studying the complexity of the health system: causal loop analysis and agent-based modelling (ABM). Both tools were developed based on a basic model (Figure 4.5) that links health system functions between the tiers of the health system with the health actors, that interact with the physical, socio-political context. The basic model helps to locate main functions and main actors that take part in health interventions, making the distinction that health services interventions aims to change the individual outcome and health system interventions aim to change health system functions capacity and health actors behaviours.

Table 4.1. Framework of key health system functions for SAM interventions

Governance
National health and nutrition policies and strategic plans included SAM in the basic package of health services of child health (supporting decentralised community-based primary health)
National SAM guidelines adapted to the country context (updated with latest evidence)
Technical leadership with capacity
Coordination system with capacity and expanded partnerships (within sector and multi-sectoral)
Regulation of health actors, quality services and products
National repository or system of nutrition data, information and knowledge management
Social participation of people and communities (responsive care, information sharing, engagement)
Advocacy system with capacity (political and financial interest and influence for change, champions)
Health financing
Pooled funding, joint financing, long-term external funding
Budgets allocated in action plans
Known costing for service delivery scale-up
Financial risk analysis and protection (User fee exemption, subsidised health insurance systems, conditional cash transfers, vouchers)
Information and knowledge management
Defined information needs, objectives, cost-effective methods and applications
Known epidemiological health and malnutrition picture: distribution, trends, determinants
Mapping of health actors and implementing partners: who does what where how, capacity, influence
Monitoring and evaluation of quality of service delivery: acceptable, accessible, comprehensive care with continuity in time and space, effective, efficient, equitable and safe
Monitoring and evaluation of health system performance and capacity: accessibility, coverage, efficiency, equity, quality, sustainability
Research (biomedical, cost-effectiveness, implementation, impact studies) to expand the evidence and knowledge base
Malnutrition included in national health information system and/or nutrition surveillance system
Information sharing and knowledge management platform
Health workforce
Health personnel policy, planning and organisation: staffing structure, financing, hiring, posting and retention, organogram, job description, performance appraisal and career development opportunities, benefits duty station (surge for contingencies)
Pre-service education curriculum, course module adaptation with accreditation
In-service training and mentoring, continuous professional education with accreditation
Supportive supervision for technical problem solving, professional development and motivation
Learning sites for internships and learning visits with accreditation
Peer information network (information sharing and problem solving)
Capacity development and involvement of national academic, training and research institutions
Capacity development and involvement of professional associations
Health infrastructure, equipment and supplies
Infrastructure and distribution of health facilities
Forecasting of supply needs
Essential drugs and medical equipment and supplies list including SAM drugs and supplies
Regulation of selection and procurement of equipment and supplies (import, tax, safety regulations)
Equipment and supplies management (distribution, storage, quality assurance, monitoring use and stockouts, buffer stocks, safe disposal of perished goods, joint or public-private partnerships)
National and local production capacity for ready-to-use therapeutic foods (certification system)
Social marketing of improved complementary foods (lipid-based and/or micronutrient supplements)
Service delivery
Community engagement for involvement, demand generation and behaviour change (improving awareness, access, use, acceptability; respecting socio-cultural values and norms; involving community actors)
Decentralised primary care staffed, equipped, supplied and funded
Community healthcare outreach and/or community case management (for remote populations)
Active case finding for early identification and referral: organisation, quality, coverage
Comprehensive continuity of care for screening, diagnosis, triage, treatment and follow-up
Individual and group health and nutrition counselling in community and health facility (social and behaviour change communication organisation, quality, coverage)
Inpatient care in health facilities with 24-hour care capacity
Referral and counter referral system between community, primary and secondary care services
Clinical monitoring of progress: successful progress, stagnation, or failure to respond
Community follow-up of problem cases (home visits for non-response, default, refuse of treatment)
Links with other health and nutrition services (IYCF, vaccination, reproductive health, HIV and TB)
Links with and involvement of informal and private health sectors (traditional healers, traditional birth attendants, religious leaders, drug vendors, private clinics)
Links with other community services (for improved household food security and livelihoods, economic opportunities, social and financial protection) and social support groups

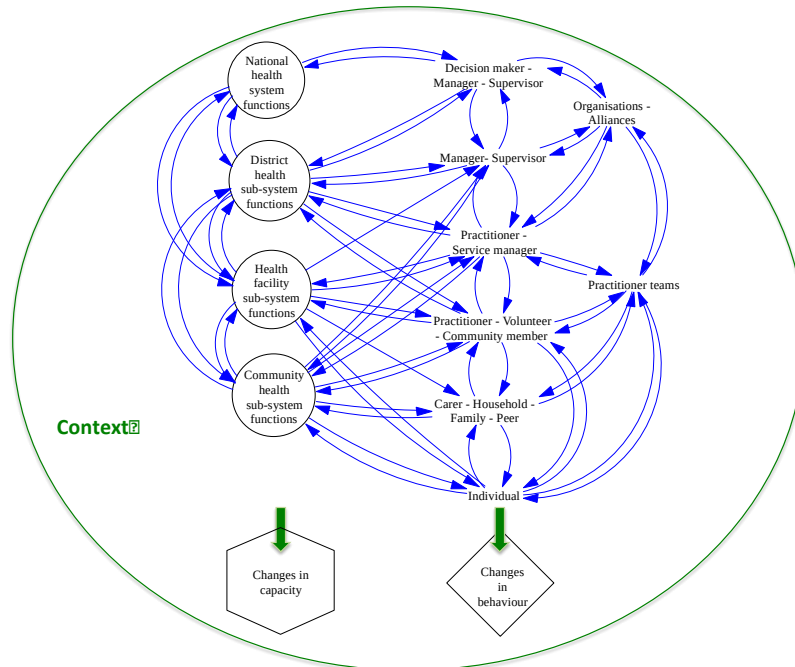


Figure 4.5. Basic model of health system functions and health actors that interact in the health system
Arrows show the direction of causality.

The causal loop analysis. The causal loop diagram (CLD) describes the interactions of causal factors of a health problem that interact across and within the tiers of the health system, with a defined boundary. In our case, the health problem has been defined as the integration of SAM interventions into the functions of the health sub-systems. Factors that facilitate or hinder (variables) the integration of SAM interventions (health problem) have been identified in the previous step (Figure 4.4). The variables are one-by-one introduced, and for each variable introduced, the causality is questioned and the effect of change (polarity) is noted: does the variable change the next variable in the same direction (S) or opposite direction (O). Thus, at each step of introducing a new variable, the causality of the link and the effect of change are being verified. Next factors are introduced by repeating the steps. By careful looking at logical chains, and respecting the set boundary (not to spread out), one tries to close the loop. When a causal loop is closed, the logical chains are verified and checked whether the loop effect amplifies (reinforcing loop (R)) or dampens (balancing loop (B)). A reinforcing loop can be virtuous (reinforcing positively) or vicious (reinforcing negatively). A simple model is provided in Figure 4.6, where the problem demands for an immediate fix of the problem that then solves the problem (dampening effect), but an unintended consequence at the long term amplifies the problem. Thus, to sustainably resolve the problem, one needs to change the intervention (find another problem solver that has no unintended negative consequence).

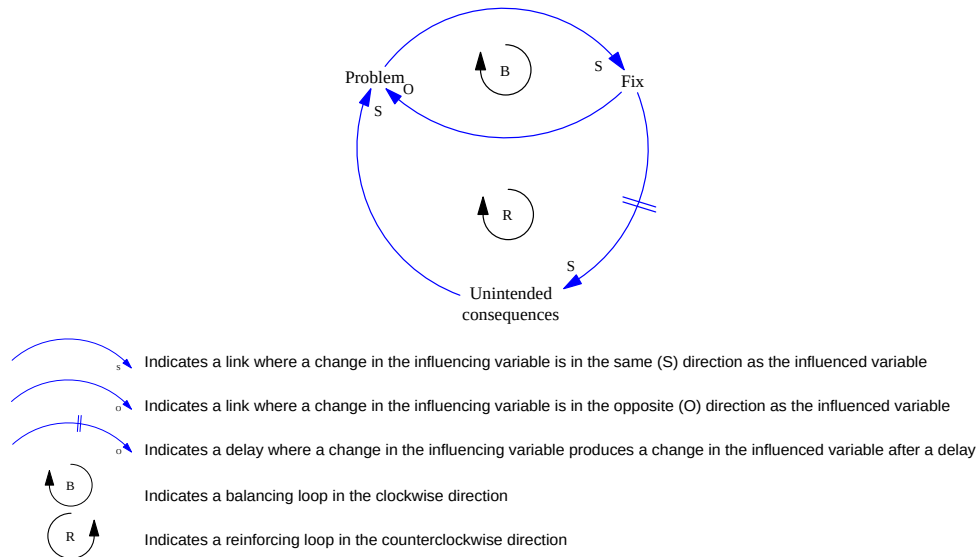


Figure 4.6. Example of a causal loop diagram, with rules for reading

B = Balancing loop; R = Reinforcing loop; O = Opposite influence; S = Similar influence.

Developing a CLD occurs in participation where participants discuss the logic and influence of each causal pathway to stepwise build the final model. At the end, the causal pathways of the multiple factors and interactions are scrutinised again. Questions that are posed are: have all key influencing factors been considered; are the links causal and correct; do the effects occur with a delay. Corrections and simplifications are made as necessary.

When the CLD is finalised, participants will discuss the following elements:

1. What does the CLD mean; what story does it reveal; and what effects are desirable and undesirable?
2. What possible scenarios for improvement do the identified interactions and delays indicate; and where and how should we intervene?

Based on generic factors (Figure 4.5) that facilitate or hinder the integration process a CLD has been developed and presented in Annex 8. The generic CLD can be used for learning purposes during the empirical exploration steps. The CLD is divided in sub-CLDs to facilitate understanding, correction and validation. Depending on the context, the characteristic of the factors that interact may change and their polarity may change (facilitating or hindering integration). A validation tool has been provided as example (Annex 8). The tool guides on how to read and complete a CLD, and how to split and validate the loops, one by one, with health actors. The CLD and the validation tool can be adapted to new contexts.

Agent-based modelling (ABM). ABM is a computer simulation method that—based on formal knowledge and assumptions—develops a model that mimics a real-world system to allow conducting experiments to understand the behaviour of the system and evaluating various strategies. An agent-based model identifies agents with characteristics that interact with each other and the environment. The interactions are based on simple, pre-defined conditional ‘if-then-else’ rules with defined parameter values introducing time, interactions and feedback, mimicking a real-world situation (Figure 4.7).

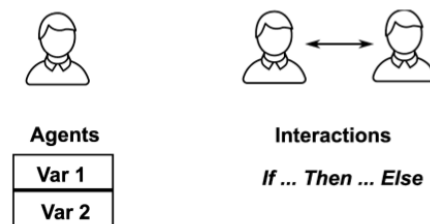


Figure 4.7. Agent-based model with agents, their characteristics (variables 1 and 2) and interactions defined as ‘if-then-else’ rules

Random effects (interventions or perturbations), based on a real-world situation and/or possible scenarios, can be introduced and parametric analyses performed. The model is transcribed in a computer program, e.g., NetLogo® [209]. Empirical calibration of parameters is based on values from contexts, in our case SAM case management in high-burden low-income countries, and when information is lacking, assumptions can be based on expert elicitation. The model, when running over time allows for the identification of emergence and self-organisation. Numerous scenarios can be designed and compared for learning [210, 211]. The interest of this application therefore is to learn how emergent behaviour from the micro-level model influences behaviour at the meso or macro level.

The bottom-up perspective of ABM is different from the framework and system dynamics learning discussed above that provides top-down learning of the study topic. Figure 4.8 visualises the macro-micro-macro learning model where step 1 studies the situational mechanisms, in our case, by a framework approach, step 2 studies the action-formation mechanism at the integrated services level, and step 3 studies the bottom-up transformation by ABM [212]. Both ways may elucidate new perspectives and understanding of the same topic under study [211].

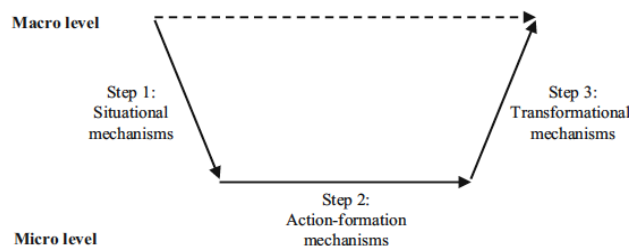


Figure 4.8. The macro-micro-macro model in social mechanism approach [212]

visualises the logic model of the initial theory with the analytical methods that have been retained for the empirical exploration (presented and discussed above and in Chapter 3). To explore and increase the understanding of integration, various frameworks will be used (top). To explore and increase the understanding of complexity, system dynamics models will be used (bottom).

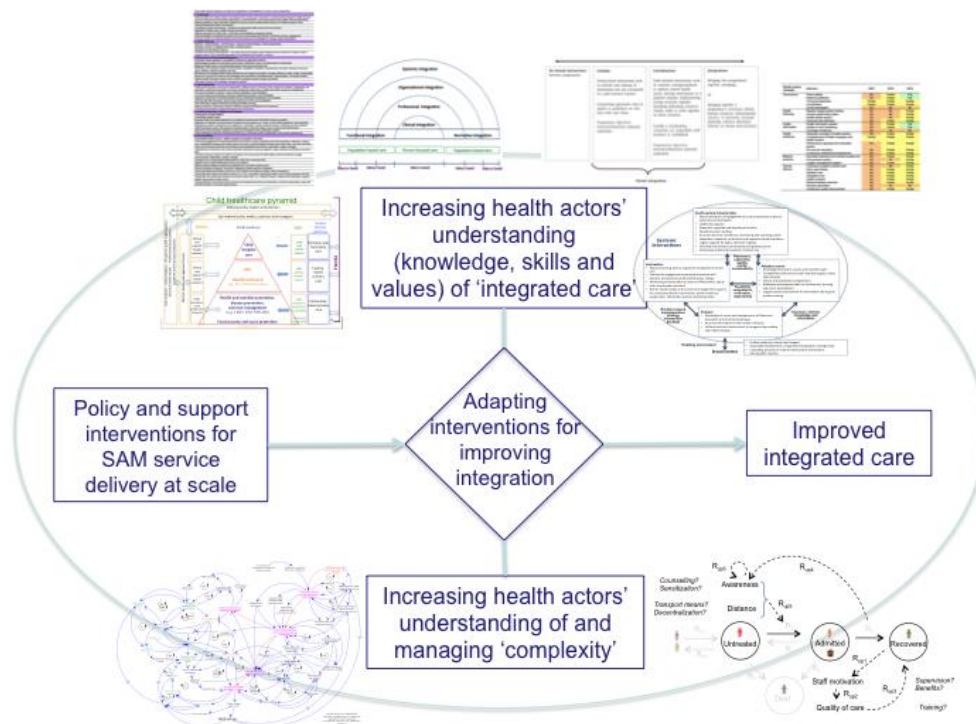


Figure 4.9. Overview of logic model of the initial theory with analytical methods

CHAPTER 5.

Applying a framework approach to understanding severe acute malnutrition integration: Niger case studies

This chapter presents a case study on Niger that for the purpose of publication has been separated into two case studies. The first case study assessed the level and trend of integration of acute malnutrition interventions in Niger since 2007 [200]. The second case study studied factors that influenced the integration process [201].

The two case studies applied a framework approach to provide country-specific learning on the integration of SAM into the national health system, and empirical learning for refining the theory.

i. Introduction

The emergency response to Niger's 2005 food crisis triggered the introduction and scale-up of case management of SAM in decentralised primary care in temporary emergency structures. The demonstrated effectiveness and feasibility of the approach and the continuing high burden of acute malnutrition, which affects over 1 million children under 5 in Niger, prompted their ministry of health (MOH) to issue directives in 2007 to integrate acute malnutrition interventions into routine healthcare. This policy change came in response to concerns about government ownership and capacity for implementation.

As in most low-income countries, Niger's health system faces important operational capacity and resource challenges to delivering IMAM services. With continuing high caseloads, the MOH and partners in Niger questioned how to better integrate IMAM for improved quality and coverage. To answer this question in the absence of an integration strategy for IMAM, we studied the extent of influences on the natural process of integration of acute malnutrition interventions into the national health system in Niger. Understanding pathways for integrating IMAM may inform ways to foster integration.

The case studies aimed to answer the following key questions on the integrating process of SAM services in Niger:

- In which context was SAM integrated?
- Was integration set as a goal and if so, why and how?
- What was the extent (and trend) of the integration process?
- What factors facilitate or hinder the integration process?
- What factors interact and how?
- What policy guidance can be given to improve the integration process?

ii. Methods

We applied qualitative methods to study the integration of acute malnutrition interventions in Niger. For the purpose of this study, integration was defined from a health system perspective as the extent, pattern and rate of adoption and eventual assimilation of a package of interventions for management of acute malnutrition into key functions of the national health system [107]. Integrated care of the child with acute malnutrition and other illness resulting from activities at multiple levels of systemic, organisational, professional, clinical, functional and normative integration was central to our study, but generalised from a macro level perspective for the country (Goodwin 2013).

We studied SAM interventions in two districts Aguié Health District in Maradi Region and Matameye Health District in Zinder Region and Niger overall. The two regions and health districts were selected based on convenience sampling (security of travel and representativeness).

We reviewed the published and grey literature on acute malnutrition interventions and their integration into national health systems. Policies, implementation strategies, guidelines and annual national, regional and district action plans were reviewed to assess the quality of planning and performance of service delivery.

National, regional and district databases provided quantitative data on the planning and service delivery performance. [Interviews] Data collection involved semi-structured key informant interviews with government administrators and partners, health managers, health workers, service users and community members (n: 57) and focus group discussions (n: 5) with community volunteers to gain insight into their experience, understanding and views. The working language was French, and simultaneous translation was available for discussions in the local languages. [Observation] We visited national, regional and district hospitals, health centres, health posts and communities in seven out of eight regions (Diffa, Dosso, Maradi, Niamey, Tahoua, Tillabéry and Zinder). Service delivery and organisational management (behaviours and interactions among healthcare providers and service users) were observed in one regional and four district hospitals, five health centres, three health posts and nine communities purposively selected for maximum variation of performance, distance from the district health office and rural and urban settings. Participation in national coordination meetings and planning workshops allowed completion and triangulation of the integration indicators and levels, and factors that facilitated or inhibited integration.

To study the extent of integration, we adapted a list of key health system functions for the integration of acute malnutrition interventions from a framework that had been used and validated in different countries (Table 4.1) [207]. Functions were organised according to the six domains of the health system: governance, health financing, health information, health workforce, medical products and service delivery [61]). We then developed a diagnostic tool with 29 indicators to measure past and current integration of acute

malnutrition interventions into the identified key health system functions (Annex 7). Guided by the literature [107, 191, 213], we defined the integration indicators and their level of integration along a continuum (no interactions or segregation when no integration existed, linkage or coordination when partial integration existed and full integration when health system functions and structures had assimilated or merged) [113]). The diagnostic tool also included indicators for measuring the performance (geographic coverage, access to treatment, quality of care, contact coverage and sustainability) of acute malnutrition services and two indicators for measuring health status (prevalence of acute malnutrition and under-5 mortality). Annex 7 described the indicators and their levels. Second, we used data from qualitative and quantitative studies conducted in 2007 [214], 2010 [215] and 2013 [216] to measure integration and performance of acute malnutrition services and health outcome [217-222] as proposed by the indicators. The qualitative studies reviewed health system capacity to implement and integrate acute malnutrition interventions in health districts in Niger between June 2007 and March 2014.

To study factors that influenced integration, we applied a framework approach (Atun et al. 2010a) to study recurring themes that influenced integration by examining 1) the problem of acute malnutrition, 2) features of the IMAM interventions, 3) characteristics of the adoption system, 4) health system characteristics and 5) the broad context. Level-adapted questionnaires with open-ended questions were developed for identifying facilitators and barriers in the integration of SAM interventions (Annex 7).

Data from observations, interviews and focus group discussion were recorded on paper and transcribed daily in a spreadsheet. Themes of integration factors were coded using an inductive approach by building on the conceptual framework. Data were synthesised and rearranged by themes, and reviewed.

Data were triangulated for comprehensiveness and shared with 17 key health actors in 2015 to review findings and make realistic operational recommendations for improved management of acute malnutrition.

iii. Integration context

The integration strategy, policy, health actors and capacity were well described in the respective papers. In addition, we mapped key information on SAM prevalence, service performance and policy events over time. Most data were available or have been collected and reported on during the various studies (Annex 9). The behaviour-over-time (BOT) graph in Figure 5.1 could help understand the changing context of fluctuating needs and resources, and interpret the integration progress over time (work in progress; when all events are mapped, the BOT may be used for in-depth discussions to build an understanding of the dynamics of the system in which the integration of SAM takes place.

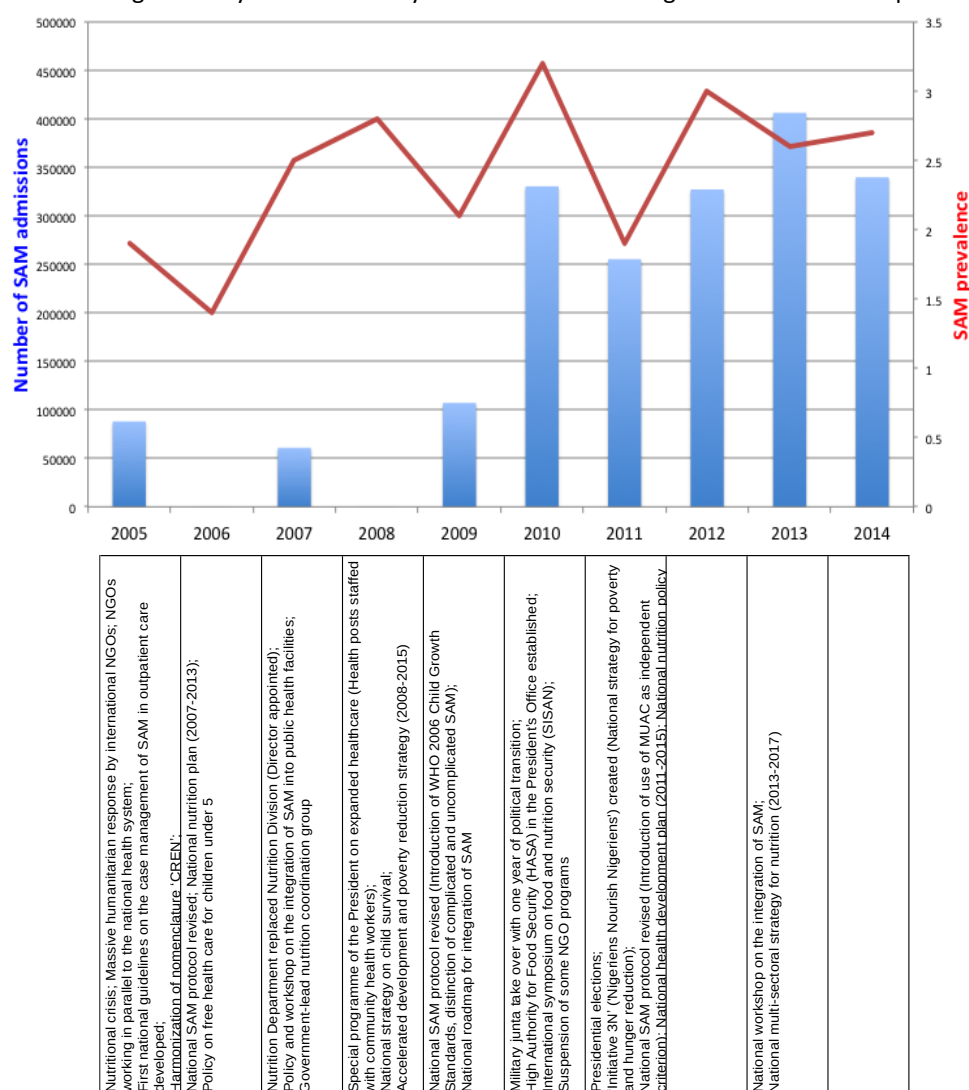


Figure 5.1. Information map of events influencing SAM case management in Niger (2005–2014)

iv. Extent of integration: case study

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RESEARCH ARTICLE

Open Access



Integrating acute malnutrition interventions into national health systems: lessons from Niger

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Abstract

Background: Since 2007, integrated care of acute malnutrition has been promoted in Niger, a country affected by high burden of disease. This policy change aimed at strengthening capacity and ownership to manage the condition. Integration was neither defined nor planned but assumed to have been achieved. This paper studied the level and progress of integration of acute malnutrition interventions into key health system functions.

Methods: The qualitative study method involved literature searches on acute malnutrition interventions for children under 5 in low-income countries to develop a matrix of integration. Integration indicators defined three levels of integration of acute malnutrition interventions into health system functions—full, partial or none. Indicators of health services and health status were added to describe health system improvements. Data from qualitative and quantitative studies conducted in Niger between 2007 and 2013 were used to measure the indicators for the years under study.

Results: Results showed a mosaic of integration levels across key health system functions. Four indicators showed full integration, 22 showed partial integration and three showed no integration. Two-thirds of system functions showed progress in assimilating acute malnutrition interventions, while six persistently stagnated over time. There was variation within and across health system domains, with governance and health information functions scoring highest and financing lowest. Steady improvements were noted in geographic coverage, access and under-5 mortality risk.

Conclusions: This study provided useful information to inform policy makers and guide strategic planning to improve integration of acute malnutrition interventions in Niger. The proposed method of assessing the extent of integration and monitoring progress may be adapted and used in Niger and other low-income countries that are integrating or intending to integrate acute malnutrition interventions.

Keywords: Acute malnutrition, Integration, Indicators, Health system, Low-income countries, Niger

Background

During the emergency response to the 2005 food crisis, technical and financial partners of the Ministry of Public Health (MOH) of Niger introduced a new approach to address acute malnutrition. This approach treated most children with the condition as outpatients in decentralised care rather than hospitalising them, and added active community case finding for early start of treatment. The demonstrated effectiveness and feasibility of the

new approach prompted the MOH to issue directives in 2007 for integrating acute malnutrition interventions into public health care. From then onward, partners no longer implemented acute malnutrition care but instead progressively provided support to the government for implementation. The policy change aimed at government ownership and scale-up the intervention by strengthening national and local capacity to improve access and coverage for the 1 million children under 5 years of age affected with acute malnutrition every year in Niger [1].

Despite the countrywide decentralisation of the management of acute malnutrition, less than one-third of all children with acute malnutrition were admitted for treatment

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in 2013 [2]. As in most low-income countries with a high burden of acute malnutrition, Niger's health system faced important operational capacity and resource challenges to delivering acute malnutrition interventions. Evaluations of acute malnutrition programmes conducted in low-income countries between 2007 and 2013 [3–5] identified challenges in systemic, organisational and clinical capacities for quality of care, integration and scale-up. With continuing high caseloads of acute malnutrition in Niger, time and again, questions about how to improve access and coverage of the integrated interventions surfaced. One systematic review studied the level of integration of health worker programmes into health systems [6], but no such studies on level of integration have been published on acute malnutrition. This paper assessed the level and trend of integration of acute malnutrition interventions in Niger since 2007. Factors that influenced the integration process were discussed in another paper. The results of the assessment may be useful to inform policy makers and guide strategic planning for improved acute malnutrition services.

Methods

We applied qualitative methods to study the status of integration of acute malnutrition interventions in Niger. For the purpose of this paper, integration was defined from a health system perspective as the extent, pattern and rate of adoption and assimilation of interventions for management of acute malnutrition into key functions of the national health system [7]. Integrated care of children with acute malnutrition and other illness was central to our study and viewed as a result of a process and activities undertaken at multiple levels of systemic, managerial, organisational, professional and clinical integration [8].

The study methods consisted of three distinct steps. First, we reviewed published and grey literature on acute malnutrition interventions and their integration into national health systems [9]. We then adapted a list of key health system functions for the integration of acute malnutrition interventions from a framework that had been used and validated in different countries [4, 9]. Functions were organised according to the six domains of the health system [10] (i.e. governance, health financing, health information, health workforce, medical products and service delivery). We then developed a diagnostic tool with 29 indicators to measure past and current integration of acute malnutrition interventions into the identified key health system functions. Guided by the literature [6, 7, 11], we defined the integration indicators and their level of integration along a continuum (no interactions or segregation when no integration existed; linkage or coordination when partial integration existed; and full integration when health system functions and structures had assimilated or merged [12]). The diagnostic tool also included indicators

for measuring the performance (geographic coverage, access to treatment, quality of care, contact coverage and sustainability) of acute malnutrition services and two indicators for measuring health status (prevalence of acute malnutrition and under-5 mortality). Indicators and their levels are described in the Additional file 1: Table S1. Second, we used data from qualitative and quantitative studies conducted in 2007 [13], 2010 [14] and 2013 [15] to measure integration and performance of acute malnutrition services and health outcome [1, 16–20] as proposed by the indicators. The qualitative studies reviewed health system capacity to implement and integrate acute malnutrition interventions in health districts in Niger between June 2007 and March 2014. The respective study teams, lead by the first author, visited national, regional and district hospitals, health centres, health posts and communities in seven out of eight regions (Diffa, Dosso, Maradi, Niamey, Tahoua, Tillabéry and Zinder). Data were collected through key informant interviews and semi-structured focus group discussions with government administrators and partners at national, regional, district and community level, district health managers and health workers, community volunteers and members and service users. Level-adapted questionnaires with open-ended questions were developed and tested before use. The working language was French, and simultaneous translation was available for discussions in the local languages. Findings were recorded on paper, summarized in a spreadsheet, analysed by theme, triangulated and summarized [13–15]. In addition, relevant policies, implementation strategies, guidelines and annual action plans at national, regional and district levels, as well as national, regional and district databases were consulted to assess the quality of planning and performance of service delivery. Third, participation in national coordination meetings and planning workshops allowed triangulation and validation of the proposed indicators definitions and levels and their results.

Results and discussion

This qualitative study assessed the level of integration of acute malnutrition interventions into key health system functions in Niger and mapped the progress of integration for 2007, 2010 and 2013 (Table 1). Results showed a mosaic of integration levels across health system functions. Four indicators showed full integration, 21 showed partial integration and three showed no integration. Two-thirds of system functions showed progress in assimilating acute malnutrition interventions, and six persistently stagnated over time. There was variation within and across domains. Governance and health information system functions scored best, and health financing scored worst. The acute malnutrition services indicators of geographic coverage and access to treatment improved, the indicator of quality of care was adequate and stable, and the indicators of contact

Table 1 Integration level of acute malnutrition interventions and health outcome in Niger

Elements	Indicator	2007	2010	2013
Health system functions				
Governance				
Policy setting	National health and nutrition policies with the integrated management of acute malnutrition (IMAM) as part of child health care (i.e. integrated management of childhood illness (IMCI) and child hospital care)	No	Partial	Full
National guidelines	National guidelines for IMAM supporting comprehensive child health care	No	Partial	Full
Technical leadership	A technical advisory group for comprehensive child health care	Partial	Partial	Partial
Regulation and coordination	Regulation and coordination of health actors (including financial and technical partners, education and training institutions, professional associations, private and informal health sector, communities and champions) aligning with the national health and nutrition policy and implementation strategy	Partial	Partial	Partial
Social participation	Social participation of local and community actors in planning, implementing and monitoring child health care with a people-centred care approach	No	No	No
Health financing				
Regular budget-pooled funding	Regular budget from pooled funds with a sector-wide approach covering financing for IMAM	No	No	Partial
Annual costed action plans	Annual costed action plans of MOH covering IMAM interventions	No	No	Partial
Health workers payroll	Staff in national health facilities involved in IMAM on MOH payroll	No	No	Partial
Financial risk protection	Fee waiver system for children under 5 covering comprehensive child health care	No	Partial	Partial
Health information				
Health information system (HIS)	National HIS, including acute malnutrition indicators	No	Partial	Full
Performance monitoring system	Performance monitoring of comprehensive child health care	No	Partial	Full
Contact coverage monitoring	IMAM coverage monitoring as part of child health care coverage monitoring	No	No	No
Health workforce				
Adequate coverage of health workers	Adequate number of qualified health workers with geographic coverage for comprehensive child health care	No	Partial	Partial
Competences of health managers and health workers	Adequate technical and organizational management skills for comprehensive child health care	Partial	Partial	Partial
Performance appraisal and motivation system	Performance appraisal and career development opportunities as part of the human resources management system	No	Partial	Partial
Pre-service education	Modules of pre-service education curriculum on comprehensive child health and nutrition	No	Partial	Partial
Continuing professional development	Continuing professional development on comprehensive child health and nutrition	No	Partial	Partial
Medical products				
Essential medicines and medical supplies list	National essential drugs and medical supplies list, including for IMAM	No	Partial	Partial
Procurement system	National drugs and medical supply needs (forecasting and) procurement including for IMAM	No	No	Partial
Logistic management system	National logistic management system for drugs and medical supplies including for IMAM	No	Partial	Partial
Service delivery				
Demand generation	Demand generation by activating and informing communities for improved child health and nutrition	No	No	No
Early case finding	Early active (by volunteers in the community), systematic (by health workers at the health facility) and enhanced (by carer) case finding for selected child illnesses	No	Partial	Partial
Community-based primary care	Promotive and preventive community health and nutrition (and community case management)	No	Partial	Partial

Table 1 Integration level of acute malnutrition interventions and health outcome in Niger (Continued)

Outpatient care (facility-based primary care)	Outpatient management of severe acute malnutrition (SAM) without complications and moderate acute malnutrition (MAM) as part of IMCI	No	Partial	Partial
Inpatient care (child hospital care)	Inpatient management of SAM with complications until stabilisation as part of child hospital care	No	Partial	Partial
Health outreach	Health outreach activities for selected child illnesses, including acute malnutrition	No	Partial	Partial
Referral and tracing between services	Referral and tracing system for detection and retention in treatment of selected child illnesses, including acute malnutrition	No	Partial	Partial
Patient-centred continuity of care	Comprehensive child health care tracked over time and place responding to individual preferences, needs and values	No	No	Partial
Continuous quality improvement	Continuous quality improvement of comprehensive child health care	No	Partial	Partial
Health services performance				
Geographic service coverage	Number of sites with SAM services	30 [13] (<5 %)	772 [26] (>70 %)	944 [15] (>95 %)
	(Proportion (%) of primary health facilities offering SAM services)			
	Number of sites with MAM services	610 [13] (<5 %)	850 [26] (>75 %)	1 180 [15] (>95 %)
	(Proportion (%) of primary health facilities offering MAM services)			
Access to treatment	Annual number of children under 5 accessing treatment for SAM	60 843 [13]	330 000 [26]	406 327 [15]
	Annual number of children under 5 accessing treatment for MAM	275 030 [13]	257 000 [26]	520 398 [15]
Quality of care	Annual overall SAM cure, case-fatality and defaulting rates	Good [13]	Good [26]	Good [15]
	Annual overall MAM cure, case-fatality and defaulting rates	Good [13]	Good [26]	Good [15]
Contact coverage	Proportion of children under 5 diagnosed with SAM in the population receiving treatment	Low [13]	Low [27]	Low [15]
Sustainability	Sustainability based on financial and technical dependence of IMAM interventions	Low [13] (NA)	Low [14] (41 %; 13)	Low [15] (60 %; 20)
	(Proportion (%) of primary health facilities with IMAM services receiving technical partner support; number of technical partners)			
Health status				
Prevalence of acute malnutrition	Proportion (%) of children under 5 diagnosed with SAM in the population (confidence interval)	0.8 % [19] (NA)	3.2 % [17] (2.7–3.7)	2.6 % [1] (2.2–3.1)
	Proportion (%) of children under 5 diagnosed with overall acute malnutrition in the population (confidence interval)	11.0 % [19] (NA)	15.5 % [17] (14.2–16.8)	13.3 % [1] (12.3–14.3)
Under-5 mortality	Probability of dying before 5 years of age expressed per 1000 live births	230 [19] (217–244)	NA	127 [18] (119–136)
	Proportion of deaths of children under 5 in the population per 10000 children per day (confidence interval)	1.8 [20] (NA)	2.1 [17] (NA)	0.7 [1] (NA)

IMAM: Integrated Management of Acute Malnutrition; IMCI: Integrated Management of Childhood Illness; NA: not available; MAM: Moderate Acute Malnutrition; MOH: Ministry of Public Health; SAM: Severe Acute Malnutrition

coverage and sustainability remained low. The health status indicator of acute malnutrition prevalence was unstable for the years under study but showed improvement for 2013, and of under-5 mortality risk showed improvement for 2013.

The study findings that integration of acute malnutrition interventions were only partially achieved contrasted with the general perception in Niger that the management of acute malnutrition was integrated into the national health system. The following sections discuss what integrated management of acute malnutrition

meant in Niger, what was expected of it and what can be learned from it.

Understanding integration and its aim

Since the Niger MOH called for the provision of integrated management of acute malnutrition (IMAM) –*Prise en charge intégrée de la malnutrition aiguë*– as a routine health service in all public health facilities in 2007, it assumed instant integration. Integration initially was interpreted from an organisational perspective as care provided by the public health sector in all health facilities. With

time, it evolved to mean integrated care of patients from a clinical perspective. The question of what “integrated care” means, or what dimension of integration is being addressed is common [8], and not just for Niger or the management of acute malnutrition. Integrative functions of primary care include dimensions of systemic, managerial, organisational and professional integration at the meso and macro level of population-based care that is needed to obtain clinical integration of patient-focused care at the micro level. Both functional and normative integration are integrative functions that cut across the different levels of care [12]). For Niger, the use of a clear taxonomy of integrative functions of care would contribute to the understanding of the complex and multi-dimensional nature of integrated care as a process and hence its improvement [8].

The quest of the MOH to integrate management of acute malnutrition was driven by its taking ownership of improving coordinated care as well as other assumptions. First, integration would rapidly scale up service delivery. Second, integration would resolve capacity concerns at national, regional and local governance and implementation levels. Third, integration would resolve all other concerns about quality of care, inequitable coverage, unbalanced resource allocations, and uncertain financial and institutional sustainability. A general belief associates integration of health services with improved efficiency, cost-effectiveness, client-orientation, equity, local ownership, quality and health status overall [21]. However, systematic reviews of integration of primary health care in low-income countries were unable to draw conclusions on the benefits and disadvantages of integrated services [21–23]. These studies have at least two relevant lessons for Niger. First, integrating a service does not necessarily mean integrating all of its components, as permutations are possible. Second, integration is not a cure for inadequate resources or capacities. For Niger, evidence of the effectiveness of integrative functions for improved acute malnutrition services and health outcome would inform appropriate strategy designs adapted to the country-context and the capacities of the MOH and its partners.

Learning from the integration process

The mosaic pattern of integration of acute malnutrition interventions (Table 1) indicated a complex and dynamic process, or continuum [24] that showed gradual progress. The absence of a strategy or phased plan implied that integration resulted from a natural self-organisation rather than orderly planning. It also showed that achieving integrated care of children with acute malnutrition required changes not only in service delivery, but also in systemic and organizational dimensions of care. Furthermore, it showed that integration into key system functions did not

progress simultaneously and therefore may not always be desirable, possible or opportune.

We identified two consequences of the failure to translate the 2007 policy on integrated management of acute malnutrition into an adapted implementation strategy. First, the policy set no goals for what aspects or components of acute malnutrition interventions to integrate how, when, why or where. Nor did it reflect on opportunities for and threats to integrated care of acute malnutrition or other health interventions. Because of the lack of a specific integration plan for IMAM in Niger, progress was not monitored and adverse or unintended effects on the health system were not studied or corrected. Positive effects of integration could have included extended coverage of interventions and increased capacity of the health system. Negative effects of integration could have included the removal of privileged status and the necessary pampering for maturation or the imbalanced care of public health priorities [25]. Second, the policy missed aligning health actors behind a common goal. As such, partners provided short-term support that yielded immediate results but did not collaboratively strengthen the health system with a long-term vision to adopt and assimilate integrated quality services sustainably. However, the policy was successful in the sense that partners gradually moved from direct implementation toward support for service delivery, which stimulated national and local ownership and political will and hence strengthened donor trust.

For Niger, an integration strategy for the management of acute malnutrition should set goals based on overall public health priorities and available capacities and resources. It should decide what aspects of interventions to integrate or not, and what aspects to outsource in the short or long term through, for example, public-private partnerships that are well regulated and coordinated as part of the same transformative change agenda. In some areas partners were well represented in the community and therefore well placed to implement the community-based interventions. Some partners were well placed to distribute bulky supplies to the periphery. Task sharing could be effective under an overarching and collaborative strategic plan with a defined goal and oversight from the MOH to regulate and coordinate activities.

The integration matrix proved useful to map the level of integration of IMAM into key system functions and show progress over time. In our study, the matrix was itself the outcome of a diagnostic of key health system functions, but it should ideally be linked with an implementation strategy to be able to measure and interpret progress and inform policy adaptations. The proposed indicators matrix is therefore a diagnostic tool that itself may be used to inform strategies and formulate objectives for improved integrated care. It therefore needs to be adapted or changed depending on the changing

country context, implementation strategy and level of integrative functions under study. We anticipate that lessons from this case study may inform the integration strategy of the multisectoral interventions of the national nutrition security policy under development in Niger.

The study had important limitations. Information was collected at three intervals. A separate paper investigated factors that influenced the process of integration of acute malnutrition interventions in Niger and complements the interpretation of the results presented here. Moreover, in the absence of a national strategy for integrating acute malnutrition interventions, progress could not be compared to national goals. Without knowing what to aim at, the pattern of integration as shown in the results matrix has limited use. The integration indicators are measured from a systemic perspective but mix types of integration (e.g. organisational, functional, professional) and levels of health system targeted (e.g. micro, meso, macro). Furthermore, the study was not designed to measure the effect of integration of acute malnutrition interventions on the overall health system, but we added indicators of performance of acute malnutrition services and health outcome to understand the context in which the integration process occurred. Nevertheless, we missed information on cost of a treatment, equity, extra-budgetary financial contributions or donor investments that played a role in improved quality and sustainability.

Conclusions

The study developed and measured indicators to investigate the level and trend of integration of acute malnutrition interventions into key health system functions in Niger. The tool was able to assess the status and monitor the process of integration. The study uncovered the missed opportunity of a national integration strategy for integration of acute malnutrition interventions with clear goals and expectations that unlock local capacities and regulate partnerships for improved integrated care and sustainability.

We recommend that for future use, health actors consultatively and collaboratively adapt the indicator matrix to the integration strategy that is aligned with national health and nutrition policies and development plans and level of use. The proposed method of assessing and monitoring integration progress may be used in Niger and other countries to stimulate the debate of integrated care, and to improve strategic planning for improved health outcomes.

Additional file

Additional file 1: Table S1. Indicators of integration level of acute malnutrition interventions and health outcome. (DOC 121 kb)

Abbreviations

HIS: health information system; IMAM: integrated management of acute malnutrition; IMCI: integrated management of childhood illness; MAM: moderate acute malnutrition; MCH: maternal and child health; MOH: Ministry of Public Health; SAM: severe acute malnutrition.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

HD and JM contributed to the study design and data collection, analysis and synthesis. MH, BC and PD contributed to the analysis and synthesis. HD drafted the manuscript. All authors revised the draft, and read and approved the final manuscript.

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v. Factors of integration: case study

Deconinck H, Hallarou ME, Pesonen A, Gerard JC, Criel B, Donner P, et al. Understanding factors that influence the integration of acute malnutrition interventions into the national health system in Niger. *Health Policy and Planning*. 2016;31(10):1364-1373.

In depth-study of caseload estimation as one factor influencing integration

Reliable estimates of SAM burden and caseload for treatment are needed for policy decisions and for planning, implementing and evaluating services in the context of competing public health priorities and limited resources. These estimates are considered key in the development of cost-effective health interventions [223].

The study of factors that influence the integration of SAM services in Niger identified information on the SAM burden as a determinant to influence policies and SAM caseload estimates as a determinant of facilitating organisational planning and performance. One of the factors that were identified as inhibiting integration was a good understanding of the SAM burden and caseload for accurate resource planning.

RESEARCH ARTICLE

Challenges of Estimating the Annual Caseload of Severe Acute Malnutrition: The Case of Niger

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Abstract

Introduction

Reliable prospective estimates of annual severe acute malnutrition (SAM) caseloads for treatment are needed for policy decisions and planning of quality services in the context of competing public health priorities and limited resources. This paper compares the reliability of SAM caseloads of children 6–59 months of age in Niger estimated from prevalence at the start of the year and counted from incidence at the end of the year.

Methods

Secondary data from two health districts for 2012 and the country overall for 2013 were used to calculate annual caseload of SAM. Prevalence and coverage were extracted from survey reports, and incidence from weekly surveillance systems.

Results

The prospective caseload estimate derived from prevalence and duration of illness underestimated the true burden. Similar incidence was derived from two weekly surveillance systems, but differed from that obtained from the monthly system. Incidence conversion factors were two to five times higher than recommended.

Discussion

Obtaining reliable prospective caseloads was challenging because prevalence is unsuitable for estimating incidence of SAM. Different SAM indicators identified different SAM populations, and duration of illness, expected contact coverage and population figures were inaccurate. The quality of primary data measurement, recording and reporting affected

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incidence numbers from surveillance. Coverage estimated in population surveys was rarely available, and coverage obtained by comparing admissions with prospective caseload estimates was unrealistic or impractical.

Conclusions

Caseload estimates derived from prevalence are unreliable and should be used with caution. Policy and service decisions that depend on these numbers may weaken performance of service delivery. Niger may improve SAM surveillance by simplifying and improving primary data collection and methods using innovative information technologies for single data entry at the first contact with the health system. Lessons may be relevant for countries with a high burden of SAM, including for targeted emergency responses.

Introduction

Prevalence estimates suggest that severe acute malnutrition (SAM) affects 16 million children worldwide [1] and kills over half a million children annually [2]. These prevalence figures, derived from cross-sectional surveys, may not reveal the true picture of the SAM burden.

Children with SAM have a high risk of death and require intensive medical care if they are detected late or have developed medical complications [3]. Until 2000, children with SAM were managed as inpatients, with low coverage and high case-fatality. In the past decade, improved outpatient treatment protocols and the innovation of ready-to-use therapeutic foods facilitated scale-up of decentralised management of SAM in primary health care. This approach is now being implemented in about 80 countries [4]. While integration of the management of SAM into child healthcare is being promoted, its scale-up in high-burden, low-income countries such as in Niger faces many challenges, including weak health service systems [5, 6].

Reliable estimates of SAM burden and caseload for treatment are needed for policy decisions and for planning, implementing and evaluating services in the context of competing public health priorities and limited resources. These estimates are considered a major step toward the development of cost-effective health interventions [7]. A 2013 review of SAM interventions in Niger [8] highlighted weaknesses in the methods used to estimate caseload for treatment at the start of the year and to report case detection and admissions during the year. These weaknesses are expected to affect the quality and effectiveness of care. This paper compares the reliability of estimating the annual SAM caseload for treatment of children 6–59 months of age in Niger at the start of the year with the reliability and accuracy of estimating the annual incidence of case detection and admission at the end of the year. It also discusses factors that account for differences in estimated SAM caseload, incidence and coverage.

Methods

Study design

This study used secondary data collected during an evaluation of SAM interventions in 2013. Data were extracted from survey reports and various databases from two health districts, Aguié in Maradi Region and Matameye in Zinder Region, for 2012 and the country overall for 2013. National nutrition surveys were conducted by the National Institute of Statistics of the Government of Niger. District nutrition and coverage surveys were conducted by the respective district health offices with support from Save the Children. Data from the various acute malnutrition

surveillance systems were collected and managed by the respective district health offices, the Directorate of Nutrition, and the Directorate of Statistics of the Ministry of Public Health with support from the United Nations Children's Fund. Annual burden and caseload estimations of SAM were calculated using data and formulas applied in Niger. Coverage was extracted from survey reports, and incidence from three SAM surveillance systems. Data from the two districts and the country overall were used to compare the trend of estimates across information systems, settings, and time.

Study definitions and data sources

SAM definition and indicators. SAM is defined by either weight-for-height below ($<$) minus 3 z-score standard deviations of the median value (WHZ < -3) of the 2006 WHO Child Growth Standards or mid-upper arm circumference (MUAC) less than ($<$) 115mm or the presence of nutritional oedema [9, 10]. (Moderate acute malnutrition [MAM] is defined by either WHZ equal to or above ≥ -3 and < -2 or MUAC between ≥ 115 mm and < 125 mm [9, 10].)

Diagnosing and recording SAM. Children detected with SAM in the community by MUAC or oedema were referred for treatment to the closest primary care facility where treatment was offered. Health posts with no nurses on staff did not offer SAM treatment, but community health workers or lay health workers (volunteers) measured children with suspected SAM. Results were marked on a SAM-specific tally sheet, and children with either WHZ < -3 or MUAC < 115 mm or oedema were referred for treatment. At the health centres (and health posts with nurses on staff), volunteers measured children with suspected SAM. Children with either WHZ < -3 or MUAC < 115 mm or oedema received a clinical examination for the presence of oedema, appetite and co-morbidities. Results for children with either WHZ < -3 or MUAC < 115 mm or oedema were written on scrap paper, then marked on a SAM-specific tally sheet, then copied in the SAM-specific outpatient register, children's outpatient treatment cards, health cards if available, therapeutic food ration cards kept by carers and in case of referral to hospital for inpatient treatment of complications, marked on referral slips. At the hospital, volunteer, auxiliary and clinical health workers collaborated to measure the children on admission, perform a medical examination, monitor progress daily until complications resolved and refer the children back to primary care to continue treatment as outpatients. Results were recorded in the SAM-specific inpatient registers, SAM-specific inpatient treatment cards, regular hospital registers and medical and drug record cards. Children admitted for treatment were given SAM-specific numbers that were copied into the different records at the various levels of service delivery.

Counting new SAM cases. Three different surveillance systems provided counts of new SAM cases, or incidence. First, the notifiable disease surveillance system (*Maladies à déclaration obligatoire, or MDO*) of the national health information system provided weekly numbers of new SAM (and MAM) cases and deaths in every health facility in the country. The responsible health workers used data from either the SAM-specific tally sheets or registers to fill out the MDO reporting sheet, which was shared weekly with the district health offices. Data were entered into the health information system database at the district level and shared and amalgamated at the regional and national level. Second, a *Monthly Report* system introduced in 2005 as part of SAM-specific monitoring and evaluation provided detailed monthly information on case admissions and exits and stock use from every site providing SAM (and MAM) treatment. Health workers used the SAM-specific registers to fill out the monthly reporting sheets. Reports were shared with the district health offices monthly. Data were entered into the SAM-specific database at the health district level and shared and amalgamated at the regional and national level. Third, another weekly surveillance system, *Scaling Up*, was introduced in

2007 to provide instant and reliable reporting of case admissions and exits and stock use from every site providing SAM (and MAM) treatment. Health workers used the SAM-specific registers to fill out the weekly reporting sheets. Reports were shared with the health districts, regions and central office weekly. Data were entered into a different SAM-specific database at the health district level and shared and amalgamated at the regional and national level. This case study extracted data from the databases [11–13] of SAM detection and admissions for the two health districts in 2012 and for Niger overall in 2013.

Caseload of SAM. For the purpose of this paper, burden of SAM refers to the overall number of children with SAM in the population, and SAM caseload refers to the number of children with SAM who effectively access and take up treatment (or number of admissions). The annual burden (Eq 1) and caseload (Eq 2) were calculated as follows:

$$\begin{aligned} \text{Annual burden of SAM} \\ &= \text{Prevalent SAM cases in the population at the start of the year} \\ &+ \text{New SAM cases during the year} \end{aligned} \quad (1)$$

$$\begin{aligned} \text{Annual caseload of SAM} \\ &= \text{Prevalent SAM cases in treatment at the start of the year} \\ &+ \text{New SAM cases admitted for treatment during the year} \end{aligned} \quad (2)$$

Estimating SAM caseload prospectively. Because SAM incidence is not known, an indirect method was used to calculate the annual expected SAM burden and caseload. In stable populations, for uncommon illnesses, prevalence is a function of incidence and duration of untreated illness (Eq 3) [14]. Thus, if prevalence and duration of illness are known, incidence (Eq 4), and the incidence conversion factor (Eq 5) can be estimated. The period t for which the incidence was calculated was 12 months (Eq 6). Prevalence of SAM defined by either WHZ < -3 or presence of oedema was derived from surveys.

$$\text{Prevalence} = \text{Incidence} * \text{Average duration of untreated illness} \quad (3)$$

$$\text{Incidence} = \text{Prevalence} * t / \text{Average duration of untreated illness} \quad (4)$$

$$\text{Incidence conversion factor} = t / \text{Average duration of untreated illness} \quad (5)$$

$$\begin{aligned} \text{Annual incidence} \\ &= \text{Prevalence} * 12 \text{ months (or 365 days)} / \text{Average duration of untreated illness} \end{aligned} \quad (6)$$

This case study retrieved SAM prevalence data from national nutrition survey reports [15, 16] and nutrition survey reports from Aguié and Matameye health districts [17, 18] for the respective years applying the Standardized Monitoring and Assessment of Relief and Transition (SMART) method [19]. Duration of untreated SAM illness is impossible to study for ethical reasons but has been estimated from historical data or modelled from recent data. Garenne et al. (2009) estimated the duration of an untreated episode of SAM from historical datasets at 7.5 months [20]. The 7.5 months of duration of SAM illness and 12-month period yielded an incidence conversion factor of 1.6 (12 months divided by 7.5 months equals 1.6). This conversion factor has been promoted globally to estimate annual SAM incidence from prevalence [21]. Isanaka et al. (2011) used empirical data to model the duration of untreated SAM illness in Maradi District in Maradi Region, Niger, and found it to be 45 days, resulting in an incidence conversion factor of 8.1 (365 days divided by 45 days equals 8.1) [22]. Health actors in

Niger had noted that the proposed 1.6 conversion factor systematically underestimated the annual burden and adjusted it for their own use to 2.0, 2.3 or 2.5 [8]. This case study used the different incidence conversion factors to compare prospective annual caseload estimates with incident cases. The expected annual burden (Eq 7) differed from the expected annual caseload (Eq 8) because not all children with SAM were expected to access and take up treatment. The caseload calculation therefore adjusted for 50% coverage, acceptable coverage in rural areas compared with international standards [23]. In both equations, prevalence was defined by either WHZ <-3 or the presence of oedema at the time of the survey, using SAM prevalence data from the previous year for the coming year.

Expected annual burden of SAM

$$\begin{aligned} &= \text{Child population 6–59 months} * (\text{Prevalence} + \text{Incidence}) \\ &= \text{Child population 6–59 months} * (\text{Prevalence} * [1 + \text{Incidence conversion factor}]) \end{aligned} \quad (7)$$

Expected annual caseload (annual burden adjusted for 50% coverage)

$$\begin{aligned} &= \text{Child population 6–59 months} * 0.5 * \\ &(\text{Prevalence} * [1 + \text{Incidence conversion factor}]) \end{aligned} \quad (8)$$

Coverage. Contact coverage, defined by the proportion of children with SAM in the population receiving treatment, is a key indicator of service performance and compares with international standards [23]. Different methods were used in Niger to estimate contact coverage of SAM.

First, cross-sectional coverage survey methods used local area sampling to assess contact coverage in health districts and large area sampling to assess contact coverage country-wide [24]. The surveys provided estimates of point coverage (proportion of children with SAM in the population receiving treatment) and period coverage (proportion of children with SAM and recovering from SAM in the population receiving treatment) that evaluated different aspects of service performance because of the additional time factor of recovery. Contact coverage of SAM was also estimated by cross-sectional nutrition surveys, with low precision. This case study retrieved the national coverage rate [25] and the Matameye Health District coverage rates from coverage surveys [26]. The coverage survey conducted in Aguié Health District in 2012 studied barriers to service access but did not yield a coverage rate [27]. In the coverage surveys, SAM was identified by either MUAC <115mm or presence of oedema. Second, an indirect method was used to measure whether SAM intervention targets were reached. Admissions at the end of the year were compared with the expected target caseload at the start of the year (Eq 9). The target caseload of SAM was derived from SAM prevalence and adjusted for 50% coverage. The numerator was derived from admissions of SAM defined by either WHZ <-3 or MUAC <115mm or presence of oedema. The denominator was derived from nutrition surveys, in which SAM was defined by either WHZ <-3 or presence of oedema.

Proportion of covered need of SAM treatment in children 6–59 months at the end of the year

$$\begin{aligned} &= \frac{\text{Number of children 6–59 months with SAM admitted for treatment during the year}}{\text{Expected annual caseload at the start of the year}} \end{aligned} \quad (9)$$

Table 1. Contact coverage of severe acute malnutrition in children 6–59 months of age estimated by coverage survey methods.

Site	Contact coverage of severe acute malnutrition (% and 95% confidence intervals)			
	2010	2011	2012	2013
Matameye	34.9 (26.3–44.2)	46.2 (36.8–55.8)	53.3 (45.0–61.2)	36.9 (30.4–43.8)
Niger	/	19 ^a	/	/

^aConfidence interval not available.

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Population figures. This case study used the same population figures of children 6–59 months of age as the annual health information system used to report Niger health indicators [28, 29].

Results

Annual caseloads are presented from prospective estimations and retrospective counts of incident cases from three surveillance systems, with their respective incidence rates and conversion factors. Because coverage estimates are used in prospective estimations of caseload, available contact coverage results of the respective sites are presented first.

Contact coverage

Contact coverage of SAM in Matameye Health District was good (>50%) to low (<30%) according to international standards [23] (Table 1) [26]. Good coverage still meant that half of all children with SAM did not access treatment. Trends in coverage fluctuated and decreased significantly in 2013 compared with 2012. Contact coverage of SAM in Niger overall was low, indicating that three out of four children with SAM did not access treatment [25].

Annual caseload

Table 2 compares SAM cases derived from indirect and direct methods. First, caseload was estimated by the indirect method at the start of the year from prevalence by applying an incidence conversion factor of 2 adjusted for an expected coverage of 50%, which was the usual method in Niger. SAM prevalence estimates were high for Aguié (3.0%) and Matameye (3.0%) in 2012

Table 2. Annual caseload of severe acute malnutrition estimated at the start of the year from prevalence and counted at end of year from three surveillance systems.

Site	Child population 6–59 months ^a (number)	SAM ^b prevalence rate (% and 95% confidence interval)	SAM ^b cases estimated at start of year ^d (number and 95% confidence interval)	SAM ^c cases counted at end of year		
				MDO ^e (number)	Scaling Up (number)	Monthly Report (number)
Aguié	91 019	3.0 (1.8–5.0)	4 097 (2 457–6 827)	17 151	16 164	11 688
Matameye	75 021	3.0 (1.6–5.6)	3 377 (1 800–6 301)	11 956	/	21 488
Niger	3 362 293	2.6 (2.2–3.1)	131 130 (110 955–156 347)	409 367	406 327	/

^aChild population estimations for the respective years [28, 29].

^bSevere acute malnutrition (SAM) defined by either WFLZ <−3 or presence of oedema.

^cSAM defined by either WHZ <−3 or MUAC <115mm or presence of oedema.

^dCaseload estimated from prevalence, incidence factor 2 and 50% coverage, the usual method used in Niger.

^eMaladies à déclaration obligatoire.

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and for Niger overall (2.6%) in 2013, and the confidence intervals yielded wide ranges in estimated caseload. Second, the three surveillance methods (*MDO*, *Scaling Up* and *Monthly Report*) (direct method) counted incident cases over the year. Caseload numbers at the end of the year showed variation across the three methods in the three sites (Aguie, Matameye and Niger overall). For example, the weekly *MDO* detected more cases than the weekly *Scaling Up* and *Monthly Report* reported admissions in Aguie and Niger overall, but detected only half the number of admitted cases in Matameye. The *Monthly Report* under-reported cases in Aguie but over-reported cases in Matameye in comparison to weekly reported cases. Third, the indirect method expected considerably fewer cases at the start of the year than the actual number of admissions over the year. The upper level predictions of expected cases were less than half the numbers detected or admitted. For example, for Niger overall, the maximum number of expected cases at the start of the year (156 347) was 2.6 times smaller than the number of cases admitted at the end of the year (406 327). The minimum degree of underestimation was 1.7 (11 688/6 827) for Aguie and 3.4 (21 488/6 301) for Matameye. Matameye Health District data from *Scaling Up* and national amalgamated data from the *Monthly Report* were not available.

Incidence and conversion factor

Table 3 shows SAM incidence rates and incidence conversion factors obtained by the three surveillance systems. Incidence rates were obtained by dividing the number of admissions by the average mid-year child populations (Table 2).

- In Aguie, the *MDO* reported that one out of five children was detected with SAM. *Scaling Up* reported one out of six children as admitted for treatment for an episode of SAM, and the *Monthly Report* reported one out of eight.
- In Matameye, the *MDO* reported that one out of six children was detected with SAM, and the *Monthly Report* reported that one out of four children was admitted for treatment for an episode of SAM.
- In Niger overall, one out of eight children was detected and admitted for an episode of SAM.

The SAM incidence conversion factors by site and surveillance system were obtained by dividing incidence by prevalence. The incidence conversion factors yielded numbers that ranged from 4.3 to 9.5, two to four times higher than factor 2, which was commonly used to estimate caseloads in Niger.

Discussion

The case study shows that the expected caseload of SAM derived from prevalence at the start of the year was lower than the actual caseload counted over the year, and uncovers differences in

Table 3. Annual incidence rates and incidence conversion factors of SAM obtained from three surveillance systems.

Site	SAM ^a incidence rate (%)			SAM ^a incidence conversion factor (number)		
	MDO ^b	Scaling Up	Monthly Report	MDO	Scaling Up	Monthly Report
Aguie	18.8	17.7	12.8	6.3	5.9	4.3
Matameye	15.9	/	28.6	5.3	/	9.5
Niger	12.2	12.1	/	4.7	4.6	/

^aSevere acute malnutrition (SAM) defined by either WHZ <-3 or MUAC <115mm or presence of oedema.

^bMaladies à déclaration obligatoire.

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incidence counts. This section discusses methodological and practical challenges in providing reliable and accurate figures on SAM caseload, incidence and coverage by the various methods used in Niger.

Challenges in estimating annual SAM caseload at the start of the year

Annual caseload was commonly analysed prospectively in Niger, as elsewhere in the world, for planning, implementation and evaluation purposes [21]. The study showed this method to be inaccurate. Reasons could be related to the unsuitability of prevalence to understand the SAM burden, the use of different SAM indicators identifying different SAM populations and the inaccuracy of figures for duration of illness, expected contact coverage and population.

First, prevalence is not an appropriate measure for an acute condition because it counts only cases at the time of the survey but misses cases that developed and died or recovered between survey intervals. Nor does prevalence capture unexpected spikes or seasonal fluctuations. Moreover, the time and context interpretation of the prevalence estimate may be lost during its applications. These are important considerations for SAM and even more so for the acute condition of oedematous SAM. Besides, surveys may use different data cleaning criteria to exclude extreme data values, which may impact on prevalence estimates. For example, one study comparing severe wasting prevalence results between survey methods found that SMART used stricter cleaning criteria, excluding three to five times more records, resulting in differences in the estimated prevalence of severe wasting between 0.4% and 3.9% [30]. In addition, relying on SAM point prevalence estimates without taking into account uncertainty intervals may give a false reassurance of accuracy [31]. Second, different anthropometric indicators were used to define SAM. For example, nutrition surveys reported SAM prevalence based on either WHZ or presence of oedema (WHZ + oedema cases), and when MUAC was measured, reported on SAM prevalence based on either MUAC or oedema (MUAC + oedema cases) separately. Coverage surveys detected SAM based on either MUAC or oedema (MUAC + oedema cases) but never on WHZ, while surveillance systems detected SAM based on either WHZ or MUAC or presence of oedema (WHZ + MUAC + oedema cases). Because WHZ and MUAC do not measure the same SAM phenomena [10] and SAM children are diagnosed by one indicator, different sources reporting on SAM using different indicators did not compare the same SAM populations [32]. Presence of oedema was the prime SAM diagnostic, and if negative, a MUAC <115mm or WHZ <-3 indicated SAM in individual children. Third, duration of untreated illness is not stable in time, between individuals or across populations and therefore should be used with caution to estimate incidence from prevalence. The universally promoted conversion factor of 1.6 was estimated from historical longitudinal data sets [33] that measured incidence of SAM defined by low MUAC measured at 3- to 6-month intervals. Duration of illness obtained from these data sets has shortcomings. Broad MUAC measurement intervals may not have captured all new cases that developed and died or recovered and therefore underestimated incidence. Also, the epidemiological and child healthcare context has changed since these studies. Further, the study did not include oedematous SAM. Another conversion factor of 8.1 was obtained by modelling duration of untreated illness based on data from Niger [22]. This modelling also applied a range of assumptions that may differ from practice. The range of the two conversion factors is wide, resulting in great differences in annual estimations. Results from this case study found that the conversion factor obtained through modelling was more realistic. Fourth, prospective estimates of SAM caseload were adjusted for 50% coverage, the benchmark for good contact coverage in rural settings [23]. Such high coverage has rarely been obtained in Niger or elsewhere in the world except in high-resource contexts [34]. As such, the annual expected caseload at the start of the year was overestimated, and its use to evaluate

whether SAM interventions met the targets set at the start of the year was inappropriate. Finally, because of high annual population growth (4.02% in 2013) [35], the delayed release of the 2012 census data and population movements, health actors in the country used different population figures, further affecting the accuracy of caseload estimates.

Challenges in counting SAM incident cases

Differences and discrepancies in incidence obtained by the three surveillance methods raised questions about the quality of the primary data; performance of health actors in measuring, recording and reporting SAM indicators; and the different purposes of the surveillance systems.

First, detection of SAM depended on the quality of the anthropometric equipment and skills to measure MUAC, weight and height accurately; verify the WHZ indicator in the child standards tables for girls and boys combined or separated (two different tables were in use); and check for the presence of oedema. The same measurement results were recorded three to four times in different information systems. Random verification of records often revealed physiologically impossible anthropometry. Second, a team of volunteers, trained, supervised and motivated by non-governmental organisations, usually measured children with suspected SAM at health facilities. Volunteers were generally dedicated lay health workers. Spot checks revealed that a combination of limited skills, the complexity of measuring and recording results in a language different from their mother tongue and the usually hectic and overcrowded work environment influenced their performance. Shifting diagnostic tasks to volunteers therefore had mixed results. Volunteers reduced the workload of health workers, but they hampered improvements of identified weaknesses in the surveillance system because they were not formal staff. Third, health workers faced difficulties applying the different indicators to report detected SAM cases in the weekly *MDO* and to report admitted cases in the weekly *Scaling Up* and *Monthly Report*. Spot checks revealed knowledge gaps of health workers about the different meanings and purposes of the indicators and their respective surveillance systems. Moreover, health workers spent many hours filling out the weekly or monthly reporting sheets for SAM and other health programmes. Spot checks revealed some SAM reporting sheets with identical numbers, calling their reliability into question and underlining a motivational issue affecting performance. Fourth, the different databases were maintained at the district, regional and national levels of the Ministry of Public Health, with different cycles of submission and data analysis. In parallel, technical partner agencies involved in SAM interventions copied data-sheets and maintained databases for monitoring and evaluation of their respective programmes, catchment areas and funding cycles. *Scaling Up* had a national reporting rate close to 80%, better than the *MDO* and *Monthly Report*, but it also received the most resources. It was indeed expected that the *MDO* would yield higher numbers of detected SAM than the surveillance systems for admissions, but this was not the case for Matameye Health District. It was also expected that the *Monthly Report* of the two districts receiving partner support would provide accurate admission numbers, which the study results could not confirm. Spot checks revealed that the organisation of primary data collection, the management of the databases and the performance of health workers differed within and across districts. The variation in implementation may have explained the erratic differences in surveillance results. Despite this, limited quality control measures were in place. Rumours hinted at children being counted several times either by attending more than one health centre or by sharing cards of ghost or replacement children, but this failed to explain the major differences in annual incidence of SAM reported. Audits of surveillance systems compared results but did not uncover why and how and in what circumstances differences in incidence results were produced.

Challenges in estimating SAM coverage

Direct methods of SAM coverage estimation were used in Niger to evaluate the performance of SAM interventions by assessing SAM service access, uptake and retention. An indirect method was also used to evaluate retrospectively whether the target caseload had been reached. Both methods entailed challenges.

First, coverage surveys were rare events, as they were labour intensive and required expensive specific international expertise. They usually provided estimates of point coverage (proportion of children with SAM receiving treatment) and period coverage (proportion of children with SAM and recovering from SAM receiving treatment) with uncertainty intervals. The distinction between point and period coverage may be useful in the intervention context but lost its meaning when applied for other purposes. Spot checks found that the better coverage estimate of the two was usually retained. Consequently, the interpretation of direct coverage estimates may have been inaccurate. Coverage surveys conducted in Matameye Health District showed variation that may be linked to changes in resources or intervention strategy. We recommend exploring how these changes affected coverage results by a dynamic systems method, for example, the behaviour-over-time graph and realist evaluation [36, 37]. Coverage estimates from nutrition surveys were not studied, as their sampling method was not adequate to estimate point coverage with adequate precision, and they were therefore impractical or of limited value. Second, results from indirect coverage methods, comparing annual admissions at the end of the year with expected admissions at the start of the year, were not discussed. The unrealistic underrating of expected caseload estimations made the coverage estimate inappropriate. For example, this method underestimated coverage of SAM in Aguié in 2012 by four times (16 164 / 4 097). Nevertheless, the indirect coverage estimation method was still being used and promoted [21], while it should be abandoned. More sustainable alternatives to obtain SAM coverage information may be explored within the broader frame of child healthcare coverage and needs.

Limitations

The quality of the primary data collection and reporting and the reliability of methods for prospectively estimating caseload or directly measuring caseload made it impossible to verify the true SAM population incidence. It was impossible to control for the possible effects of using different anthropometric indicators (WHZ or MUAC) that identified different SAM populations. Moreover, prevalence estimates covered different child populations by including or excluding infants 0–6 months of age. Prospective methods relied on a set of unrealistic assumptions (e.g. constant child populations, average duration of illness and prevalence adjusted for 50% coverage). The case study did not examine either the validity of the various methods and surveillance systems in accurately reflecting the magnitude or temporal and geographic variation of SAM, their cost-effectiveness or their sustainability. Instead, it was limited to applying figures and calculations used by health actors in Niger for planning, implementing and evaluating SAM interventions. The case study aimed to describe differences in results that were available and used in the country and their effect on planning. Therefore, comparing different SAM populations with gaps in some of the data weakened but did not change either the findings or the discussion.

Conclusions

Reliable and accurate SAM caseload figures will continue to be in demand in Niger and elsewhere in the world. Indirect methods of estimating SAM caseload are inaccurate and rely on many unproven assumptions, yet continue to be used in the absence of direct incidence

information. Prospective SAM caseload estimates derived from indirect methods should be used with great caution, as they considerably underestimate the true burden. The three surveillance systems in place in Niger either underestimated or overestimated true values of incidence, and causalities were intrinsically linked in complex ways. Differences in incidence numbers yielded by the systems caused confusion. Nevertheless, prospective caseload estimates and incidence numbers were used interchangeably for planning, implementation and evaluation of SAM services. Policy and service decisions that depend on these numbers may therefore be inappropriate and further weaken performance of service delivery [38].

Niger made major efforts to establish SAM surveillance systems for timely access to incidence information so that it could adapt resources to actual needs and maintain quality of services. Because of inadequate primary data measurement, reporting and recording methods or processes, it did not invest enough in ensuring the reliability of the incidence information. The country should consider improving SAM surveillance by improving primary data collection methods for easy and single entry of reliable data at the first contact with the health system. For example, anthropometry may be improved by using wide MUAC straps, length measures with infrared sensors and electronic tarred scales; medical recording may be improved by using mobile or smartphone or tablet applications linked with electronic health information systems. To be cost-effective, owned and sustainable, SAM surveillance should be aligned with the national health information system and be evaluated by systems methods that uncover the dynamics of the complex information system and the role of its actors [39]. Moreover, health actors in Niger may benefit from a health information exchange platform with open access that could disseminate the wealth of in-country learning and stimulate continuous learning in a fast changing context. Lessons from this case study may be relevant for countries with a high burden of acute malnutrition, including for targeted emergency responses.

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vi. Discussion and conclusions

The case studies in Niger provided a first exploration of the initial theory from a macro-level perspective, guided by a framework approach. We explore here whether questions that were formulated at the start challenged our pre-set assumptions of how and why SAM integration has progressed in Niger.

Situational context

Partners initially played a major role in the introduction and scale-up of SAM. Because the services were provided in routine healthcare, partners continued to play an important role in filling SAM-specific system capacity gaps. External financial and technical support was channelled through vertical approaches, with limited system cohesion and inadequate leadership.

Integration as a common goal

SAM services were integrated into the national health system in Niger in a health policy environment in which government and technical and financial partners embraced integration as an already achieved goal. Integration of SAM services was viewed in terms of service delivery.⁴ The country had no specific policies or strategy for achieving or improving integrated comprehensive child healthcare. SAM had been effectively inserted into health and nutrition policies but was usually addressed in other sections than child healthcare, often managed under nutrition, which further encouraged a vertical approach even when an add-on model was in place as it still lacked cohesion. Also, the multisectoral approaches to nutrition included SAM, but again diverted SAM case management from comprehensive curative child healthcare. The absence of a common vision hindered exploration of integration, cost and missed opportunities with a systems lens to unlock local capacities and build strengths from within the system.

Extent and progress

Results from the case study that assessed the level and trend of integration of SAM in Niger since 2007 showed steady progress in some key health system functions and stagnation in others. Table 5.1 summarizes the extent of integration and outcome limited to the systemic perspective. While integration levels scored well, outcome scored disappointingly low.

⁴ Integrated SAM services were defined in terms of service delivery: SAM services delivered routinely in primary care with an established referral and counter-referral system between communities (for early detection) and facilities (for treatment of uncomplicated SAM in primary care and complicated SAM in secondary care until complication resolve and continued treatment in primary care until recovery).

The overall outcome rating was a rough way of summarising results that obscured internal strengths and weaknesses. Because of good geographical coverage and free access to healthcare, access was rated as mixed because of remote and underserved populations. Contact coverage (service uptake) was rated as weak because of dependency on support partners and the difficulty of reaching remote populations, despite the referral-base model being decentralised to health post level. The quality rating was mixed. Service performance rates (recovery, case-fatality and defaulter rate reflecting adherence to standardised care) were good, but no other quality of services (such as provision of comprehensive integrated care across the continuum of care adapted to people's needs) was available. Because performance rates were good on average, health outcome based on recovery was rated as good. Sustainability was weak. Effectiveness coverage is unknown, but based on the above results could also be rated as weak.

Table 5.1. Summary of the extent of SAM service integration in Niger, 2013

Integration		Outcome	
Governance		Access	
Financing		Coverage	
Information		Efficiency	
Health workforce		Equity	
Supplies		Quality	
Service delivery		Sustainability	
Demand generation		Health outcome (Recovery)	
		Health outcome (Prevalence)	
		Effectiveness coverage	

Legend:	
Extent of integration:	Outcome:
Full integration	Good
Partial integration	Mixed
No integration	Weak
	Unknown

Factors

The case studies summarised key factors that facilitated and hindered SAM integration:

- Key facilitating factors identified were knowledge and recognition of the problem supported by accurate information; effective decentralised continuity of SAM care; compatibility with goals, support and involvement of health actors; and leadership for aligning policies and partnerships and mobilising resources in a favourable political context driven by multisectoral development goals; and
- Key hindering factors identified were lack of understanding of the severity at the community, causes and consequences of the SAM problem; limited utilisation of and trust in health interventions; heavy health worker workload and high turnover and attrition; and high dependency on financial and technical support based on short-term emergency funding in a context of high demographic pressure.

When closely scrutinised, the factors that were identified influenced SAM service delivery more than they influenced integration of SAM into child healthcare services. This finding indicates how easy it is to be trapped in disease-specific approaches. A systems perspective is new and has to be learned.

The case studies conducted in Niger were a first step in our learning about pathways of integration of SAM from a systems perspective. All health managers and healthcare providers who participated in the case studies found the systems thinking approach interesting and were surprised to learn about the integrated nature of SAM or the vision of comprehensive child healthcare including SAM. Therefore, their participation in the analysis was a springboard for their learning on integration and applying a systems lens that hopefully paved the way for further application.

To conclude, learning by doing proved to be useful in creating awareness and fuelling curiosity about applying systems thinking to move away from the comfort zone of linear thinking. Guidance on integration of SAM should be part of a systems strengthening approach to improve comprehensive child healthcare and not a SAM-specific stand-alone tool.

CHAPTER 6

Applying a system dynamics approach to understanding severe acute malnutrition integration: Nepal and Burkina Faso case studies

Two case studies were conducted in Nepal and Burkina Faso, applying framework and system dynamics approaches, to provide country-specific learning on the integration of SAM into the national health system, and empirical learning for refining the initial theory.

i. Introduction

National health system capacity for integrating severe acute malnutrition (SAM) and levels of SAM integration vary across countries and settings. While significant progress has been made in scaling up management of SAM, weak health systems have constrained sustained quality services. As a result, support from technical and financial partners remains essential. Concentrated efforts are needed to continue the integration of the management of SAM into national health systems through strengthening key health system functions; adopting new roles and responsibilities and expanding knowledge and skills among key health actors; and assimilating new elements into managerial, operational and clinical and promotive health and nutrition interventions.

The Burkina Faso and Nepal case studies explored the extent of integration of SAM interventions, factors that facilitated or hindered the integration process and their interactions and the pattern of integration, as well as identifying improvements to foster integration.

ii. Methods

The two case studies used the same study design.

Case selection

Two countries were purposively sampled using the global mapping result (see Chapter 3). Pre-set criteria for selecting the countries were 1) high prevalence of SAM, 2) minimum of 2 years since the introduction of SAM in primary care, 3) a different history of introducing SAM in development or emergency setting, 4) a different integration score and 5) a different region. Regional UNICEF advisors investigated feasibility, interest and funding availability. Burkina Faso and Nepal were selected by mutual agreement.

Methodological approach

A mixed-method design was applied, with multiple data collection and data analysis methods and tools. First, a situational analysis described the context in which the integration process of SAM was being studied and established a common discussion platform. Participants drew a health sector organogram and child health pyramid and undertook policy mapping to identify the position of SAM interventions in normative policies, and health actor mapping to identify health actors' involvement in and influence on SAM (Figure 3.7).

Second, a detailed thematic analysis based on a multiple-framework approach identified key characteristics of the integration process. The approach enabled investigating the extent of integration of SAM interventions at the macro, meso and micro levels of the health system (Figure 1.3), and by the different dimensions of systemic, organisational, professional, clinical, functional and normative, horizontal and vertical integration (Figure 3.1) [113]. The overall vision was for the child to receive continuous comprehensive integrated care. The analysis therefore explored the integration of SAM as follows:

At the micro level:

1. *Clinical integration* (individual comprehensive and integrated healthcare provided in health facility-based and community-based primary care);

At the meso level:

2. *Professional integration* (collaboration and teamwork among various health providers and professionals both within and between services and organisations having a collective responsibility);

At the meso and macro level:

3. *Organisational integration* (organisation and collaboration of groups working together to reach a common goal);
4. *Systemic integration* (coherence of rules, systems and policies);

At all levels:

5. *Functional integration* (integration of non-clinical support);
6. *Normative integration* (integration of values and commitment, and political will);

7. *Horizontal integration* (integration of elements across levels); and
8. *Vertical integration* (integration of elements within similar levels).

Third, factors that facilitated or hindered integration were investigated according to the key elements of 1) the nature of SAM as a public health priority, 2) features of SAM interventions, 3) behaviours of health actors in adopting SAM, 4) readiness and capacity of the health system to integrate SAM and 5) the broad context (Figure 3.3) [107].

Fourth, participatory and iterative causal mapping explored in a causal loop diagram (CLD) whether factors that influenced integration interacted and had balancing or synergistic effects that affected or shaped the integration process. Next, plausible scenarios and their unintended consequences with mitigating strategies were being discussed. As such, health actors developed the CLD and visualised causal pathways of integration in a stepwise and participatory way that stimulated discussion and a shared understanding.

Study definition of integration

For the case studies, integration was defined as a process of interdependent activities acting at the tiers of the national (public) health system to achieve systemic, managerial, organisational and clinical integration, and to contribute to improving accessibility of sustainable quality SAM interventions for children to receive comprehensive child-centred healthcare with continuity across time and services.

Participants

Health actors of all tiers of the health system were invited to participate in group discussions, interviews and field visits. All participants were purposively selected based on their roles and responsibilities in child health and nutrition. They represented ministries of health (MOH), United Nations (UN) agencies, academic and research institutions, non-governmental organisations (NGOs) and other technical and financial partners, community-based organisations (CBOs), health workers and volunteers, communities and service users.

Data collection

Group discussions were held in both countries in 2-day workshops at national level and 1-day workshops in each district. Interviews and observations were conducted during field visits. During the health facility visits, 1- to 2-hour group discussions were held with health workers and service users, complemented by observation of service delivery where possible. Participants were probed on their perspectives of integration of SAM. All participants and respondents agreed to share information and have it recorded.

Data tools

Data collection tools for group discussions and interview and observation guides were developed and adapted for the case study and level of inquiry. Group discussions and interviews used semi-structured questionnaires and mental mapping techniques. Generic indicators were used, and the inquiry stimulated context adaptations. Mental and causal

mapping were done on paper posters. The visual data formats were shared in plenary discussions and refined. Group model building by causal loop diagrams prompted discussion of the interaction of influencing factors and intervention scenarios to improve the integration process. The data collection process allowed participatory and iterative exploration of the integration of SAM and built a rich picture of this integration in steps. Discussions were recorded and transcribed. Annex 9 contains the data collection tools and raw data.

Data analysis

Data were coded and organised by the themes in the analytical framework during the case study activities. Visual display of discussion results allowed ongoing triangulation, completion and validation by the participants. The common language of the various discussion platforms stimulated ownership of the integration investigation. Causal loop analyses were completed in Vensim PLE software version 6.3 [224], presenting a system view of the interplay among the different factors identified as influencing integration.

iii. Burkina Faso case study – Étude de cas

Une équipe composée du Ministère de la santé (MS) du Burkina Faso, de l'UNICEF, des partenaires techniques, et du chercheur de l'étude a mené une étude de cas sur l'intégration des interventions de la prise en charge de la malnutrition (PEC MAS) dans le système national de santé en avril et mai 2016. Cinquante intervenants clés nationaux ont participé à des ateliers (3), des discussions de groupe, des entrevues et à des visites d'observation.

L'enquête a été menée tant au niveau national qu'au niveau du district. Deux districts sanitaires - le district de Gourma dans la région Est et le district de Manga dans la région Centre-Sud - ont été choisis en fonction de la variation maximale de la performance des services PEC MAS. Dans chaque district, la structure sanitaire secondaire et deux structures sanitaires de soins de santé primaires ont été choisis en fonction de la variation maximale de la performance des services de la PEC MAS; Deux hôpitaux et sept centres de santé ont été visités au total. Les critères de performance des services étaient les taux de guérison, de la mortalité pendant le traitement et de l'abandon.

Les résultats de l'étude de cas ont permis d'explorer l'intégration de la prise en charge (PEC) de la malnutrition aiguë sévère (MAS) dans le système national de santé, s'il y a une stratégie d'intégration des services MAS, l'étendue du processus d'intégration et les facteurs qui influent sur celui-ci. Nous n'avons pas étudié si les fonctions devaient être intégrées. Ensuite, un outil dynamique du système a permis d'explorer les interactions et les synergies des facteurs influençant le processus d'intégration. Finalement, des scénarios possibles pour améliorer le processus d'intégration ont été simulés et discutés.

Promptitude du système de santé national à intégrer la PEC MAS

Suivant la méthodologie de l'étude de cas, des exercices participatifs ont permis d'éclairer progressivement le niveau d'intégration de la PEC MAS dans le système national de santé au Burkina Faso. Tout d'abord, les participants ont discuté de la mise en œuvre des services de PEC MAS dans le pays et de la façon dont ils ont été mis en place et comment ils ont été mis en œuvre. Ensuite, la position de la PEC MAS dans le système de santé, la pyramide des soins de santé, les politiques de santé et les principaux acteurs de la santé impliqués dans la PEC MAS ont été cartographiés. Les exercices de cartographie ont contribué à créer une compréhension commune sur laquelle s'appuyer pendant les activités d'exploration de l'intégration de la PEC MAS de l'étude de cas.

Burkina Faso : contexte national démographique et sanitaire

Le Burkina Faso a une population d'environ 19 millions d'habitants et de plus de 60 groupes ethniques parlant une variété de langues. L'organisation administrative du pays compte 13 régions et 63 provinces divisées en 70 districts sanitaires. Plus de 90% de la

population travaille dans le secteur agricole. Le tableau 6.1 résume la situation démographique et de santé du pays. En 2014, l'indicateur de développement humain a placé le pays à la 183^{ème} place sur 188 pays avec 45% de sa population vivant sous le seuil de pauvreté.

Tableau 6.1. Contexte national en bref

Indicateurs		(Anée)
Population :	18 931 686	(2015)
Population infantile (moins de 5 ans) :	3 382 578	(2015)
Croissance annuelle de la population :	3,03%	(2015)
Taux de naissance :	42,03 naissance / 1000	(2015)
Taux de fécondité :	5,9	(2015)
Taux d'alphabétisation des adultes :	36%	(2015)
	hommes 43%, femmes 29%	
Espérance de vie à la naissance :	55.9	
Mortalité infantile, moins d'un an :	66 sur 1000 naissances	(2012)
Allaitement maternel exclusive :	46,7% (95% IC 43,2-50,3)	(2015)
Insuffisance pondérale (PA) :	23,0% (95% IC 22,1-23,9)	(2015)
Malnutrition chronique (TA) :	30,2% (95% IC 29,2-31,3)	(2015)
Malnutrition aiguë (PT) :	10,4% (95% IC 9,8-11,0)	(2015)
Revenu national brut par habitant (parité de pouvoir d'achat international) :	1 800	(2015)
Population vivant avec moins de \$1,25 par jour :	44,6%	(2007-2012)
Dépenses sanitaires totales par habitant:	109 \$ international	(2013)
Dépenses totales de santé en pourcentage du PIB :	6,4%	(2013)
Groupe de revenu de la Banque mondiale :	Pays à faible revenu	(2015)
Indice de développement humain :	183 rang sur 188 pays	(2014)

PA = Rapport poids-âge ; TA = Rapport taille-âge ; PT = Rapport poids-taille.

Sources: WHO World Health Statistics [225], World Bank Country classification [226], UNDP HDI [227], Enquête nutritionnelle 2015 [228]

Introduction et mise à échelle de la PEC MAS

La PEC MAS dans les soins de santé primaires a été pilotée par des organisations non gouvernementales (ONG) à partir de 2005 et progressivement étendue à dix districts. En 2007, une formation initiale a été achevée et un premier protocole de la prise en charge intégrée de la malnutrition aiguë (PCIMA) qui comprenait la PEC MAS en interne, la PEC MAS ambulatoire, la PEC de la malnutrition aiguë modérée (MAM) et l'aspect communautaire de dépistage a été élaboré et diffusé et les agents de santé ont été formés. Au niveau central, la PEC MAS n'a pas été considérée comme une mise à l'échelle d'une nouvelle approche, mais d'une activité en cours, c.-à-d., la PEC MAS promue par les centres de récupération et d'éducation nutritionnelle (CREN). A partir de 2011, la mise en œuvre de la PEC MAS ambulatoire et en interne a été en grande partie soutenue par l'UNICEF et d'autres partenaires. Ensuite, la PEC MAS a été initiée dans tous les districts sanitaires du Burkina Faso.

Le plan national de mise à échelle de la PEC MAS développé par la Direction de la nutrition (DN) qui couvrait la période de 2011-2015 présentait les étapes suivantes de la stratégie

d'expansion par le renforcement : 1) des compétences, 2) du dépistage, 3) de la communication pour le changement des comportements et la mobilisation communautaire, 4) de la coordination des intervenants et 5) de l'intégration des indicateurs dans le système national d'information sanitaire (SNIS). Le renforcement des compétences était fait par une formation des formateurs et la mise en place d'une Task Force nationale. Ensuite, la formation des formateurs régionaux au niveau de la direction régionale de la santé (DRS) et de districts sanitaires (DS) était assurée par cette Task Force nationale. Ainsi, les agents de santé étaient formés par les formateurs des districts sanitaires avec l'appui des DRS. La formation des agents sanitaires à base communautaires (ASBC) était assurée par les infirmiers chef de poste (ICP) avec l'appui des équipes cadre de district (ECD) en place. Le tableau 6.2 décrit les indicateurs d'interventions de la PEC de la malnutrition aiguë.

Position de la PEC MAS dans le système sanitaire national

L'organisation administrative du système national de santé (sous-secteur sanitaire public) et l'organisation des prestations de la PCIMA étaient discutées pour bien comprendre où il y a des interactions et de probables synergies dans les responsabilités et l'organisation de la PEC MAS et des autres maladies. Le ministère de la santé (MS) comprend trois niveaux : le niveau central, intermédiaire (régional) et périphérique (district). Le niveau central comprend le cabinet du ministre, le secrétariat général et trois directions générales (directions générales de la santé, des études et des statistiques, et de la pharmacie, médicaments et laboratoires) et ses directions techniques. Dont la DN se trouve sous la Direction générale de la santé (à côté des directions techniques de la promotion de la santé, la lutte contre la maladie, la prévention par les vaccinations, la santé de la famille et les établissements de santé). Au niveau central, la DN était responsable entre autre de la PCIMA qui était gérée comme un programme vertical. Au niveau intermédiaire la Direction régionale de la santé (DRS) et son point focal de nutrition de la région (PFNR) et au niveau périphérique l'équipe cadre de district (ECD) et son point focal de nutrition du district (PFND) partageaient les responsabilités de la supervision et de la mise en œuvre, ainsi que l'intégration dans les activités sanitaires existantes de la prise en charge intégrée des maladies de l'enfant (PCIME), des consultations du nourrisson sain (CSN), et de campagnes de vaccinations (journées de la vitamine A). Les formations sanitaires sont organisées en soins de santé tertiaires (niveau central), secondaires (niveau intermédiaire) et primaires (niveau périphérique). Le niveau périphérique comprend les soins de santé dans les centres de santé et de promotion sociale (CSPS) et les stratégies avancées, et à base communautaire avec les activités sanitaires fournies par les agents de santé à base communautaires (ASBC). La place des activités de la PEC MAS dans la pyramide des soins de santé infantile est présentée en figure 6.1.

Tableau 6.2. Indicateurs d'interventions de la prise en charge de la malnutrition aiguë sévère au niveau national et deux districts (2015)

Indicateurs	Burkina Faso	District sanitaire de Fada	District sanitaire de Manga
Indicateurs de population			
Population infantile (0 à 5 ans)	3 382 578	83 618	58 413
Malnutrition aiguë sévère (MAS)	2.2%	1.4%	2.8%
(Rapport poids-taille et œdèmes)(% et 95 IC)	(1.9-2.4)	(0.8- 2.4)	(1.7- 4.6)^
Malnutrition aiguë sévère (MAS)	0,7%	1.0%	0,8%
(Périmètre brachiale et œdèmes) (% et 95 IC)	(0,5-0,9)	(0,4-2,2)	(0,3-2,3)^
Nombre de MAS annuel estimé*	193 483	3 044	4 252
Retard de croissance (TA)	30.2%	38.2%	21.6%
(% et 95 IC)	(29.2-31.3)	(32.7-43.9)	(18.6-25.0)^
Indicateurs de système de santé			
Système de santé nationale (publique) :			
Centre hospitalier universitaire (CHU)	4	NA	NA
Centre hospitalier régional (CHR)	9	1	0
Centre médicale avec antenne chirurgicale(CMA)	47	0	1
Centre de santé et de promotion sociale (CSPS)	1698	40	37
Système de santé communautaire:			
Agent de santé à base communautaire (ASBC)	17 000	360	ND
(2 par village)			
COGES	1698	40	37
Comités de développement villageois	1 par village	1 par village	1 par village
Organisations non-gouvernementale (ONG) – partenaires PEC MAS	19	4	1
Gratuité des soins de santé infantile :	Pour MAS	Pour MAS	Pour MAS
(Politique nationale de gratuité mise en œuvre à partir d'avril 2016)	assurer par PTF	assurer par PTF	assurer par PTF
Indicateurs de la PEC MAS			
Début des services PEC MAS en soins de santé primaire	2006	2009	2013
Couverture géographique de PEC MAS en soins de santé primaire	100%	100%	100%
Coordination sanitaire et/ou nutritionnelle sectorielle et multisectorielle	SUN, REACH, Cellule de concertation, Faim zéro	ND	ND

^ Résultats pour la région Centre-Sud ; * Estimations basées sur le facteur de conversion de l'incidence de 1.6 ; NA = Non applicable ; ND = Non disponible ; PEC MAS = Prise en charge de la malnutrition aiguë sévère ; PTF = Partenaires techniques et financiers.

Sources: WHO World Health Statistics, MICS, DHS, SMART 2015, Enquête de couverture.

Le système national de santé est complété par d'autres structures sanitaires comme les services de santé du Ministère de la défense, de la Caisse nationale de sécurité sociale, des structures privées, de la médecine traditionnelle, et les structures et activités des sociétés civiles (organisations non-gouvernementales nationales et internationales et communautaires). Environ 20% des formations sanitaires sont des établissements sanitaires privés qui se concentrent dans les deux villes principales.

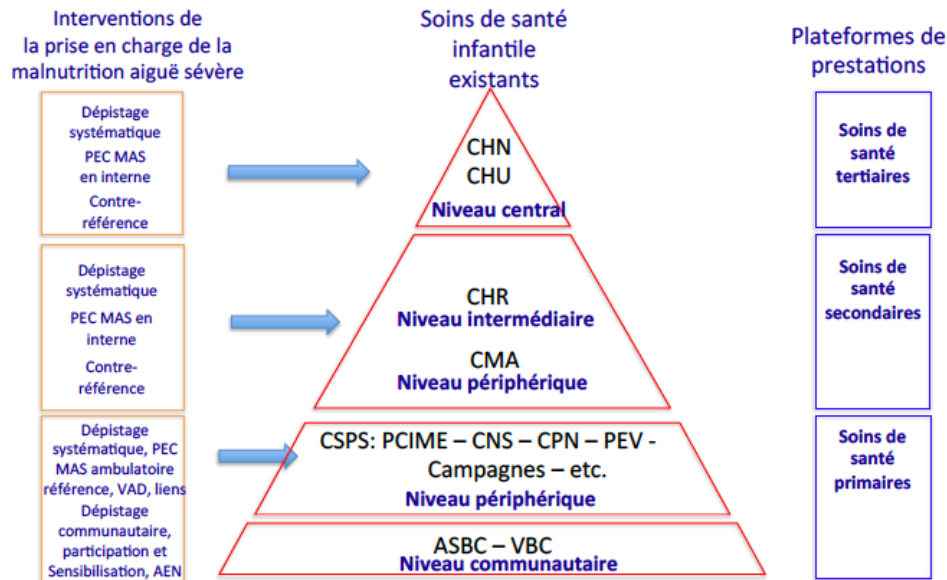


Figure 6.1. Pyramide sanitaire des soins de santé infantile indiquant les services de la PEC MAS
 AEN = Action essentielle en nutrition ; ASBC = Agent de santé à base communautaire ; CHN = Centre hospitalier nationale ; CHR = Centre hospitalier régionale ; CHU = Centre hospitalier universitaire ; CMA = Centre médicale avec antenne chirurgicale ; CNS = Consultation de nourrissons sains ; CPN = Consultation pré et post-natale ; CSPS = Centre de santé et de promotion sociale ; MAS = Malnutrition aiguë sévère ; PCIME : Prise en charge intégrée des maladies de l'enfant ; PEC = prise en charge ; PEV = Programme élargi de vaccination ; VAD = Visites à domiciles ; VBC = Volontaire à base communautaire.

Cartographie des politiques de santé

Un exercice de cartographie avait pour but d'identifier comment et pourquoi la PEC MAS était positionnée et appréciée dans les différentes politiques de santé et de nutrition (tableau 6.3). Les politiques nationales en matière de santé et de nutrition comprenaient la PEC MAS et fournissaient un cadre pour une approche intégrée dans la MAS. Il était difficile de déterminer si les politiques effectivement incluaient la PEC MAS comme une approche intégrée pour obtenir les soins de santé infantile complets et intégrés (Cela mérite une exploration plus approfondie sous l'angle des soins de santé infantile). Dans le protocole national de la PCIMA, l'intégration des composantes de la PCIMA était décrit sur une base autonome d'un programme verticale afin de les intégrer dans les services de santé existants. Ainsi, les directives de l'organisation de la PCIMA portaient sur la mise en œuvre de PEC MAS uniquement et discutaient donc le point de vue des services de la PEC MAS. Cet exercice a permis aux participants de réfléchir sur la complétude des politiques et l'approche intégrée. Néanmoins, il était difficile de faire cet exercice en groupe ; il mérite une exploration plus poussée des dernières versions des politiques pour analyser quelle approche d'intégration a été décrite et comment ensuite elle a influencé le degré et la vitesse de cette intégration du point de vue PEC MAS et du point de vue des soins de santé infantile ou de l'autre activité sanitaire ou fonction du système de santé dans lequel l'intégration de la PEC MAS était prévue.

Tableau 6.3. Cartographie des politiques de santé et de nutrition clés qui couvrent la PEC MAS

Document	Position de la MAS
Politique nationale de santé (PNS) (2011) et Plan national de développement sanitaire (PNDS) 2011-2020 (2011)	La malnutrition aiguë se trouve sous l'axe 2 « Amélioration des prestations de services de santé », et l'axe 4 « Promotion de la santé et lutte contre les maladies »
Politique nationale de nutrition (PNN) (2016)	La malnutrition aiguë se trouve sous l'axe 1 « Réduction de la sous-nutrition »
Protocole de prise en charge intégrée de la malnutrition aiguë (PCIMA) (2014)	Directives décrivent l'approche intégrée du point de vue de la prise en charge de la malnutrition aiguë sévère (PEC MAS) (et de la PEC de la malnutrition aiguë modérée) et discute le rôle des acteurs gouvernementaux uniquement
Plan stratégique de nutrition 2010-2015 (nouveau en cours)	Le plan décrit l'intégration des activités de la nutrition dans le paquet minimum d'activités des formations sanitaires
Plan de survie de l'enfant 2015-2020 (2015)	La malnutrition aiguë se trouve sous l'axe 1 « Renforcement de l'offre de soins de qualité »

Cartographie des acteurs en soins de santé infantile (parties prenantes)

La cartographie des intervenants a permis de cerner la participation et le rôle des acteurs clés de la santé, en tant qu'individus ou institutions dans les interventions de la PEC MAS (tableau 6.4). L'intérêt et l'influence des acteurs de la santé et leur pouvoir dans l'intégration de la PEC MAS ont été cartographiés sur une matrice de bas à haut qui les a ensuite positionnés comme bloquants (faible intérêt, forte influence), témoin (faible intérêt, faible influence), partisan (intérêt élevé, faible influence) ou conducteur (intérêt élevé, forte influence) (figure 6.2). Cet outil a permis aux participants de réfléchir sur la complétude du partenariat et d'identifier des lacunes et de discuter les pistes pour améliorer les partenariats. Un consensus était difficile à obtenir mais la discussion de réflexion était riche.

Le partenariat pour le développement du protocole national de la PCIMA était très inclusif. Par contre, l'organisation de la PCIMA dans le protocole (les rôles des acteurs de santé gouvernementaux aux trois niveaux central, régionale, et du district) est décrite du point de vue restreint de la MAS (et pas élargie aux soins de santé infantile complets et intégrés). Également, les interventions des ONG et des structures privées intervenant dans la PCIMA au niveau périphérique étaient reconnues (le rôle du PFND est de tenir à jour un répertoire des partenaires) mais une structure de coordination (et de régulation) des activités n'était pas spécifiées. Pour une étape ultérieure, il sera intéressant d'analyser les dynamiques entre partenaires pour mieux comprendre les (non-)interactions et mieux cibler les activités pour améliorer la collaboration et la coordination afin de minimiser la défragmentation des services et de maximiser l'utilisation rationnelle des ressources.

Tableau 6.4. Cartographie des acteurs en soins de santé infantile et leurs positions concernant l'intégration de la PEC MAS

Acteurs	Rôle en soins de santé et nutrition infantiles ; Participation actuelle en PEC MAS	Position
Structures gouvernementales		
MS/DN	Coordination des activités, formation, supervision, élaboration des directives et protocoles, gestion des intrants, gestion des données	Moteur
MS/autres directions	ND	Défenseur
Autres ministères : MA, MEF	ND	Défenseur
MS/DRS	Coordination, formation, supervision, gestion des intrants, gestion des données	Défenseur
MS/ECD	Coordination des prestations de services, formation, supervision, gestion des intrants, gestion des données	Défenseur
MS/Prestataires des services	Soins de santé cliniques ; PEC MAS	Défenseur
Autorités administratives	Coordination des activités, leadership, multisectorialité	Défenseur
Structures communautaires		
Collectivités territoriales (mairies)	Gestion administrative et financière des formations sanitaires publiques	Défenseur
COGES	Gère la caisse des structures de santé, lien communautaire ; Appui à la sensibilisation et la gestion des intrants, reproduction des outils	Défenseur
ASBC	Activités sanitaires communautaires : Activités de sensibilisation, dépistage, référence des cas, suivi des cas, recherche des pertes de vue	Défenseur
Tradipraticiens de santé	Soins traditionnels (liens par ou comme ASBC) ; PEC traditionnelle, référence	Inhibiteur
Communautés et leurs leaders	Participation et appui aux activités sanitaires ; Plaidoyer, sensibilisations, participation communautaire	Défenseur
Groupeement féminin	Participation et appui aux activités sanitaires ; Sensibilisations, participation communautaire	Défenseur
OBCE	Activités de sensibilisation, dépistage et référence des cas, démonstrations des bouillies enrichies	Défenseur
Structures ou initiatives multisectorielles		
SUN, REACH Faim Zéro	ND	Défenseur
Institutions académiques, de formation et de recherche		
Écoles de médecine	Formation de base des médecins et recherche	Implication limitée
Écoles de santé publique	Formation de base des agents de santé et recherche	Implication limitée
Nations Unies		
UNICEF	Appui à la santé et à la nutrition mère et enfants ; Appui institutionnel au système de santé ; Financements, achats intrants, transport intrants, formation, supervision, dépistage communautaire	Moteur
OMS	Surveillance épidémiologique, campagne de vaccination, formations PEC MAS ambulatoire	Défenseur
ONG	Appui à la prise en charge de la malnutrition aiguë	Défenseur
Structures privé	ND	ND
Structures confessionnelles	PEC MAS ambulatoire et en interne	Moteur
Bailleurs de fonds	Appui financier	Défenseur

ASBC = Agents de santé à base communautaire ; COGES = Comité de gestion ; ECD = Équipe cadre du district ; ND = Non disponible ; MA = Ministère de l'Agriculture ; MAS = Malnutrition aiguë sévère ; MEF = Ministère de l'économie et finances ; OBCE= Organisation à base communautaire d'exécution ; PEC = Prise en charge.

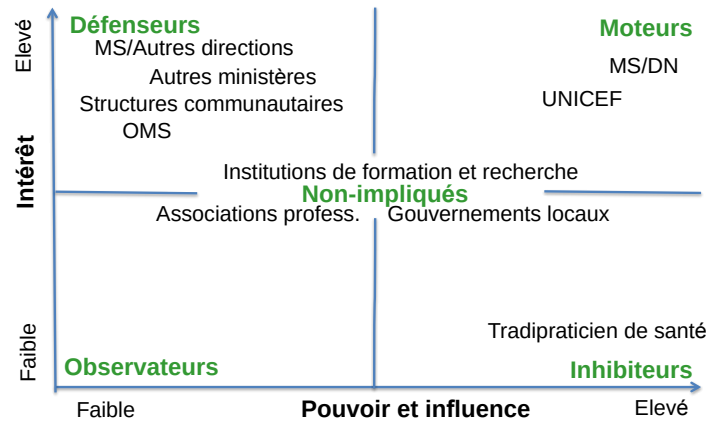


Figure 6.2. Positionnement des acteurs en soins de santé infantile impliqués avec PEC MAS
 DN = Direction de la nutrition ; MS = Ministère de la santé ; OMS = Organisation mondiale de la santé.

Stratégie de l'intégration de la PEC MAS dans le système de santé national

La stratégie nationale de la mise à échelle de la PCIMA (2012-2015) avait pris une approche intégrée au départ qui était décrite dans le protocole national qui fournissait le cadre pour son organisation et sa mise en œuvre.

D'un part, la PCIMA avait été introduite dans le programme national de nutrition qui était géré verticalement par la MS/DN et coordonné par la DRS et l'ECD par l'intermédiaire de leurs points focaux en nutrition de la région et du district (PFNR et PFND) (« intégration verticale et horizontale »). Au niveau central, le MS fournissait un cadre politique et financier bien défini, laissant une souplesse minimale à l'ECD pour coordonner les divers programmes verticaux et organiser des services de santé intégrés.

D'autre part, le protocole national de la PCIMA, décrivait l'organisation de la PCIMA d'un point de vue autonome (« stand-alone ») en donnant quelques indications pour « intégrer » des activités mais pas comment intégrer ni quelles activités dans les services de santé existants. Les directives pour organiser la PCIMA portaient sur la mise en œuvre de PEC MAS uniquement et du point de vue des services de la PEC MAS. En conséquence, l'approche intégrée de la PCIMA se concentrait surtout sur « lier » les composantes de la PEC de la malnutrition aiguë entre elles en établissant un système de référence et contre-référence (« continuité des soins spécifique pour la PEC MAS »), et « lier » la PCIMA avec les services de soins existants (la PCIME, le PEV, les CNS, les campagnes, les services VIH) (« add-on »). Les rôles des acteurs de santé gouvernementaux (de la DN, la DRS, l'ECD et des structures sanitaires) stipulaient les responsabilités dans l'organisation de la PEC MAS. Néanmoins, la performance de la PCIMA était décrite en terme de résultats de la qualité

(qualité des soins exprimé par les indicateurs de guérison, létalité (mortalité des cas MAS pendant le traitement), d'abandon et de couverture) et d'accès et de capacité (nombre d'admission) et il n'y avait pas d'indicateurs de la mise en œuvre ou d'intégration prévus.

Pour les autres politiques de santé, il était difficile de déterminer si les politiques effectivement incluaient la PEC MAS comme une approche intégrée pour obtenir les soins de santé infantile complets et intégrés. Il semble que l'adoption de l'approche PCIME acceptait aussi l'intégration comme un fait accompli plutôt qu'un processus qui doit être organisé au niveau de la mise en œuvre des soins mais aussi aux niveaux des fonctions clés du système national de santé.

Cet exercice a permis aux participants de réfléchir sur la complétude des politiques et de l'approche intégrée. Bien que l'intégration de la PEC MAS n'ait pas été fixée comme objectif ou n'ait pas été spécifiquement encouragée, il y avait un accord général comme quoi l'intégration de la PEC MAS était une approche d'appropriation. L'idée du but de l'approche intégrée pour rationaliser l'utilisation des ressources ou réduire les duplications des efforts et ensuite contribuer à améliorer l'accessibilité, l'efficacité et la durabilité des services PEC MAS était nouvelle.

Degré d'intégration de la PEC MAS dans le système de santé national

Le degré d'intégration des interventions PEC MAS a été exploré aux trois niveaux du système national de santé, compte tenu de l'intégration systémique au niveau central, l'intégration managerielle et organisationnelle au niveau du district, et l'intégration clinique dans les établissements de santé et au niveau de la communauté. Le degré d'intégration des interventions a été défini sur une échelle de notation d'absence d'intégration, d'intégration partielle ou d'intégration complète. Aucune intégration n'a été donnée quand il n'y a pas d'interactions ou quand il y a une ségrégation; intégration partielle quand il y a une liaison ou une coordination entre activités; et l'intégration complète lorsque des fonctions, des activités, des systèmes ou des structures sont généralisés. A chaque niveau de l'exploration, les fonctions, les activités ou des structures de routine ont été répertoriées et le degré d'intégration de la PEC MAS a été exploré, discuté et marqué. En d'autres termes, l'intégration complète, partielle, ou aucune a été atteinte lorsque le MS était entièrement, partiellement ou non en charge des activités de santé infantile complètes incluant la PEC MAS. A noter : certains indicateurs manquaient ou les résultats ne sont pas disponibles ce qui est dû à la méthode de collecte des données. Le libre choix des indicateurs par les participants a permis de retenir un certain nombre d'entre eux.

Interventions systémiques au niveau national

Les fonctions clés du système de santé ont bien intégré la PEC MAS: les politiques, lignes directrices, SNIS de la direction technique, la liste des médicaments essentiels. Toutes les autres fonctions sont partiellement intégrées.

Le degré d'intégration de la PEC MAS dans les fonctions clé du système de santé montre que les fonctions les plus critiques ont pleinement intégré la PEC MAS, et tous les autres partiellement (tableau 6.5). Les discussions révélaient que le score d'intégration partielle a souvent été attribué lorsque les partenaires avaient pris en charge ou apporté un soutien ou que le MS avait une capacité insuffisante pour couvrir la fonction.

La collaboration perçue entre les partenaires de santé, des structures et des services de santé sur l'intégration systémique de la PEC MAS a été dérivée de la triangulation de l'information et classée par la même mesure d'intégration. Le score a montré une intégration systémique presque complète (tableau 6.6).

Tableau 6.5. Degré d'intégration systémique des interventions de la PEC MAS

Fonctions systémiques clés		Degré d'intégration
Gouvernance		
Élaboration des politiques	Les politiques nationales de santé et de nutrition couvrent les soins de santé infantile complets (c.à.d. les soins de santé maternelle et infantile (SMI), la prise en charge des maladies de l'enfant (PCIME), les soins hospitaliers pédiatriques)	Complète
Directives nationales	Les directives nationales des soins de santé infantile complets sont en place	Complète
Leadership technique	Un groupe consultatif technique des soins de santé infantile complets est active pour améliorer les évidences, les ressources, l'offre et la demande (Task force ou groupe de travail)	Complète
Coordination	La coordination des partenaires de santé –les partenaires techniques et financiers (PTF), les établissements d'enseignement et de formation, les associations professionnelles, le secteur privé de la santé et informel, les communautés, et des personnages phares– sont alignés aux politiques et des stratégies de mise en œuvre des soins de santé infantile complets	Partielle
Participation sociale	La participation sociale dans la conception, la planification stratégique, la mise en œuvre et le suivi des soins de santé infantile complets et axés sur l'individu	Partielle
Financement		
Financement du budget-commun régulier	Le budget sanitaire couvre les activités des soins de santé infantile complets avec les fonds communs	Partielle
Des plans d'action annuels chiffrés et budgétisé	L'estimation de coûts de la mise en œuvre des soins de santé infantile complets dans les plans annuels est basée sur les besoins de prestation des services et des coûts de l'appui	Partielle
Les prestataires sur la liste de paie	Les prestataires en soins de santé infantile sont tous sur la liste de paie du MS	Partielle
Protection contre les risques financiers	La gratuité pour les enfants de moins de 5 ans ou une couverture de l'assurance de santé pour toutes les maladies infantiles est en place	Partielle
Information sanitaire		
Système national d'information sanitaire (SNIS)	Indicateurs des maladies infantiles sont inclus dans le SNIS	Complète

Suivi de qualité des soins	Suivi de la performance de la qualité des soins de santé infantile fait partie du SNIS	Partielle
Suivi de couverture	Suivi de la couverture des soins de santé infantile fait partie du SNIS	Partielle
Personnel de santé		
Une couverture adéquate des agents de santé	Nombre suffisant des agents de santé qualifiés en soins de santé infantile complets ayant une bonne couverture géographique	Partielle
Compétences des gestionnaires de santé et des prestataires de santé	Compétences techniques des agents de santé suffisantes pour les soins cliniques et la gestion opérationnelle des soins de santé infantile complets	Partielle
Évaluation de la performance du personnel et le système de motivation	Système d'évaluation des performances du personnel et le système de motivation (possibilités de perfectionnement professionnel) dans le cadre du système des ressources humaines nationales sont en place et sont fonctionnels	Partielle
Éducation professionnelle de base	Les curricula de l'éducation de base des professions de santé clés sont adaptés aux soins de santé infantile complets	Partielle
Développement professionnel continu	Le développement professionnel continu (formation continue et supervision de soutien incluse) est adapté aux soins de santé infantile	Complète
Intrants		
Liste des médicaments et des fournitures médicales essentiels	Équipements, médicaments et fournitures des soins de santé infantile complets sont sur la liste nationale des médicaments et des fournitures médicales essentiels	Complète
Système d'achat	Système national d'achat des médicaments et des fournitures médicales comprend les soins de santé infantile complets	Partielle
Système de la gestion logistique	Système national de la gestion logistique des intrants médicales -et les prévisions des besoins et d'approvisionnement- couvre les besoins des soins de santé infantile complets	Partielle
Prestation des services		
Décentralisation des soins et couverture géographique	Soins de santé infantile complets sont offerts décentralisés à proximité des bénéficiaires	Partielle
Soins complets axés sur le patient	Soins de santé infantile complets sont offerts avec un suivi dans le temps et de lieu répondant aux besoins et les préférences individuelles	Partielle
Dépistage précoce	Recherche active (par des relais/bénévoles communautés), systémique (par les agents de santé dans les structures de santé) et avancée (par les mères/soignants) pour certaines maladies infantiles clés	Partielle
Soins hospitaliers	Soins de santé hospitaliers pédiatriques complets	Partielle
Soins ambulatoires	Soins de santé de base/primaires de santé infantile complets	Complète
Stratégie avancée	Les stratégies avancées des soins de santé infantile complets	Partielle
Références/contre-références entre services	Système de références et contre-références entre services pour les soins de santé infantile complets	Partielle
Génération de demande	Génération de la demande en activant et en informant les communautés pour promouvoir l'accès, l'utilisation et la rétention aux services, et le changement social et de comportement pour améliorer les soins de santé infantile complets	Partielle

Tableau 6.6. La collaboration entre les partenaires de santé, les structures et les services de santé au niveau national de la PEC MAS

Collaboration	Degré d'intégration
Coordination entre partenaires: Les fonctions systémiques des soins de santé infantile sont-elles coordonnées entre les différents partenaires de santé ?	Partielle
Coordination entre professionnels : Les fonctions systémiques des soins de santé infantile sont-elles coordonnées entre les différents professionnels ?	Partielle
L'intégration fonctionnelle: Les fonctions systémiques des systèmes d'information sanitaire, des ressources humaines et d'approvisionnements couvrent-elles les soins de santé infantile dans leur globalité ?	Partielle
L'intégration normative: Les soins de santé infantile et la PEC MAS reposent-ils sur des valeurs et des principes communs ?	Complète
L'intégration horizontale: Les fonctions systémiques des soins de santé infantile sont-elles coordonnées au sein d'un même niveau de soins ?	Complète
L'intégration verticale: Les fonctions systémiques des soins de santé infantile sont-elles coordonnées entre les différents niveaux de soins ?	Complète

Interventions de la gestion et de l'organisation au niveau du district sanitaire

Le degré d'intégration managerielle et organisationnelle de la PEC MAS montre que la plupart des activités de routine pour gérer et organiser la prestation de services au niveau des districts avaient totalement ou partiellement intégré la PEC MAS, et très peu ne l'avaient pas (tableau 6.7).

Les discussions ont révélé que le score d'intégration partielle était souvent attribué lorsque les capacités étaient faibles. Par exemple à Manga, l'intégration du budget de la santé était partielle (pas de ligne budgétaire MAS), ou l'intégration de mobiliser des ressources supplémentaires des partenaires était partielle car le DS coordonne les ressources des partenaires. Par exemple à Gourma, l'intégration de fournir des supports de formation et/ou des outils de travail était partielle car il y a des soucis de nombre et de qualité. Les enquêtes de couverture MAS fournissant des photos instantanées représentatives ne sont pas intégrées ou ne sont pas faites en l'absence d'une PTF, mais la participation de l'ECD était assurée. Par contre, la couverture des services préventifs SMI ciblant la population infantile était systématiquement vérifiée par des mesures indirectes. La planification de contingence était gérée par le MS aux niveaux nationaux et régionaux, ce qui fait que les districts ou les formations sanitaires ne prévoyaient pas un plan de contingence (pas leur tâche). Cependant, le district Gourma avait développé un plan de contingence MAS avec l'aide de l'ONG, y compris les stocks tampons de ATPE.

Tableau 6.7. Degré d'intégration managerielle et organisationnelle de la PEC MAS

Activités de routine menées aux districts sanitaires	Degré d'intégration		
	National (Ensemble des districts)	Gourma district	Manga district
Encadrement de la gestion			
Élaboration des plans d'action	Complète	Complète	Complète
Promouvoir et réglementer respect des directives	Complète	Complète	Complète
Coordination des partenaires et des activités	Complète	Complète	Complète
Planification des activités	Complète	Complète	Complète
Gestion des conflits	Complète	Complète	Complète
Cadres de concertation	Complète	Complète	Complète
Planifier des interventions d'urgence et de contingence (p. ex. stocks régulateurs)	Partielle	Partielle	Aucune
Impliquer communautés dans l'élaboration plans	Partielle	Partielle	Complète
Financement			
Affecter et gérer le budget de la santé	Partielle	Complète	Partielle
Mobiliser des ressources supplémentaires des partenaires	Partielle	Complète	Partielle
Rémunérer le personnel et les contractants locaux	Partielle	Complète	Partielle
Information sanitaire			
Gestion du système d'information sanitaire (SNIS)	Complète	Complète	Complète
Partager les données utiles et faire remonter les informations – feedback – diffusion	Partielle	Partielle	Complète
Gérer, superviser les enquêtes menées auprès de la population, Enquête SMART, Enquête de couverture	Complète	Complète	Complète
	Partielle	Aucune	
Capitalisation des données (Logiciel ENDOS)	Complète	Complète	Complète
Personnel de santé			
Gestion des RH	Partielle	Partielle	Partielle
Formation continue des agents	Partielle	Complète	Partielle
Assurer une supervision de soutien	Complète	Complète	Complète
Fournir supports de formation et outils de travail	Partielle	Partielle	Partielle
Fournir des profils de poste et un système d'évaluation	Partielle	Complète	Partielle
Créer des opportunités d'évolution professionnelle afin d'éviter les départs de personnel et d'accroître la motivation	Partielle	Complète	Partielle
Produits de santé			
Gestion des intrants et médicaments	Partielle	Partielle	Partielle
Mise à disposition des outils et matériel	Partielle	Partielle	Partielle
Maintenance infrastructures et équipements	Partielle	Partielle	Partielle
Gérer la chaîne d'approvisionnement	ND	ND	ND
Gérer les stocks régulateurs pour faire face aux situations d'urgence	Partielle	Partielle	Partielle
Prestation de services			
Fournir appui opérationnel aux services	Partielle	Partielle	Partielle
Organiser les interventions de santé de proximité – adéquations infrastructures et accessibilité	Partielle	Partielle	Partielle
Organiser les activités PECMA	Partielle	Partielle	Partielle
Mobilisation communautaire de soins de santé primaires infantile et PEC MAS	Partielle	Partielle	Partielle
Organiser le système de référence et contre-référence	Partielle	Partielle	Partielle

ND = Non disponible ; MAS = Malnutrition aiguë sévère ; PEC = Prise en charge.

Interventions cliniques au niveau des prestations des services

Le degré d'intégration clinique des interventions MAS dans les activités de routine est présenté dans les tableaux 6.8 à 6.11. Les raisons de l'intégration «partielle» étaient la plupart du temps due aux faiblesses dans la capacité ou d'absence de prise de conscience de l'approche intégrée.

Tableau 6.8. Degré d'intégration clinique hospitalière de la PEC MAS

Activités cliniques de routine	Degré d'intégration	
	Gourma district CHR	Manga district CREN
Diagnostic		
Tri, évaluation et traitement d'urgence (TETU)	Partielle	Aucune
Anthropométrie	Partielle	Aucune
Soins :		
Soins continues	Partielle	Aucune
Traitement des complications	Partielle	Aucune
Traitement nutritionnel	Partielle	Aucune
Suivi :		
Suivi du progrès	Partielle	Aucune
Reference au CSPS	Partielle	Aucune

ND = Non disponible

Tableau 6.9. Degré d'intégration clinique au centre de santé de la PEC MAS

Activités cliniques de routine aux CSPS	Degré d'intégration	
	Gourma district	Manga district
Promotion :		
Consultation nourrisson sain (CNS)	Complète	Complète
Planning familial (PF)	Complète	Complète
Consultation prénatale (CPN)	Complète	Complète
Communication pour le développement (C4D)	Partielle	ND
Information, éducation et communication (IEC) / Communication pour le changement des comportements	ND	Complète
Prévention :		
PEV - vaccination	Complète	Complète
Référence	Partielle	
Distribution moustiquaires imprégnées d'insecticide	ND	Partielle
Diagnostic :		
Dépistage systématique	Partielle	Complète
Examen clinique-test d'appétit		Complète
CCI consultation curative infirmière	Complète	Complète
Soins :		
Traitement PCIME - PEC MAS	Complète	Complète
ATPE externe :	Partielle	Partielle
Suivi :		
Référence	Partielle	Partielle
Visite à domicile (VAD)	Partielle	Partielle
Supervision	Partielle	Partielle
Rapportage mensuel	Partielle	Complète
Tuberculose / VIH	ND	Complète

ATPE = Aliment thérapeutique prêt à l'emploi ; MAS = Malnutrition aiguë sévère ; ND = Non disponible ; PCIME = Prise en charge intégrée des maladies de l'enfant ; PEC = Prise en charge.

Tableau 6.10. Degré d'intégration clinique communautaire de la PEC MAS

Activités sanitaires de routine communautaires	Degré d'intégration	
	Gourma district	Manga district
Promotion et prévention :		
Démonstrations des bouillies enrichies ; Information, éducation et communication (IEC) / Communication pour le changement des comportements (CCC)	Aucune	Partielle
Visites à domicile (VAD)	Partielle	Aucune
Promotion diversification alimentaire	Partielle	Aucune
Diagnostic :		
Dépistage actif dans la communauté	Partielle	Partielle
Dépistage continue	Partielle	Partielle
Référence des cas pour confirmation	Complète	Partielle
Soins :		
Stratégie avancée	Partielle	Partielle
Suivi :		
Suivi à domicile - VAD	Aucune	Partielle
Recherche absents / perdue de vue	Partielle	Partielle
Suivi des référencement	Partielle	Partielle
Participation :		
Sensibilisation/mobilisation sociale	Partielle	Complète

ASBC = Agents de santé à base communautaire.

Tableau 6.11. Degré d'intégration des soins de santé infantile selon différents points de vue

Activités sanitaires de routine	Degré d'intégration Manga district
Du point de vue de l'enfant :	
- L'enfant fait-il l'objet d'un examen et d'une prise en charge complète, indépendamment du motif qui l'amène à se rendre dans l'établissement de santé ?	Complète
Du point de vue du soignant :	
- La personne en charge de l'enfant considère-t-elle que celui-ci fait l'objet d'un examen et d'une prise en charge complète, au même titre que les autres enfants, indépendamment du motif qui l'amène à se rendre dans l'établissement de santé ?	Partielle
Du point de vue du bénévole :	
- Le bénévole prend-il en compte tous les besoins de l'enfant ?	Partielle
Du point de vue du prestataire de services cliniques :	
- Le prestataire de services cliniques prend-il en compte tous les besoins de l'enfant ? (charge de travail, négligence du prestataire)	Partielle
Du point de vue du personnel auxiliaire (agent de santé chargé de prendre les mesures, technicien de laboratoire, pharmacien) :	
- Le personnel auxiliaire prend-il en compte tous les besoins de l'enfant ?	Partielle
Du côté du travail en équipe :	
- Sur le lieu de travail, les tâches liées à la santé de l'enfant sont-elles coordonnées entre les membres de l'équipe ?	
- Le personnel de même niveau est-il en rotation et prend-il en charge tous les enfants de la même manière ?	
- Les membres de l'équipe partagent-ils une vision et des valeurs similaires concernant l'intégration de la prise en charge de la MAS dans les activités ordinaires de prise en charge de l'enfant, et font-ils tous preuve d'un esprit de collaboration ?	Partielle
- Sur votre lieu de travail, les tâches liées à la prise en charge de la MAS sont-elles coordonnées entre les membres du personnel ? (Les collègues de votre circuit de prestation de services collaborent-ils pour fournir aux enfants des soins de santé complets ?)	
Du point de vue du responsable de circuit (ICP) :	
- Le responsable assure-t-il l'organisation et la coordination des soins de santé infantile ainsi que la répartition des tâches entre les membres du personnel, et permet-il une résolution participative des problèmes ?	Complète
Du côté de l'enregistrement et des rapports :	
- Les services de soins de santé infantile utilisent-ils tous les mêmes systèmes d'enregistrement, dossiers médicaux et outils de supervision ?	Partielle
Du côté du système d'information :	
- Les services de soins de santé infantile utilisent-ils tous les mêmes systèmes d'information ?	Partielle
Du côté des fournitures médicales :	
- Sur votre lieu de travail, les tâches liées à la prise en charge de la MAS sont-elles coordonnées entre les membres du personnel ?	Complète
Du côté du système d'orientation :	
- Existe-t-il un système intégré et opérationnel d'orientation, l'échange et de résolution des problèmes reliant le système de soins à la base / au sommet de la pyramide et à la communauté ? (insuffisance de la contre-référence)	Partielle
Du côté des relations avec la communauté :	
- Existe-t-il un système intégré et opérationnel d'orientation, d'échange et de résolution des problèmes relié à la communauté ?	Complète

MAS = Malnutrition aiguë sévère ; PEC = Prise en charge.

Facteurs déterminants influençant le processus de l'intégration

Les facteurs influençant l'intégration de la PEC MAS ont été identifiés à travers les discussions en travaux de groupes et en plénière au niveau national, de district et clinique. Les résultats des cartes mentales avec facteurs influençant le processus d'intégration se trouvent en annexe 7. Les facteurs déterminants clés qui ont facilité ou entravé l'intégration de la PEC MAS sont représentés dans la figure 6.3 et énumérés dans le tableau 6.12. Les facteurs déterminants étaient ensuite utilisés dans le développement des diagrammes de boucles causales.

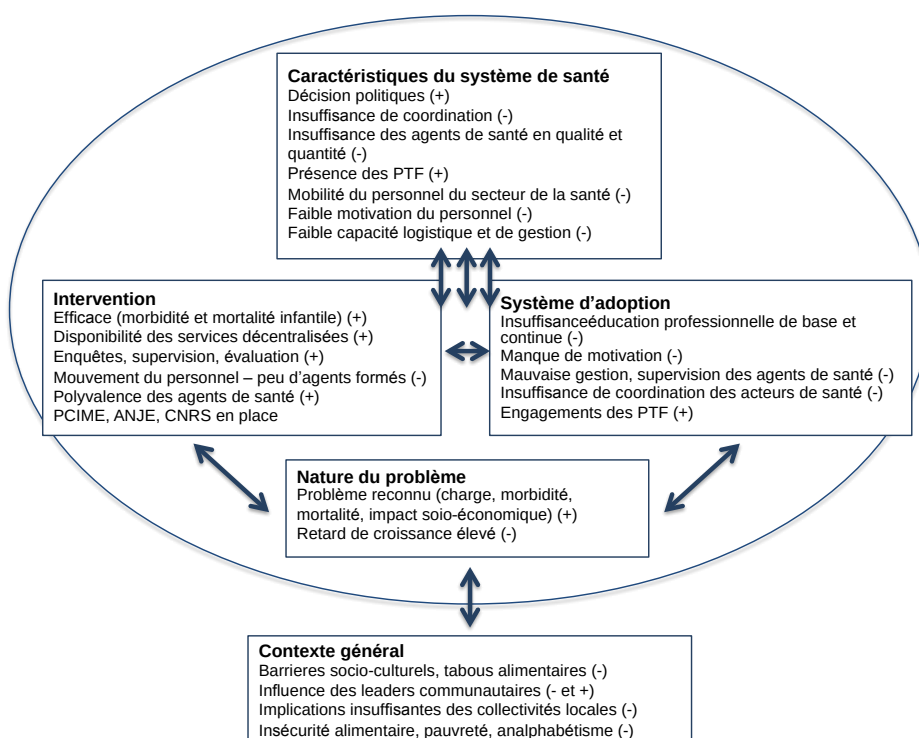


Figure 6.3. Facteurs déterminants clés influençant l'intégration de la PEC MAS

PTF = Partenaires techniques et financiers

Tableau 6.12. Facteurs déterminants retenus

National	Gourma district	Manga district
Intégration systémique :	Intégration managérielle et organisationnelle :	
Nature du problème MAS : • Connue par les populations • Fardeau, morbidité, mortalité • Impact socio-économique • Retard de croissance élevé Intervention : • Baisse de la morbidité et de la mortalité infantile • Disponibilité des services • Enquêtes – supervision – contrôle - évaluation • Rotation mouvement du personnel → peu d'agents de santé formés • Polyvalence des agents de santé • PCIME - ANJE - CNRS Acteurs : • Insuffisance de formation • Disponibilité des directives • Insuffisance de l'organisation du service • Mauvaise gestion des RH • Insuffisance des supervisions • Insuffisance de coordination • Engagement des PTF • CNCN • Insuffisance de coordination Système de santé : • Existence de politiques et de protocole • Insuffisance de coordination • Insuffisance des ressources financières • Existence des PTF • Mobilité du personnel • Insuffisance des RH (quantité et qualité) • Faible motivation du personnel • Problème de logistique • Problème de gestion • Plateau technique inadapté Contexte général : • Barrières socio-culturelles • Influence des leaders communautaires • Implications insuffisantes des collectivités locales • Insécurité alimentaire • Tabous alimentaires • Pauvreté • Faible niveau d'instruction • Analphabétisme	• Leadership du DS (+) • SNIS (+) • Enquêtes (-) • Intrants (approvisionnement / planification / gestion) (+ et -) • Mobilisation communautaire (+ et -) • RH (+ et -) • Rotation (-) • Financement des partenaires (+) • Financement de l'État (-) • Intégration des activités PEC MAS dans les plans d'action du DS (+) • Formations continues (+) • Supervisions conjointes intégrées (+) Intégration clinique CSPS : • Formation (+) • RH (+ et -) • Implications des communautés (+ et -) • Disponibilités des intrants (+ et -) • SNIS (+ et -) • Financements disponibles (+ et -) Intégration clinique CSPS : • Suivi/supervision des activités (+ et -) • Motivation des ASBC (-) • Formations en cascade des acteurs (+) • Perception de la malnutrition par la population (-) • Pesanteur socio-culturel (-)	• Participation communautaire • Accessibilité financiers de la population (-) • Logistique roulante (-) • Mobilité des AS (-) • Mobilité des gestionnaires ECD Intégration clinique CSPS : • Compétence AS (+) • Gap AS (-) • Moyens de transport pour supervision (-) • Moyens financiers de l'État (-) • Disponibilités des intrants pour traitements systématiques (-) • Implications des parents (+ et -) • Pesanteur socio-culturel (-) • Influences des TPS (+ et -) • Implications des parents (+ et -) • ASBC illettrés, motivation, charge de travail (-)

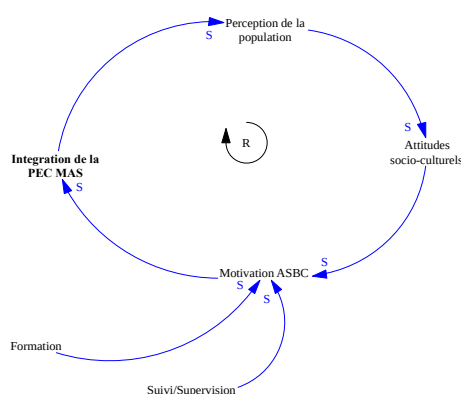
AS = Agents de santé ; ASBC = Agent de santé à base communautaire ; CNS = Consultation de nourrissons sains ; CNRS = Centre national de la recherche scientifique ; DS = District sanitaire ; ECD = Équipe cadre de district ; RH = Ressources humaines ; MA = Malnutrition aiguë ; PCIME = Prise en charge intégrée des maladies de l'enfant ; PTF = Partenaires techniques et financiers ; TPS = Tradipraticien de santé.

Les interactions entre facteurs et les dynamiques du système

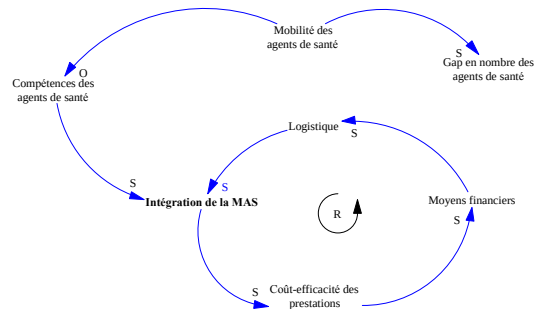
Une cartographie causale a exploré les interactions et la rétroaction entre les différents facteurs déterminants qui influençaient l'intégration avec une approche systémique. Les facteurs étaient identifiés dans l'ensemble des travaux de groupe par étapes dans les trois ateliers.

Le diagramme de boucles causales sur l'intégration clinique de la PEC MAS (aux niveaux du district, des formations sanitaires et de la communauté) développé dans l'atelier du district de Gourma montre une boucle de renforcement vertueuse (figure 6.4a) : l'intégration clinique de la MAS améliorait la perception de la population qui améliorait ou changeait les attitudes socio-culturelles qui ensuite augmentait la motivation des ASBC, et renforçait l'intégration. Le diagramme de boucles de causales sur l'intégration clinique de la PEC MAS développé dans l'atelier de district de Manga (figure 6.4b) montre une boucle de renforcement vertueuse : l'intégration clinique de la MAS améliorait le coût-efficacité des prestations, qui augmentait (libérait) des moyens financiers qui stimulait/améliorait la gestion des logistique qui ensuite renforçait l'intégration. Le diagramme de boucles causales sur l'intégration de la PEC MAS développé à l'atelier national (figure 6.4c) montre deux boucles de renforcement vertueuses, et l'influence d'autres facteurs encore à explorer. Dans la première boucle de renforcement (R1) l'intégration de la PEC MAS donnait un appui pour renforcer les décisions politiques, qui augmentait la coordination, qui ensuite augmentait l'intégration. La deuxième boucle de renforcement peut être interprétée de deux façons : l'intégration de la PEC MAS augmentait le besoin des compétences dont la formation qui augmentait la disponibilité des compétences et ainsi renforçait l'intégration (R2a), mais aussi augmentait la disponibilité des agents polyvalents qui ensuite renforçait l'intégration (R2b).

a) Diagramme de boucles causales de Gourma :



b) Diagramme de boucles causales de Manga :



c) Diagramme de boucles causales de l'atelier national :

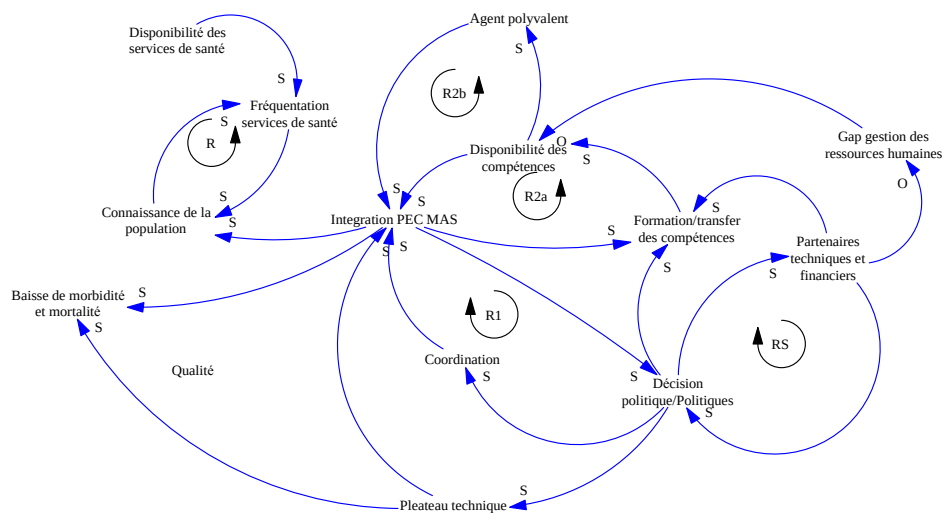


Figure 6.4. Diagrammes de boucles causales développés pendant les ateliers

Ensuite un diagramme final était finalisé avec un groupe restreint (figure 6.5) et les scénarios probables ont été discutés. `

L'analyse de boucles causales des facteurs influençant l'intégration de la PEC MAS capte la dynamique du système. Les descriptions des boucles causales et de leurs effets sont présentés au tableau 6.13. L'analyse de boucles causales révèle les goulots d'étranglements de l'insuffisance de la coordination, des compétences (connaissances) des acteurs de santé (depuis les décideurs, gestionnaires, cliniciens, jusqu'au ASBC, VBC, TPS et utilisateurs), des ressources humaines et du budget sanitaire. Il révèle aussi les positions clés du leadership (à tous les niveaux) et l'effet amortisseur de l'appui technique et financier à long terme.

L'analyse a identifié plusieurs boucles de rétroaction de renforcements avec un effet renforçant sur elles-mêmes, ou un effet réseau, qui amplifient l'effet de rétroaction. Ces interactions de facteurs jouent un rôle important d'amplification et doivent surtout être pris en compte si leurs effets renforcent un effet indésirable.

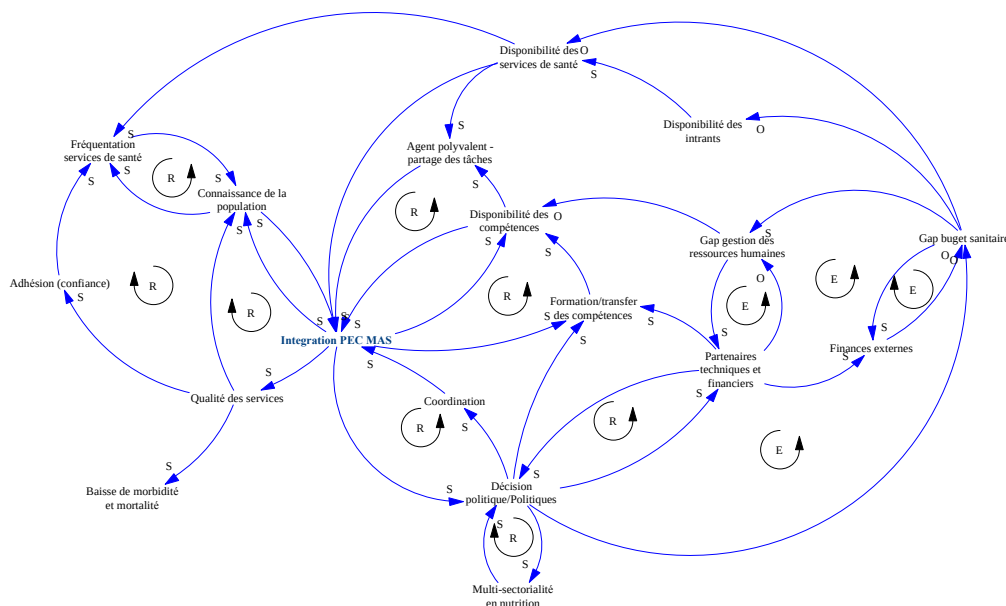


Figure 6.5. Diagramme de boucles causales final

Lorsque le diagramme final a été terminé, les participants ont discuté des éléments suivants: Que signifie le schéma de la boucle causale ? Quels effets sont (non) souhaitables? Quels scénarios plausibles améliorent ou aggravent les interactions ? Pourquoi et comment devons-nous intervenir?

Le diagramme a aidé à explorer les opportunités ou les risques possibles à prendre en compte dans le développement ou ajustement des stratégies enfin d'améliorer ou de renforcer l'intégration et la qualité des soins de PEC MAS durables. A partir des hypothèses, nous avons identifié les scénarios probables suivants :

1. Si le budget sanitaire augmente, ...

Il est prévu que le budget sanitaire sera augmenté pour les achats des ATPE. Cette augmentation budgétaire pourrait assurer une disponibilité d'ATPE à court et long terme, ce qui va avoir un effet positif sur la disponibilité des services de PEC MAS, qui ensuite améliorerait l'intégration de la PEC MAS dans les soins de santé infantile. Si le budget sanitaire augmente effectivement, il sera ensuite important de vérifier les effets désirables et indésirables sur les autres aspects des soins de santé infantile. Par

exemple, une amélioration des services curatifs pourrait augmenter l'attention sur les soins curatifs, au détriment des activités de prévention.

2. Si l'engagement des PTF diminue, ...

L'engagement des PTF risque de diminuer à cause des fonds globaux humanitaires diminuant. La diminution de l'appui des PTF pourra avoir un effet négatif sur la qualité des soins de PEC MAS mais surtout sur les activités de prévention dans la communauté et ensuite sur les connaissances de santé des communautés puis sur la demande de soins, et les motivations des AGBC et volontaires.

3. Si les initiatives multisectorielles en nutrition gagnent en importance, ...

L'initiative multisectorielle en nutrition est un motivateur politique qui gagnera en importance et qui pourrait stimuler les compétences des acteurs de santé afin de mieux gérer la place de la nutrition dans l'ensemble du système de santé. L'initiative multisectorielle en nutrition sera obligée ensuite de renforcer les compétences au niveau périphérique et de décentraliser la coordination des activités et partenaires et la prise de décision, ce qui ensuite renforcera le leadership de l'ECD. Un meilleur leadership de l'ECD motivera l'appropriation traduite en terme d'une meilleure collaboration et d'un partage des rôles avec une rationalisation des ressources, qui contribueront à l'intégration de la PEC MAS.

4. Si les compétences des acteurs de santé augmentent, ...

De meilleures compétences pour gérer les soins de santé intégrés (avec une vision systémique) augmenteront une meilleure gestion de la mise en œuvre des politiques et des services intégrés (qui motivera l'appropriation) de plus grande qualité (gains de ressources et de collaboration) et de durabilité.

Tableau 6.13. Boucles causales de rétroaction

Description de la boucle		Effet de la boucle
Boucles de renforcements du leadership (aux niveaux central, intermédiaires et périphériques : MS, DRS, ECD, structures sanitaires et activités communautaires) :		
R1	Boucle de coordination	Un leadership fort maximise la coordination, qui mène à une meilleure collaboration entre agents de santé, qui stimule le travail d'équipe/partage des tâches, qui est une condition préalable à l'intégration
R2	Boucle de compétence	Un leadership fort maximise les compétences qui mènent à une meilleure collaboration, qui rendent les agents de santé polyvalents et compétents, qui stimulent le travail d'équipe/partage des tâches, qui est une condition préalable à l'intégration
R3	Boucle des ressources humaines	Un leadership fort essaie de combler le gap de ressources humaines, qui mène à une meilleure disponibilité des services de santé, qui est une condition préalable à l'intégration
R4	Boucle de budget sanitaire	Un leadership fort essaie de combler le gap du budget sanitaire, qui mène à une meilleure disponibilité des intrants, puis des services de santé, qui est une condition préalable à l'intégration
R5	Boucle leadership et ressources humaines	Un leadership fort essaie d'attirer un appui /cherche un partenariat avec partenaires techniques et financières pour combler des gaps en compétences techniques et budget sanitaire, qui mène à une meilleure disponibilité de compétences et des finances, qui renforce le leadership
Boucle d'équilibrage avec effet amortisseur de partenariat		
E1	Boucle appui partenaires techniques et financières	L'appui des partenaires techniques et financières pour combler des gaps en compétences techniques et budget sanitaire, mène à réduire les gaps, et ensuite diminue le besoin de l'appui des partenaires
Boucles de renforcements de compétence et disponibilité des services accessible et de qualité :		
R6	Boucle de polyvalence et compétence des agents de santé (décideurs, gestionnaire, clinicien, ASBC, VBC, TPS et l'utilisateurs)	Les agents de santé polyvalents et compétents augmentent la disponibilité des services de santé et le partage de tâches, qui ensuite renforce l'intégration
R7	Boucle de disponibilité des services	Les soins de santé intégrés stimulent le partage des tâches qui rend les services plus disponibles, qui augmentent la connaissance de la population, qui ensuite promut l'intégration
R8	Boucle de connaissance et confiance	Les soins de santé intégrés stimulent la connaissance des services, et l'utilisation, et la qualité des services, qui augmentent la confiance et l'adhésion au traitement et ensuite promurent l'intégration
Boucles de rétroaction de renforcements avec effet renforçant sur eux-mêmes (= effet réseau)		
R	Boucles de renforcement xxx	Effets renforcements
ASBC = Agent de santé à base communautaire ; DRS = Direction régionale de la santé ; ECD = Équipe cadre de district ; MS = Ministère de la santé ; TPS = Tradipratricien de santé ; VBC = Volontaire à base communautaire.		

Leçons apprises du Burkina Faso

Le Burkina Faso a fait d'énormes progrès concernant la mise en œuvre de la PEC MAS intégrée dans le système national de santé en peu d'années, toutefois les goulots d'étranglements pour l'intégration persistent. Par exemple, le budget sanitaire alloué pour la PEC MAS reste faible ; les directives politiques pour l'approche complète et intégrée des soins de santé infantile sont faibles. L'analyse de l'intégration de la PEC MAS nous a appris que l'évolution de l'intégration avait progressé d'une façon spontanée jusqu'à un certain niveau. Ensuite, pour obtenir une intégration de la PEC MAS plus complète et durable et pour soutenir des soins de santé infantile complets, il faut que les acteurs de santé de tous les niveaux du système national de santé jouent un rôle de leader et aient les compétences pour la mise en œuvre et pour évaluer le progrès de l'intégration en appliquant une approche systémique.

L'exploration de l'intégration de la PEC MAS par étapes a fourni une approche expérientielle à l'apprentissage (apprentissage par la réflexion sur le fait) (experiential learning, or learning through reflexion on doing) qui s'est révélée utile dans la sensibilisation en alimentant la curiosité sur l'application de la pensée systémique par la prise de distance de la zone de confort de la pensée linéaire. Les orientations sur l'amélioration des interventions MAS (pour la qualité ou la durabilité) devraient envisager l'intégration et le renforcement des systèmes à travers un objectif de pensée systémique pour améliorer la prise en charge complète des enfants plutôt que par une approche spécifique à la MAS.

L'intégration de la PEC MAS dans le système national de santé était importante mais des nuances pourraient se faire que selon les capacités et les buts précises, les fonctions du système de santé ne devront pas toutes être intégrées. Pour cela, les acteurs de santé concernés devront avoir une bonne vision et compréhension de la mise en œuvre des soins de santé infantile primaires avec une approche systémique. À base des priorités, des capacités et de la durabilité, des choix stratégiques d'intégration doivent être faits sur mesure, et les partenariats internationaux et nationaux continueront à jouer un rôle important pour atteindre ce but en commun (c.à.d. la planification axée sur les objectifs généraux et non sur les résultats immédiats). Par exemple, il est probable que des contrats à long terme avec partenaires en sous-traitance seront nécessaires pour assurer l'accès à l'ATPE et à la mise en œuvre du volet communautaire pour l'éducation sanitaire et nutritionnelle. Puis, le rôle important du MS sera d'assurer la régulation et la coordination de sorte que les points focaux des programmes verticaux et toutes autres acteurs de santé pourraient s'aligner pour atteindre ensemble les soins de santé infantile complets et intégrés.

Leçons de la méthode d'exploration. L'apprentissage de l'exploration participative de l'intégration de la PEC MAS dans le système national de santé était très apprécié. Les différents niveaux et dimensions de l'intégration ont clarifié le concept de l'intégration et ont soulevé les pistes importantes pour mieux intégrer la PEC MAS au Burkina Faso afin

d'obtenir des services de soins de santé infantile de qualité et durables. L'outil rapide et participatif offrait la possibilité d'évaluer le progrès et la dynamique de l'intégration d'une façon faisable et abordable.

Limites. La méthode de l'étude de cas a fait face à plusieurs limites. Premièrement, elle ne cherchait pas à être représentative et les résultats ne pouvaient pas être généralisés au reste du pays. Cependant, la diversité des participants et des sites d'étude a fourni une image approximative de la situation du pays. Deuxièmement, l'étude de cas dépendait largement des connaissances tacites et des perceptions des participants, limitant la profondeur de l'enquête mais non la fiabilité de l'information. Les discussions ont souvent été interrompues en raison de contraintes de temps et n'ont pas toujours donné l'exhaustivité souhaitée ou attendue. Les participants avaient une exposition limitée aux méthodes de discussion participative et pouvaient avoir été restreints pour partager leurs opinions en présence de leurs pairs, ce qui aurait pu influencer leur contribution. Troisièmement, les orientations étaient basées sur des indicateurs génériques qui n'étaient pas adaptés au contexte du pays en raison des contraintes de temps, qui auraient dû être faites avant l'étude de cas et qui auraient pu permettre une meilleure compréhension et des discussions plus approfondies. Cependant, bien que l'utilisation des indicateurs génériques ait pu limiter les résultats, elle n'a pas influencé l'appréciation globale de l'intégration. Quatrièmement, la sélection délibérée des districts et des établissements de santé a été influencée par le calendrier étroit de la visite de l'équipe. Cinquièmement, les résultats de l'intégration de la PEC MAS sur l'amélioration des services de santé, la performance du système national de santé n'ont pas été étudiés, mais les indicateurs de résultats globaux de santé ont été utilisés pour comprendre l'environnement contextuel. Enfin, le protocole de l'étude de cas n'a pas été examiné et approuvé par un comité d'éthique parce qu'aucun sujet humain n'était étudié, mais des systèmes. Toutefois, le MS a approuvé la proposition d'étude de cas et participé à toutes les discussions; et, avant toute discussion, il avait été demandé aux participants leur consentement à participer.

Conclusion. Cette étude de cas a exploré l'intégration spécifique de la PEC MAS dans le système nationale de santé de façon complète dans toutes ses dimensions sur une courte période de temps. L'étude a été utile pour montrer que le système de santé a bien réussi à intégrer certains aspects de la PEC MAS. Il a montré l'étendue de l'intégration aux différents niveaux du système de santé et les facteurs qui ont influencé le processus d'intégration et la dynamique d'interaction de l'un à l'autre. De plus, l'approche participative de l'étude a fourni une opportunité d'apprentissage collaboratif. Les principaux acteurs de la santé ont amélioré leur compréhension du concept et du processus d'intégration et ont appris un langage commun de discussion.

L'étude de cas visait à informer les décideurs et les gestionnaires sur la situation d'intégration afin qu'ils puissent utiliser l'information pour ajuster les politiques pour améliorer la qualité, l'équité et la couverture des services MAS de manière durable. Parallèlement, l'étude de cas a renforcé les compétences en matière d'application de la

pensée systémique, a sensibilisé les acteurs clés de la santé à la complexité et les a préparés à des conséquences imprévues. Le deuxième objectif était aussi important que le premier. L'application de l'étude de cas a permis aux acteurs de santé de discuter le sujet en profondeur avec une compréhension avancée et une langue en commun. Nous espérons que cette étape encouragera les participants à examiner davantage les relations causales non linéaires en tenant compte de l'imprévisibilité de leur travail.

Recommandations. Les priorités ou opportunités spécifiques à l'intégration suivantes sont proposées pour discussion et action:

Pour améliorer la mise en œuvre de la PEC MAS au Burkina Faso :

- Explorer comment l'approche d'intégration de la PCIME et de la PCIMA (ou plus large, la stratégie de la nutrition, ou de la nutrition multisectorielle) influence l'un l'autre et identifier les voies pour améliorer la qualité et la durabilité des soins de santé infantile intégrés ;
- Améliorer l'intégration de la PEC MAS par le biais de la planification stratégique: les interventions de la mise en œuvre de la PEC MAS font déjà partie du système national de santé, mais la discussion stratégique et la planification - basées sur l'apprentissage tiré de cette étude de cas - pourraient définir comment et comment intégrer la PEC MAS plus efficacement ;
- Stimuler la prise de conscience (et améliorer l'apprentissage) de l'intégration avec une approche systémique pour mieux informer les stratégies et la planification de la PEC MAS (et autres comme les soins de santé infantile, la nutrition) par une apprentissage expérientiel (utiliser l'étude de cas comme synthèse de l'apprentissage PEC MAS) ; plaider en faveur de son application; La méthode et les outils d'exploration de l'intégration de la PEC MAS pourraient être adaptés à un nouveau contexte ou à une portée élargie, par exemple, d'étudier l'approche intégrée de la PCIME complète, ou le plan de la nutrition ou la nutrition multisectorielle ; Renforcer les capacités des agents de santé à faire face aux complexités qui améliorent leur rôle de leader (en coordination, compétences organisationnelles et le travail en équipes) pour lutter contre la défragmentation des services de santé et de rationaliser les ressources ; et
- [Plaider en faveur d'un partenariat mondial public-privé en santé pour accroître l'accès à l'ATPE en s'appuyant sur des initiatives similaires (par exemple, l'Alliance mondiale pour les vaccins et la vaccination) et contribuer au renforcement du système de santé en ne l'affaiblissant pas].

Pour une recherche continue :

- Explorer les méthodes d'évaluation des performances des systèmes de soins de santé primaires (p. Ex., l'analyse des goulets d'étranglement, autres méthodes d'évaluation de systèmes de santé pour la PEC MAS) qui peuvent être adaptées aux besoins spécifiques du contexte ou au niveau du district en appliquant une approche systémique. Les indicateurs d'intégration et de durabilité peuvent avoir

leur place ici. L'outil peut soutenir le rôle de leadership du district et plaider en faveur de la création d'un espace de prise de décisions ;

- Explorer les opportunités manquées en réalisant une évaluation réaliste de l'efficacité de la mise en œuvre de la PEC MAS - ce qui fonctionne, comment, pour qui, dans quelles circonstances et pourquoi. Cette méthode permettra de découvrir des modèles causaux récurrents, fournissant un niveau d'abstraction significative et transférable à d'autres contextes. L'exercice combinerait de façon exhaustive le renforcement et l'intégration des systèmes de santé pour améliorer la PEC MAS et les résultats en matière de santé ;
- Tester des scénarios de changement de politiques de la PEC MAS pour simplifier le protocole de traitement sans perdre l'efficacité et l'efficacité par un modèle de simulation informatique, en se basant sur les boucles causales de rétroaction développées pour l'intégration de la PEC MAS au Burkina Faso ; et
- Développer l'apprentissage de la dynamique du système pour améliorer la PEC MAS en modélisant et en testant des scénarios à l'aide de simulations informatiques qui s'appuient sur les résultats des études de cas.

iv. Nepal case study

A team comprising the study investigator, the Nepal Ministry of Health (MOH), UNICEF and technical partners conducted the case study on the integration of SAM interventions into the national health system from March 21 to April 1, 2016. One hundred and fourteen key national and sub-national health actors participated in group discussions, interviews and observation visits.

The investigation was conducted at both the national and district level. Two health districts—Bardiya District in Western Region and Kapilvastu District in South-Central Nepal—were purposively selected based on maximum variation of SAM service performance. In each district, one secondary health facility and two primary health facilities were purposively selected based on maximum variation of SAM services performance; nine health facilities were visited in total. Criteria for service performance were average SAM recovery, case-fatality in treatment and default rates.

This section presents the results of the first in a series of case studies that explored national health system readiness for SAM integration, existence of a strategy on integration of SAM services, the extent of the integration process and factors influencing the integration process. Next, in a dynamic participatory process, a system dynamics tool explored interactions and synergies of factors influencing the integration process. Finally, possible scenarios to improve the integration process were simulated and discussed.

National health system readiness for SAM integration

The case study engaged participants in participatory discussions and exercises to outline the position of SAM in the national health system in Nepal. They first discussed how SAM services were implemented, when and how they were introduced and scaled up and how they performed. Next, they mapped the position of SAM in the health system, healthcare pyramid, health policies and key health actors involved in SAM. Mapping exercises helped create a common understanding to build on during the SAM integration exploratory activities of the case study.

Nepal demographic health and nutrition context

Nepal has over 40 ethnic population groups and languages in three agro-ecological zones (mountains in the north, hills in the central part and plains in the south). Administratively the country is vertically divided into five regions (Far Western, Mid Western, Western, Central and Eastern) covering 14 zones and 75 districts. Table 6.14 summarises the country's demographic, health and nutrition situation.

Table 6.14. Nepal national demographic, health and nutrition context at a glance

Indicator		(Year)
Population:	31,551,305	(2015)
Under 5 population:	2,955,177°	(2015)
Annual population growth:	1.8%	(2015)
Urban population:	17.3%	(2012)
Birth rate:	20.6 births /1000 population	(2015)
Fertility rate:	2.3 children /woman of childbearing age	(2014)
Adult literacy rate:	63.9% – 76.4% male, 53.1% female	(2015)
Life expectancy at birth:	68 years	(2012)
Child mortality:	42 child deaths /1000 live births	(2012)
Exclusive breastfeeding under 6 months:	69.6%	(2012)
Vitamin A coverage:	95.0%	(2012)
Iodized salt coverage:	80.0%	(2012)
Stunting:	37.4%	(2014)
Wasting (WHZ):	11.3%	(2014)
Severe wasting (WHZ):	3.2%	(2014)
Gross national income per capita (purchasing power parity in International\$):	2500	(2015)
Population living on less than 1.25 US\$ /day:	24.8%	(2011)
Total expenditure on health per capita (International \$):	135	(2012)
Total expenditure on health as a percentage of GDP:	6%	(2012)
World Bank income group:	Low income	(2015)
Human Development Index:	145 rank out of 188 countries	(2014)

WHZ = Weight-for-height z-score indicator; ° MOH population projection based on 2011 census [229].

Sources: WHO World Health Statistics [225]; World Bank Country Groups [226]; UNDP HDI 2015 [227]; UNICEF Country Statistics [230]; MICS 2014 [231].

Burden of SAM

The 2014 Nepal multi-indicator cluster survey (MICS) [231]—reporting on data collected in 2013—found the following nutrition indicator results:

Wasting:	National prevalence of 11.3%, with highest levels in the Central Terai (17.0%), Eastern Terai (13.3%) and Western Terai (13.1%);
Severe wasting:	National prevalence of 3.2%, with highest levels in the Eastern Terai (4.9%), Eastern Hills (4.2%), Central Terai (3.8), Western Hills (3.8%), and Far Western Hills (3.7%); and
Stunting:	National prevalence of 37.4%, with highest levels in the Mid Western Mountains (64.2%), Far Western Hills (62.7%) and Mid Western Hills (50.3%).

There seemed to be an irregular distribution of malnutrition across the country that may be explained by variations in, e.g., rural/urban living conditions, maternal education and ecological region (that may be linked with environmental health and food security). The 2011 Nepal demographic and health survey (DHS) [232]—reporting on data collected in 2010—found a slightly better tendency of wasting of 10.9% (with highest level found in the Western Terai: 15.2%) and severe wasting 2.6% (with highest level also in Western Terai: 5.1%) affecting different ecological regions.

In 2013, the annual national burden of SAM in children under 5 could have been as high as **249,600**⁵ children, while in total 8,741 children with SAM were admitted for treatment. Or, in 2013, 3.5% of the estimated caseload children with SAM accessed care.

National health system organisation

The national health system (or public sector) consisted of three tiers—central, regional and district (there is no zonal health administration). At national level, the central MOH was responsible for determining the health sector's objectives and policies and for executing plans under its jurisdiction. The MOH Department of Health Services oversaw seven divisions (Child Health, Family Health, Epidemiology and Disease Control, Leprosy Control, Management, Logistics Management and the Primary Health Care Resource Centre) and four national health centres (TB, HIV, Health Education and Training), a national laboratory and eight central hospitals.

Each division managed national programmes that restricted decision-making power to the central level (vertical model). The Child Health Division (CHD) managed the National Nutrition Programme, the National Integrated Management of Neonatal and Childhood Illness (IMNCI) Programme and the National Immunization Programme. SAM service implementation is managed under the National Nutrition Programme of the CHD, which links it with other relevant programmes (such as IMNCI and Immunization) and other divisions (such as Management and Logistics Management). National health programmes linked with regional and district focal points or coordinators as executing agents at the organisational and implementation level for integrated service delivery (horizontal model).

The National Planning Commission (NPC) was the advisory body for formulating development plans and policies under the directives of the National Development Council of the Government of Nepal. The NPC served as the Scaling Up Nutrition (SUN) Movement secretariat and lead the MSNP 2013–2017 for improving maternal and child nutrition, including SAM. It also oversaw the sectoral actions of the Ministries of Agriculture and Development, Education, Federal Affairs and Local Development, Health and Urban Development, Livestock, and Women and Child Welfare.

At regional level, each of the five Regional Health Directorates (RHDs) managed a (sub)regional hospital, training centre and medical store and oversaw the District (Public) Health Office (D[P]HO). There was one regional TB centre.

At district level, D[P]HOs managed and organised services at the district hospital, primary health care centres (PHCCs) and health posts. Health post managed and organised

⁵ Based on 2,808,000 million children, 3.2% SAM prevalence and 1.6 incidence conversion factor.

community-based primary care in immunization clinic and outreach clinics. Health workers from the health post support and supervised female community health volunteers (FCHVs). Nutrition activities at the district included growth monitoring, bi-annual vitamin A supplementation and deworming campaigns for under 5, nutrition celebration days, iron and folic acid supplementation for pregnant mothers, school nutrition and deworming, micronutrient powder distribution for under 2, infant and young child feeding promotion, and management of SAM in target districts for under 5.

At the community level, the health facility operation management committee, village development committee, the nutrition and food security steering committee, ward citizen forums and citizen awareness centres involved in health and nutrition. Each ward (that may cover few villages) had one FHCV assigned who lead a mothers' group.

Inpatient SAM care (secondary care) was organised in 20 nutrition rehabilitation homes (NRHs) and the district hospital of the target districts (referral-based model). The 20 NRHs were attached at regional and zonal hospitals, have a mixed role in SAM and MAM case management and nutrition education (except for one private NRH in Kathmandu). Besides the national Kanti Child Hospital, it was unclear how and whether SAM inpatient care was being provided in national and teaching hospitals (stand-alone model). Outpatient SAM care (add-on model in primary care) was organised in the outpatient departments of district hospitals, the PHCCs and health posts. FCHVs were pivotal community health actors involved in awareness raising, community participation and SAM screening through their links with community members and groups. Not all health facilities in the target district offered SAM services, but all detected SAM and referred for treatment (referral-based model). Community outreach for SAM awareness raising, involvement, screening at the community, and follow up has been added to the FCHVs' activities (referral-based model). SAM screening had been added to other community health outreach activities (e.g., immunization clinic, outreach clinic that includes growth monitoring⁶, national Vitamin A/Deworming campaign)(add-on model).

The child health pyramid and the MOH organogram were discussed to understand better how SAM interventions had been inserted into child healthcare (Figure 6.6) or into the various departments (Annex 2). Both exercises helped create a common understanding to further build on during the SAM integration investigation.

⁶ Growth monitoring and promotion had a national average coverage of 51%.

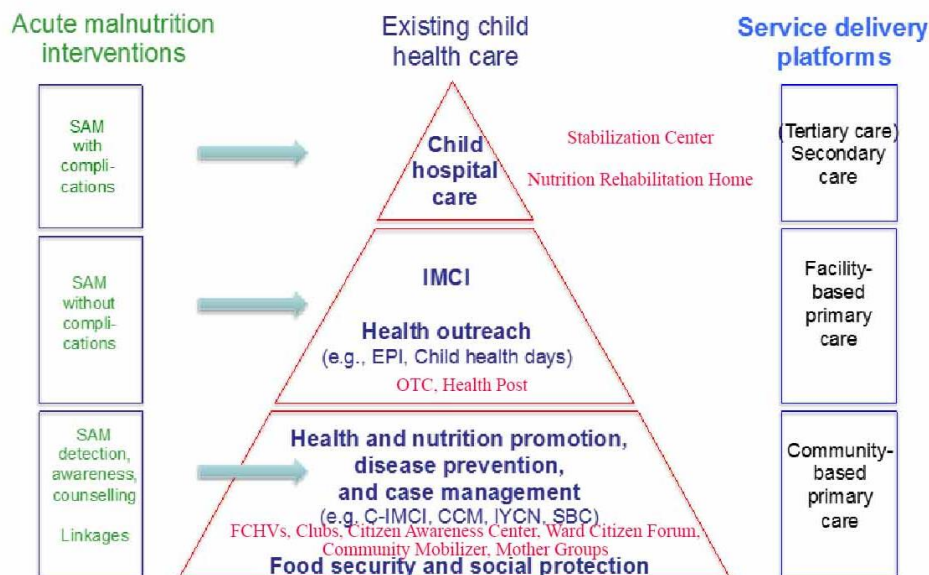


Figure 6.6. Child health pyramid with SAM interventions

(C-)IMNCI = (Community-)Integrated management of neonatal and childhood illness; EPI = Expanded programme of immunization; IYCN = Infant and young child nutrition; CCM = Community case management; SBC = Social and behaviour change.

Introduction and scale-up of the management of SAM in Nepal

Case management of SAM in children under 5 was generally addressed in hospitals. In 1998 the first NRH was established by the Nepali Youth Foundation in Kathmandu. Subsequently, 18 NRH were set up adjacent to regional or zonal hospitals, and 2 in mission hospitals. In 2005, a training of trainers was conducted for NRH collaborators that introduced the WHO 1999 inpatient management of SAM protocol targeting a select group of health workers including a few paediatricians. After 5 years of existence, the NRH were handed over to the government after 5 years (minus the NRH in Kathmandu).

In February 2009, case management of SAM in outpatient care was first piloted in Bardiya District (Terai district) by Concern Worldwide. Key child health and nutrition actors were trained, and admissions started in April 2009. By the end of 2009, with support from technical and financial partners, the MOH expanded SAM services to Mugu District (Mountain district), and added 3 more to cover five districts in August 2010. As such, the three ecological regions were covered in pilot districts, and scale-up was brought to 11 districts in 2012. The first pilots were implemented in parallel systems by NGOs. Next, the MOH—with continued support from partners—took the lead, building upon learning from introducing and scaling-up IMNCI. Policies were adapted, guidelines and job aids shared, health workers trained and therapeutic supplies purchased and distributed. Teams of

master trainers were formed consisting of government and NGO health actors with a mix of competencies.

The April 2015 earthquake triggered the (temporary) expansion of services for SAM and moderate acute malnutrition (MAM) case management in 14 emergency districts (with one district, Okhaldunga, overlapping with the 11 regular districts). Thus in 2015, 24 (11 + 13) districts provided SAM care. By August 2016, seven more regular districts were added, thus covering 31 districts (18 + 13). The national Suaahara nutrition programme, Suaahara phase II (2016–2021)—covering 40 districts of which 20 overlap with SAM case management services—will establish SAM secondary care in an additional 20 districts, but may not foresee expansion of SAM services into primary care. The full package of SAM case management will cover 44⁷ districts by June 2017. By mid-2016, there were 223 PHCCs or health posts in regular districts and 156 in emergency districts that provided SAM case management in primary care, totalling 379 sites.

In the health districts targeted for SAM interventions, not all primary care facilities provided all SAM service activities, but at the minimum they detected and referred cases to those that provided treatment. In the district hospital, PHCC or health post with SAM treatment, SAM activities had been ‘added on’ or ‘merged with’ regular child health care following the IMNCI protocols. In the health facilities without SAM treatment, cases were being referred to primary care sites with treatment availabilities (referral-based model). In places where there was no SAM treatment in health facilities but an NRU existed, children were referred.

Table 6.15 summarizes key acute malnutrition interventions indicators in 2015 for Nepal overall and the two health districts studied. Table 6.16 provides an overview of SAM admissions for treatment in primary and secondary care. The table shows that while expansion of services was ongoing, admission numbers did not follow the same trend.

It is worth noting that the national SAM reporting system misses SAM cases that are being treated in the 16 university hospitals, one national child hospital and 72 out of 89 government hospitals that were without NRH. SAM reporting was part of *HMIS 9.3*, which collects data from all primary health facilities. The *HMIS 9.4*, which collects data from hospitals, had no indicator of SAM included, therefore did not report on SAM cases, except when there is the NRH. Every 5 years, the *HMIS* is being reviewed, therefore, in 2 to 3 years, the plan to include SAM indicators will be discussed. In the meantime, all NRH reported to the *HMIS 9.3*.

⁷ Of the 44 districts, 28 would be MSNP regular districts, plus 14 earthquake affected districts, plus the districts of Kanchanpur and Chitawan (the latter targeting marginal populations only).

Table 6.15. Health system and acute malnutrition intervention indicators in Nepal and two Districts (2015)

Indicators	Nepal	Bardiya District	Kapilvastu District
Population indicators			
Under 5 population estimation:	2,955,177	47,450	2,015
Wasting (based on WHZ <-2) (MICS 2014)	11.3%	10.3%*	13.1%*
Severe wasting (based on WHZ <-3) (MICS 2014)	3.2%*	2.2%*	2.9%*
Red MUAC screening° (April/May 2015)	/	79 /36,354 (0.2%)	409 /67,241 (0.6%)
Red MUAC screening° (Oct/Nov 2015)	/	33/34,129 (0.01%)	/
Moderate wasting (based on WHZ) (MICS 2014)	8.1%	8.1%*	10.2%*
Yellow MUAC screening° (April/May 2015):	/	1266 /36,354 (3.5%)	2364 /67,241 (3.5%)
Yellow MUAC screening°(Oct/Nov 2015):	/	556/34,129 (1.6%)	/
Stunting:	37.4%	36.0%*	41.6%*
Health system indicators			
Public health service delivery system:			
University hospitals (paediatric unit)	8	/	/
National children's hospital (Kanti Hospital)	1	/	/
Regional and sub-regional hospitals	6	/	/
Zonal hospitals	10	/	/
District hospitals	65	1	1
Primary health care centres	214	3	2
Health posts	+3000	30	73
Outreach clinics	13,811	156	278
Immunization clinics	16,260	197	385
Female community health volunteers	+50,000	841	1056
Fee waiver for under 5 health care for SAM care	Yes	Yes	Yes
SAM intervention indicators			
Start SAM services:	2009	2009	2012
Access coverage of SAM treatment in primary care (proportion of PHCC or HP with SAM treatment):	379/3,214	18/33	20/75
Annual SAM admissions as outpatients:	3,301	5648	1172
Annual SAM admissions as inpatients:	2,188	2	/
Performance SAM (annual average): cure, case-fatality and defaulter rates in primary care	84.8%, 0.3%, 10.1%	83.0%, 0.2%, 8.8%	75.8%, 0.0%, 20.6%
Health and nutrition coordination of sectoral and multisectoral initiatives:	MSNP, SUN Movement		

HP = Health Post; MSNP = Multisectoral Nutrition Plan; PHCC = Primary Health Care Centre; / = Not applicable; ^ Estimates based on 1.6 incidence conversion factor; * Prevalence based on WHZ of the ecological region; ° MUAC screening conducted during the Vitamin A/Deworming campaign.

Sources: UNICEF Country Statistics [230]; MICS 2014 [231]; Coverage surveys Nepal [177]; MOH Annual report 2014 [233]; MOH National and district database on IMAM 2015 [234].

Table 6.16. Number of admissions for SAM treatment in primary and secondary care, 2009 – 2016

Year	Under 5 child population estimation ⁺	SAM in primary care	SAM in secondary care (20 NRH)	Total SAM emergency admissions	Total annual SAM admissions	District coverage
2009	NA	1,689	1,489	/	3,178	1
2010	NA	3,596	1,493	/	5,089	5
2011	2,984,100	5,278	1,496	/	6,774	5
2012	2,984,100	5,144	NA	/	NA	6
2013	2,808,179	6,641	2,100	/	8,741	11
2014	2,820,060	8,621	1,905	/	10,526	11
2015	2,955,177	3,301	2,188	1,474	6,963	11 (+13) [°]
2016	NA	5,337 [^]	NA	3,251 [^]	8,588 [^]	18* (+13)

D = district; NA = Not available; / = Not applicable.

⁺ MOH population projection based on 2011 census [229]; [°] Earthquake affected districts from April 2015 onwards (14 districts minus Okhaldunga District that overlaps with regular district); * Seven new districts added in August 2016; [^] End October 2016.

Source: MOH National and district database on IMAM 2015 [234].

Policy map

A policy mapping exercise identified health and nutrition policies that include SAM services that are listed in Table 6.17. All national health and nutrition policies included SAM and provided a cadre for an integrated approach in the SAM target districts. Preventive and curative acute malnutrition interventions are part of the national nutrition programme that stands next to the IMNCI and EPI programmes of the child health section. The multiple national health and nutrition programmes are vertically structures and centrally managed, but leaving the coordination of implementation to the DHO.

Nepal's Multisectoral Nutrition Plan 2013–2017 (MSNP) covered acute malnutrition interventions under the health sector activities and laid out the scale-up of SAM interventions. A next 2018–2023 MSNP is being planned. No strategic and budget plans are in place for countrywide coverage yet.

Stakeholder map

A stakeholder mapping exercise was conducted to identify the involvement and role of key health actors, as individuals or institution, in SAM interventions (Table 6.18). Health actors' interest, influence and power in SAM integration involvement were mapped on a matrix from low to high that then positioned them as blocker (low interest, high influence), bystander (low interest, low influence), abstainer (neutral interest, neutral influence), supporter (high interest, low influence) or driver (high interest, high influence) [136].

Overall, discussions revealed that health and nutrition partners were committed leaders to improve SAM, but resources and other elements were often hindering or holding back their ambitions. Aligned with resources frailty were concerns about longer-term sustainability of current approaches within the given financial environment.

Opportunities to involve national academic and training institutions have occasionally been taken, e.g., during guidelines development and training, but missed expanding or formalizing their role. The planned revision of the nutrition curriculum may be an opportunity to strengthen these links. With the public sector covering less than 50% of all health services provided in Nepal [244], it may be of interest to explore collaborations of referral, especially for the traditional and/or religious health system.

Table 6.17. Key health and nutrition policies that cover the management of SAM

Policy document name	Position of SAM
1. Ministry of Health (MOH), National Nutrition Policy (NNP) (2004) [235]	The policy addressed protein energy malnutrition and suggests various activities including treatment of severe malnutrition in zonal hospitals, training of health workers in counselling a, and food support.
2. MOH, Nutrition in Emergency Policy (2008) [236]	Guidance on severe acute malnutrition (SAM) cases in emergencies is no longer valid but has now been covered in the updated national SAM guidelines (2015).
3. MOH, National Community-based Management of Acute Malnutrition Guideline and Treatment Protocols (2008) [237] MOH, National Integrated Management of Acute Malnutrition Guidelines (2015) [238] (endorsement pending)	Guidance on SAM case management in development. Guidance on SAM case management, integrated with different sectors, and aligned with the MSNP (despite not yet endorsed, has been rolled out and implemented). It includes guidance on SAM case management in emergency and in Nutrition Rehabilitation Homes (NRH).
4. MOH, Nepal Health Sector Programme Implementation Plan (NHSP IP II) (2010) MOH, Nepal Health Sector Programme Implementation Plan (NHSP IP II) reviewed (2012) [239]	Under the National Nutrition Programme, the pilot on SAM case management in primary care is discussed as a good practice and plans to scale up. Under the National Nutrition Programme, SAM case management planned to further scale up.
5. NPC, Multisectoral Nutrition Plan (MSNP) 2013-2017 (2012) [240]	Case management of SAM discussed under improving specific and sensitive nutrition services of outcome 2 (out of 3, policies and coordination).
6. MOH, Nutrition Rehabilitation Home (NRH) Guidelines (2012) MOH, Revised National Guidelines of NRH (Technical and management guidance) (2014) [241]	Guidance on inpatient management of SAM, moderate acute malnutrition (MAM) and nutrition education. Inpatient management of SAM and MAM and nutrition education, SAM case management updated. However, NRH guidance has been updated as part of the SAM guidelines.
7. MOH, Strategy for Infant and Young Child Feeding (IYCF) (2015)[241]	Guidance on linking IYCF with SAM.
8. MOH, National Health Sector Strategy (2015) [242]	The strategy recognises the importance of multi-sector approach to address social determinants of health, including malnutrition.
9. MOH, Integrated management of neonatal and childhood illness (IMNCI) handbook, training manual and chart booklets (2015) [Nepali] [243]	IMNCI protocols have been updated to adopt SAM and MAM screening and triage, and refer to the IMAM guidelines for case management.

Table 6.18. Key health actors involved in SAM implementation and integration

Health actors	Role in child healthcare	Interest in SAM	Influence	Position
Governmental structures				
National level:				
NPC	National planning commission (NPC), Multisectoral coordination of nutrition with seven ministries, SUN secretariat	High	High	Driver
MOH/CHD	Policy and planning, coordination, implementation, capacity strengthening, information management	High	High	Driver
Regional level (Regional Health Direction, RHD):				
MOH/RHD	Coordination, monitoring & supervision	High	High	Driver
District level (District Health Office, DHO):				
MOH/DHO	Management of service delivery (coordination, resources, training, implementation, inform., supervision)	High	High	Driver
Community structures:				
Female comm health volunteers	Community health activities (awareness, screening, referral, home visits)	High	Low	Supporter
Local government	NA	High/Low	High	Driver/Blocker
Community leaders	Advocacy, awareness raising, community participation, support for planning & implementing activities	High/Low	High	Driver/Blocker
Community groups and committees	Local-level policy and advocacy, awareness raising, community participation, comm. health activities	High/Low	High	Driver/Blocker
Traditional	Traditional and religious healers	High/Low	High	Driver/Blocker
National initiatives:				
SUN/REACH	NA	?	High	?
Professional associations:				
	NA	Low	High	?
Academic, training and research institutions:				
	NA	Low	High	?
United Nations:				
UNICEF	Government support for maternal and child health and nutrition development, including supply management	High	High	Driver / Supporter
WHO	Government support for health information and disease surveillance	Low	High	?
Non-governmental organisation (NGO):				
ACF	Technical support for comm. activities	High	?	Supporter
HKI	Child nutrition support (Suaahara II)	Low	High	Supporter
IMC	Emergency SAM and MAM	High	High	Supporter
Save the Children	Child health and nutrition support	High	High	Supporter
Nepal Youth Foundation	Started 16 NRHs and trained staff in collaboration with WHO	High	?	Supporter
National NGOs	Technical support and support for community activities	?	?	Supporter
District NGOs	Technical support and support for community activities	?	?	Supporter
Donors:	NA	High	High	Driver

? = Unknown or undecided; NA = Not available.

Integration as a strategy for improving case management of SAM

The introduction and scale-up strategy of SAM interventions in the regular (development) target districts implied an integrated approach. Therefore, CMAM was renamed as IMAM, and the IMAM guidelines (2015) re-enforced the links between SAM and MAM case management and community outreach activities that had been described in the CMAM guidelines (2009). IMAM also consolidated the tie with IMNCI that aligned its protocol accordingly.

At the central level, the governance system of the MOH traditionally delegated the management and organisation of health services to the health district providing a defined policy and financial cadre. At the district level, health managers were accustomed to coordinate the various vertical programmes and deliver services as a comprehensive package. Therefore, there was neither a specific SAM integration strategy in place nor integration indicators monitoring its progress (in 2016, the UNICEF bottleneck analysis was conducted but covered neither integration nor sustainability).

While integration of SAM interventions was not set as a goal or was not specifically being promoted, there was a general consensus that SAM service integration improved rational use of resources and reduced duplication of efforts. Integrated health services were also considered to improve accessibility, effectiveness and sustainability of services.

Extent of the integration of SAM interventions

The extent of SAM service integration was explored at the three tiers of the national health system: national (considering systemic integration), district (management and organisational integration), and health facility and community level (clinical integration *of the SAM target districts*). The extent of integration of interventions was scored on scale from none to partial or full integration. No integration meant no interaction, or segregation; partial integration meant a linkage or coordination; and full integration meant that functions, activities, systems or structures were in the mainstream and routine. Routine functions, activities, systems or structures were listed. In other words, full, partial or no integration was achieved when they were fully, partially or not in charge of comprehensive child healthcare activities that included SAM.

Systemic integration

The mapping showed that most health system functions had fully or partially integrated SAM (Table 6.19). The partial integration score was often allocated when the MOH had inadequate capacity to cover the function's activity. For example, because of the difficult geography, transport was inadequate and RUTF stockouts occurred; therefore, the integration of SAM into the logistic supplies function was considered partial.

The perceived collaboration among health partners, professions, structures and services for systemic integration of SAM (Table 6.20) derived from triangulation of information was graded by the same integration score.

The question about *perceived need for change to improve systemic integration* was ambiguous. First, before the integration exercise, integration was perceived as achieved. No further difficulties had been encountered for integrating SAM once it was part of national policies and plans, and capacities had been strengthened and resources made available. SAM management was not available countrywide, but a step-wise scale-up plan was agreed and in place. Second, the need for change to improve integration was highlighted during the exercise that identified some gaps that had not been perceived before.

Managerial and organisational integration

The mapping of the extent of managerial and organisational integration of SAM showed that most routine managerial and organisational activities of service delivery at the district level had fully or partially integrated SAM (Table 6.21). The discussions revealed that the partial integration score was often allocated when capacities were weak.

The question about *perceived need for change to improve managerial and organisational integration* was not answered. However, integration was also perceived as achieved at this level before the exercise, although the need to strengthen some functions to improve integration was agreed.

Clinical integration at health facility and community levels

Table 6.22 shows the extent of clinical (or implementation) integration of SAM interventions into routine clinical activities at secondary healthcare (SHC), facility-based primary healthcare (FB PHC) and community-based primary healthcare (CB PHC). Reasons for 'partial' integration were mostly weaknesses in capacity and lack of awareness of the integrated approach, hence lack of ownership was mentioned. For registration, monitoring and reporting, it was remarkable that a multitude of registration books, recording cards and reporting sheets were in place at health facility level for the various national programmes. The DHO was in charge of digital recording of all health data.

Table 6.19. Extent of integration of SAM at the national level

Key health system functions		Extent
Governance		
Policy setting	National health and nutrition policies with SAM as part of comprehensive child healthcare* (i.e., integrated management of childhood illness [IMCI] and child hospital care)	Full
National guidelines	National guidelines for IMCI and child hospital care supporting comprehensive child healthcare	Partial
Technical leadership	Technical advisory group for comprehensive child healthcare	Partial
Regulation and coordination	Regulation and coordination of health actors aligning with national health and nutrition policy and implementation strategy	Partial
Evidence-based decision making	Generation and interpretation of intelligence and research on policy and strategy options	Partial
Social participation	Social participation of local and community actors in planning, building coalitions and implementing and monitoring comprehensive child healthcare with a people-centred approach	Full
Contingency planning	Plans and regulations for addressing contingencies	Full
Financing		
Regular budget-pooled funding	Regular budget from pooled funds with a sector-wide approach covering financing for comprehensive child healthcare	Full
Annual costed action plans	Annual costed action plans for comprehensive child healthcare	Full
Health workers payroll	Staff in national health facilities involved in comprehensive child healthcare on MOH payroll	Partial
Financial risk protection	Fee waiver system for children (or health insurance) under 5 covering comprehensive child healthcare	Full
Information		
Health information (HIS)	National HIS including indicators for comprehensive child healthcare	Full
Service monitoring	Performance monitoring of comprehensive child healthcare	Partial
Contact coverage monitoring	Coverage monitoring of comprehensive child healthcare	No
Workforce		
Adequate coverage	Adequate number and spread of qualified health workers for comprehensive child healthcare	Partial
Competences	Adequate technical and organisational management skills for comprehensive child healthcare	Partial
Performance and motivation	Performance appraisal and career development opportunities for comprehensive child healthcare	Partial
Pre-service education	Pre-service education modules on comprehensive child health and nutrition	No
Professional development	Continuing professional development on comprehensive child health and nutrition	Partial
Supplies		
Essential medical supplies list	National essential drugs and medical supplies list covering comprehensive child healthcare	No
Procurement system	National drugs and medical supplies needs (forecasting and) procurement covering comprehensive child healthcare	Partial
Logistic mgmt system	National logistic management system for drugs and medical supplies covering comprehensive child healthcare	Partial
Service delivery		
Demand	Demand generation for informing communities, changing health	Partial

generation	behaviour and improving health service access and utilisation	
Early case finding	Active case finding of selected child illnesses by volunteers in community and systematic case finding by health workers at the health facility	Partial
Community-based primary care	Promotive and preventive community-based health and nutrition activities and community case management (CCM)	Partial
Facility-based primary care	Decentralised comprehensive child-centred IMCI	Partial
Child hospital care	Comprehensive child-centred paediatric hospital care	Partial
Health outreach	Health outreach activities for immunization and other comprehensive child healthcare and nutrition services	Partial
Referral and tracing system	Referral and tracing system between services for service uptake and retention in treatment of comprehensive child healthcare	Partial
Patient-centred continuity of care	Comprehensive child healthcare tracked over time and place responding to individual preferences, needs and values	Partial
Quality improvement	Continuous quality improvement of comprehensive child healthcare	Partial

* Comprehensive child healthcare, i.e., IMCI and child hospital care, includes the management of SAM.

Table 6.20. Perceived collaboration among health partners, professions, structures and services for systemic integration of SAM at national level

Perceived collaboration	Extent
Partner coordination	
Health system functions of child healthcare coordinated among different health partners	Partial
Professional coordination	
Health system functions of child healthcare coordinated among different professions	Partial
Functional integration	
Health information, human resources and supplies covering child healthcare in common	Full*
Normative integration	
Common values and principles for child healthcare and SAM	Full*
Horizontal integration	
Health system functions of child healthcare coordinated across the same levels of care	Full
Vertical integration	
Health system functions of child healthcare coordinated across different levels of care	Partial

* Full integration is rated here for the Nepal context, in which vertical health programmes merge at health facility level to provide integrated services.

Table 6.21. Extent of integration of SAM into routine managerial and organisational activities at the district level

Routine managerial and organisational activities	Extent of integration		
	National level	Bardiya District	Kapilvastu District
Managerial leadership			
Translating policies and strategic plans into action plans	Full	Full	Full
Annual review and reflection	NA	Full	Partial
Resource mapping	NA	Partial	NA
Regulating adherence to guidelines	Full	Full	NA
Coordinating technical and financial partners	Full	Partial	Full
Promoting social participation (planning, implementing and monitoring)	Full	Full	Full
Planning for contingencies (e.g., buffer stocks)	Full	/	/
Financing			
Allocating and managing the health budget	Partial	Partial	Partial
Mobilising additional resources	Partial	/	/
Information			
Managing the HMIS (monitoring, recording, reporting)	Full	Full	Full
Sharing information for use and feedback to stakeholders (including local government and communities)	No	Full	NA
Managing, overseeing, participating in population surveys (e.g., surveys and assessments)	Partial	Full	Full
Workforce			
Managing adequate skilled professionals and promoting equitable distribution of health workers	Partial	Full	NA
Training health workers in clinical care and health facility management	Partial	Partial	Partial
Conducting supportive supervision	Partial	Full	Full
Providing training materials and/or job aids	Partial	Full	NA
Providing job descriptions and appraisal system	No	Full	NA
Creating career development opportunities to reduce attrition and improve motivation	Partial	/	/
Supplies			
Infrastructure	NA	NA	Full
Supply chain management:	Partial	Partial	Partial
Use and expiry	NA	Full	NA
Storage and stock	NA	Full	NA
Quality control	NA	Full	NA
Transportation to health facilities	NA	Full	NA
Managing buffer stocks for contingencies	Partial	/	/
Service delivery			
Providing operational support to facility-based services	Full	Full	NA
Organising health outreach and campaigns	Full	Full	NA
Organising community-based primary care activities	Partial	Partial	NA
Organising referral systems	/	NA	NA
Ensuring quality	/	Full	Full
Social mobilisation			
Awareness raising	/	Full	NA
Mass media	/	Full	NA
Community meetings	/	Full	NA
FCHV mobilisation	/	Full	NA
Mother group meetings	/	Full	NA

/= Not relevant; NA = Not available.

Table 6.22. Extent of integration of SAM into routine clinical activities

Routine clinical activities	Extent of integration					
	Bardiya district			Kapilvastu district		
	SHC	FB PHC	CB PHC	SHC	FB PHC	CB PHC
Promotion:						
Awareness raising	/	/	Partial	/	/	Partial
FCHVs	/	Full	Full	/	Full	Full
Mother groups	/	/	Full	/	/	Full
Traditional healers	/	/	Partial	/	/	Partial
Advocacy and awareness links (schools, ECD)	/	/	Partial	/	/	Partial
Prevention—outreach clinics:						
Outreach	/	Full	Full	/	Full	Full
Immunization	/	Full	Full	/	Full	Full
Campaigns	/	Full	Full	/	Full	Full
Registration	Full	Full	NA	Full	Full	NA
Diagnosis	Full	Full	NA	Full	Full	NA
Treatment	Full	Full	NA	Full	Full	NA
Follow-up	Full	Full	NA	Full	Full	Partial
Registration, recording and reporting	Full	Full	Full	Full	Full	NA
Information system	Full	Full	Full	Full	Full	NA
Medical supplies	Full	Full	Full	Full	Partial	NA
Referral system	Full	Full	Full	Partial	Full	Partial
Link to community	/	Full	Full	/	Partial	Partial

/ = Not relevant; NA = Not available; CB PHC = Community-based primary healthcare; FB PHC = Facility-based primary healthcare; SHC = Secondary healthcare

Table 6.23 provides an overview of perspectives on clinical integration of the various health actors. A mix of managers and service providers at national and district levels shared how they and others perceived integrated care, which is not the best way to answer these questions and may explain the differing results.

A 'partial' scoring was mostly given if the various clinical activities were not always optimally coordinated between health workers and other team members. This poor coordination could have been because of lack of awareness of the integrated approach or weak organisational capacities for clinical care. Observation showed local variations in organising SAM services adapted to the facility context. For example, a health facility manager and trained staff agreed to separate SAM interventions from other child health interventions to improve follow-up care.

Table 6.23. Clinical integration perceptions from different perspectives

Clinical integration perspectives	Extent of integration					
	Bardiya District			Kapilvastu District		
	SHC	FB PHC	CB PHC	SHC	FB PHC	CB PHC
Child	Full	Full	Full	Full	Full	Full
Carer	Full	Partial	Full	Full	Full	Full
Volunteer	Partial	Partial	Full	NA	Full	Full
Clinical provider	Full	Full	Full	Full	Full	NA
Support staff*	Partial	Full	Full	Full	Full	NA
Teamwork across	Full	Partial	Full	Full	Full	NA
Supervisor	Full	Full	Full	Full	Full	NA

CB PHC = Community-based primary healthcare; FB PHC = Facility-based primary healthcare; SHC = Secondary healthcare; *Support staff, e.g., anthropometry measurer, laboratory technician, pharmacist.

The question about *perceived need for change to improve clinical integration* was ambiguous, as SAM service delivery was considered integrated. Suggested changes for improved implementation were discussed instead, and covered improvements in the FHCV system, supportive supervision, supply access and community awareness.

Factors influencing the integration process

Factors that influenced the integration of SAM were identified through the group work discussions at national and district level. The factors that were retained as key to facilitate or hinder integration of SAM were mapped in the framework categories in Figure 6.7.

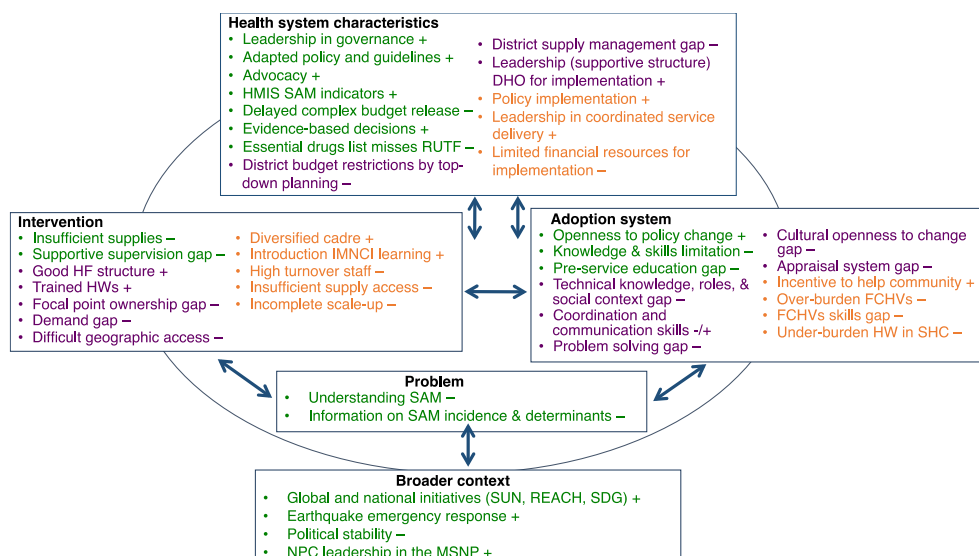


Figure 6.7. Key factors influencing the integration of SAM

DHO = District Health Office; HF = Health facilities; HW = Health workers; MSNP = Multisectoral nutrition plan; SDG = Sustainable development goals; SHC = Secondary healthcare.

The influencing factors were analysed and their current or possible future effects on other determinants of integration (direct, indirect, feedback) listed (Table 6.24.)

Table 6.24. Factors facilitating or hindering integration of SAM by component of analysis

Factors that influence integration of SAM	Effect on other determinants of integration (direct, indirect, feedback) identified or possible or plausible in the future	Effect on integration
Health outcomes		
Improving child health		Positive
Health services outcomes		
Improving use of SAM services (contact coverage)	Positive benefit for effectiveness coverage, resource availability (opportunity cost)	Positive
	Missed opportunity for detection and treatment, weak trust in health services	Negative
	Vulnerability because no strong strategic plan is in place	Negative
Improving quality of SAM services	Uncertainty about continuous quality of care	Negative
Improving sustainability of SAM services	Uncertainty about sustainability	Positive
	MSNP support for SAM scale-up	Negative
Systemic integration (policy making level)		
Strength of leadership	Advocacy capacity	Positive
	Openness to policy change	
Decentralisation of leadership	Central oversight leaving little room for flexibility or local adaptations	Negative
Comprehensiveness of policies and guidelines	Policies adapted to 'add' SAM	Positive
	Policies not conceptualising comprehensive integrated childcare	Negative
Coordination and alignment of expanded partnerships	Untapped capacities	Negative
Top-down and insufficient budget allocation	Funding security but dependence vulnerability	
	Central oversight leaving little room for flexibility or local adaptations to changes	Negative
Comprehensiveness of the essential medical supply list	Supply chain management weaknesses	Negative
Comprehensiveness of the health information system	Evidence on SAM burden	Positive
Services at scale	MSNP supports SAM scale-up, but scale-up slow and no strategic vision of country-wide scale-up	Positive
Social participation	Untapped capacity	Negative
Evidence gap on SAM integration	Untapped capacity	Negative
Incomplete pre-service training	Missed opportunity for involvement of educational institutions and professional associations	Negative
Weak supply chain system	Supply forecasting gap, external procurement, external supply chain	Negative
Development partner interest gap	Not local production of RUTF	Negative
Managerial and functional integration (District Health Office)		
Health manager capacity and leadership	Nutrition focal point instead of 'child health' coordinator' in charge of SAM	Negative
Good coordination skills	Integrated service delivery	Positive
Health manager turnover	Continuity of quality improvement	Negative
Weak communication skills	Weak demand generation	Negative
Complex and delayed budget release	Limited resources capacity	Negative
Resource gap for health workforce	Weak comprehensive supportive supervision	Negative

management support	Weak comprehensive continuing professional education	
Managerial and professional integration (health facility)		
Decentralised care	SAM provided in health facility or referral if no services	Positive
Health worker openness to change	Top-down compliance with guidance	Positive
Health worker knowledge and access to guidelines	Relevant	Positive
Health worker organisational skills	Relevant	Positive
Health worker competences and skills (diverse cadres)	Good when trained; Low coverage of trained staff	Positive Negative
Health worker attitude and motivation	Demand creation opportunities; Positive attitude	Positive
Health worker turnover	High	Negative
Health worker workload (too little)	Low SAM caseload threatening loss of skills and motivation	Negative
Strength of referral system	Weak	Negative
Timely access to drugs and supplies	Weak	Negative
Managerial and professional integration (community)		
Community participation	Encouragement of community involvement and accountability	Positive
Knowledge of causes, consequences, treatment pathways	Influential leaders and individuals	Negative
FCHV workload overload	Probable work overload from vertical programme demands	Negative
FCHV skills and capabilities	Limited or unstable; Elderly FCHVs with limited training	Negative
FCHV motivation	Limited or unstable Elderly FCHVs with limited training	Negative
Clinical integration (individual level)		
Knowledge of causes, consequences, treatment pathways	Limited awareness opportunities	Negative
Cultural resistance to health seeking and behaviour change	Presence of influential leaders and individuals	Negative
Distance and geographical access	Opportunity cost to access care	Negative
Perception of integrated care	If services available, one-stop-shop model, otherwise referral-based model	Positive

FCHV = Female community health volunteers; RUTF = Ready-to use therapeutic food; SAM = Severe acute malnutrition.

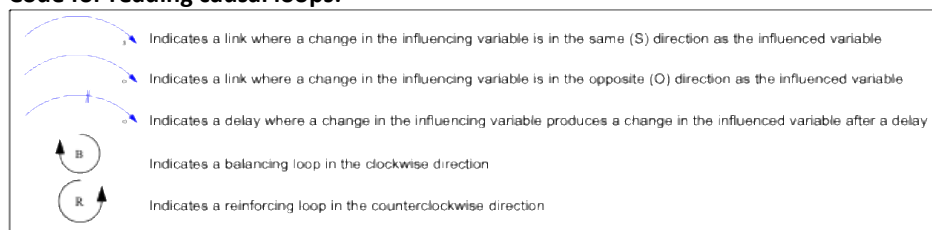
Interactions between factors and system dynamics

Causal mapping was conducted using system dynamics modelling to explore interactions and feedback among the different factors influencing integration through a step-wise participatory approach that included experiential learning. The causal loop diagram (CLD) was at each occasion a useful tool that stimulated reflective discussions. The CLD developed in the national workshop (Figure 6.8a) identified a virtuous reinforcing loop (R1) in which national MOH leadership stimulated the development of adapted health and nutrition policies that positively influenced integration and decreased the integration gap, which further strengthened the MOH leadership. A second loop (R2) showed how integration improved forecasting, which improved procurement and availability of supplies and further improved integration (a virtuous reinforcing loop). A third loop (R3) showed how national MOH leadership also improved procurement and availability of supplies, thus reinforcing the effect on integration. Only reinforcing effects were identified. (This merits further exploration).

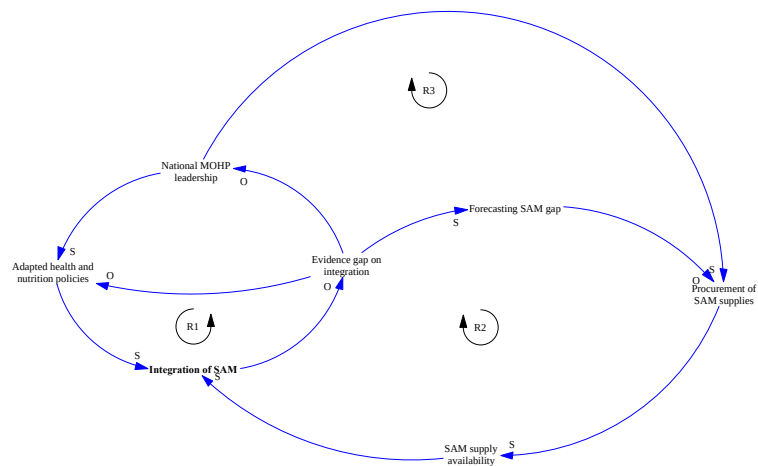
The causal loop diagram developed in the Bardiya District workshop (Figure 6.8b) focused on SAM integration at the health facility level and identified two reinforcing loops and one balancing loop. First, clinical integration of SAM improved quality of care, which reduced knowledge and skills gaps, which further improved clinical integration (R1). Second, clinical integration of SAM also strengthened IMNCI, which improved clinical integration of SAM in the community, which for its part stimulated improved clinical integration of SAM (R2). Third, clinical integration of SAM improved community awareness, which improved SAM admissions and thus increased workload, which affected the quality of care and then hampered clinical integration (B).

The causal loop diagram developed in the Kapilvastu District workshop (Figure 6.8c) focused on SAM integration at district and health facility levels and identified two reinforcing loops. First, integration of SAM was influenced by leadership (similar to R1 in the CLD at national level). Second, Integration of SAM supported IMNCI, which created more screening opportunities, which improved awareness and admissions, which then promoted integration of SAM.

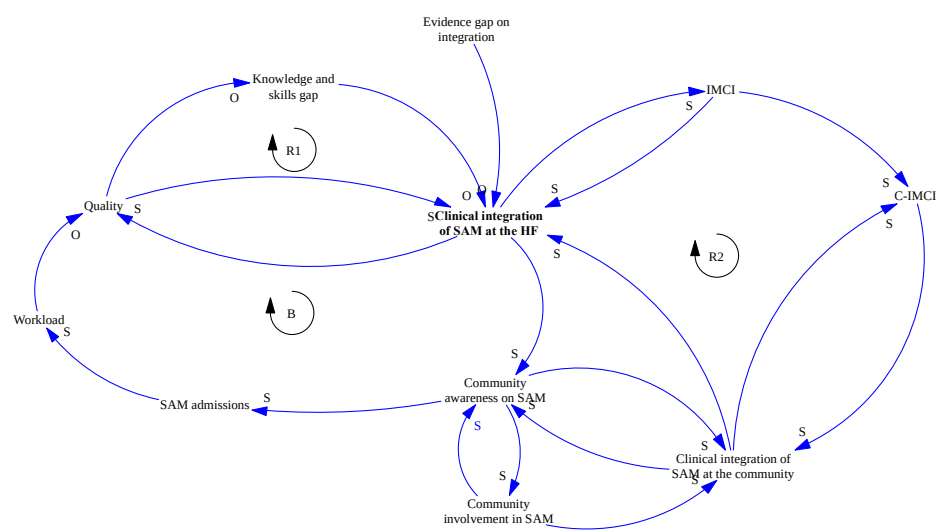
Code for reading causal loops:



a) Causal loop diagram developed in the national workshop:



b) Causal loop diagram developed in the Bardiya district workshop:



c) Causal loop diagram developed in the Kapilvastu district workshop:

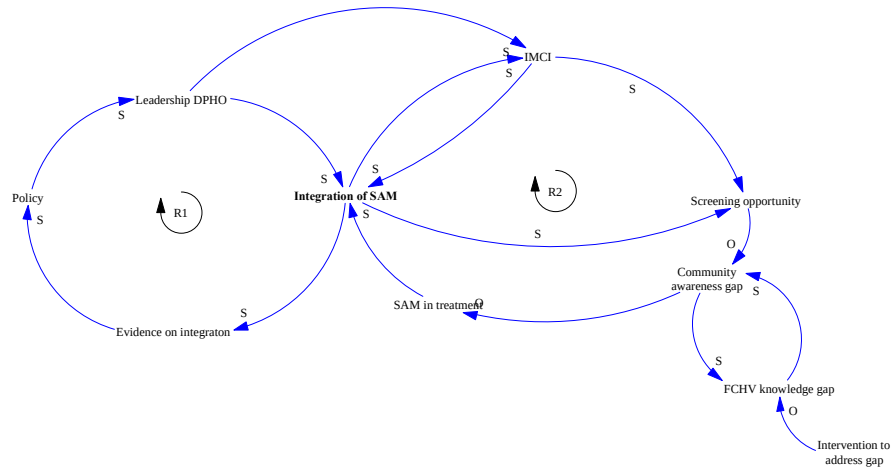


Figure 6.8. Initial causal loop diagrams

R = Reinforcing loop; B = Balancing loop; S = Similar causal effect, O = Opposite causal effect
 DPHO = District Public Health Office; FCHV = Female community health volunteer; IMCI = Integrated management of childhood illness.

In a final step, the three causal loops (Figure 6.8) were combined and further developed based on the determinants of integration (Table 6.24) resulting in a final CLD (Figure 6.9). Causal loops descriptions and their effects presented in Table 6.25 reveal the the system dynamics. Plausible scenarios that may induce change or perturb the system were not envisaged but could have been probed by the use of this tool.

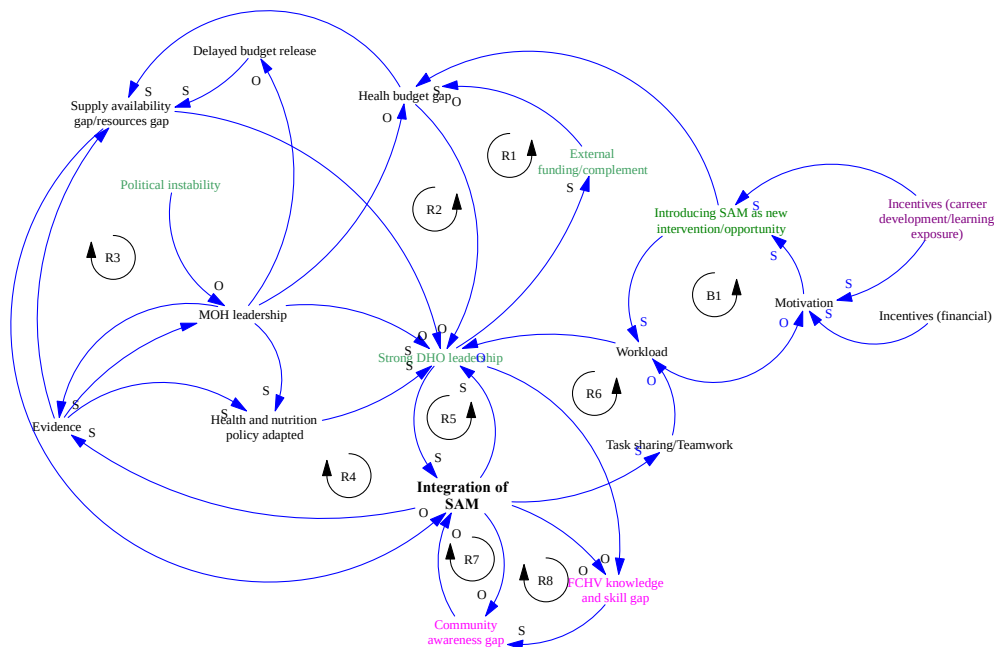


Figure 6.9. Final causal loop diagram

R = reinforcing loop; B = balancing loop; S = similar causal effect; O = opposite causal effect
DHO = District Health Office; FCHV = Female community health volunteer; IMCI = Integrated management of childhood illness; MOH = Ministry of Health; SAM = Severe acute malnutrition.

Table 6.25. Reading of the causal loops

	Loop description	Loop effect
R1	External funding opportunity reinforcing loop	Strong DHO leaders may find opportunities to identify external funding to cover the health budget gap
R2	Resources reinforcing loop	Financial and supply resources are needed to achieve integration
R3	Evidence reinforcing loop	Evidence for improved planning improves leadership for integration
R4	MOH integration support reinforcing loop	MOH leadership creates an enabling environment that stimulates integration
R5	DHO integration support reinforcing loop	Strong DHO leaders support integration that makes them stronger leaders
R6	Teamwork reinforcing loop	Integration implies planning for teamwork that absorbs workload
R7	Community awareness reinforcing loop	Integration creates more opportunities for service users to be exposed to learning about health interventions and healthy behaviours
R8	FCHV reinforcing loop	FCHVs play a crucial role in creating awareness and strengthening demand
B1	Motivation balancing loop	Introducing new interventions create more workload that needs to be balanced, and non-financial incentives have a better effect than financial ones

DHO = District Health Office; FCHV = Female community health volunteer; MOH = Ministry of Health.

Lessons on SAM integration from Nepal

The Nepal case study revealed that SAM was considered integrated because integration was interpreted as routine provision of SAM care components in zonal or district hospitals, primary care facilities, and communities of targeted districts as described in the national guidelines. Thus, in the absence of a specific strategic plan or set goal, SAM interventions were integrated spontaneously into the national health system up to a certain extent. Because of the notion of achieved integration, health actors focused on strengthening capacities for scale-up, and less so on quality improvement, integration or sustainability. Prior learning from introducing and scaling up the IMNCI approach guided the SAM care introduction and scale-up process. While the SAM services scale-up was initially slow, it recently gathered momentum, and effectiveness coverage in the SAM target districts and the country overall was expected to remain low.

The case study found a mix of integration models and varied extents of integration. At the **macro level**, key health system functions were adapted to absorb SAM. For example, national SAM guidelines described 'integrated' management of SAM in which service components were linked with a referral system; and policies, resources, support for training and implementation, monitoring and supervision were in place to support SAM-specific services in the target districts. Integrated approaches were considered 'normal' in the government leadership environment of Nepal, in which numerous vertical programmes support health system work. Nepal's centralised decision-making placed focal point coordinators of vertical programmes at the various tiers of the health system to stimulate or ensure horizontal and vertical integration. The effectiveness of the integrated approach of the programmes then depended on the leadership at each tier. A comprehensive child healthcare focus at the systemic and managerial level was ignored, and emerged (or not) depending on the initiative and skills by the health actors involved.

At the **meso level**, the district health offices (DHOs) were skilled at coordinating service delivery for the various national programmes. In the introduction and scale-up of SAM, experiential learning from IMNCI probably played a role in their juggling of vertical organisation of planning and monitoring and horizontal implementation. However, the leadership of the DHO was most important for integration of sustainable quality SAM services and could vary. Although the study did not discover why leadership differed, it did find that this influenced integration (Figure 4 CLD).

At the **micro level**, delivery of SAM services at health facilities and in communities differed depending by site, related to leadership and engagement of health workers (capabilities and motivation). SAM care was delivered as a 'stand-alone' service in university hospitals and some NRHs; as a 'one-stop-shop' in one NRH; as an 'add-on' to or 'merged' with IMNCI, depending on how health workers formed collaborative teams for comprehensive child healthcare, with various services integrated horizontally; and as an 'add-on' to growth monitoring, FCHV interventions and campaigns. Community outreach was the

weak spot in the health system overall, with limited coordination of activities and responsibilities of FCHVs unless supported by community-based NGOs.

Digging deeper into integration issues uncovered the following missed opportunities, uncertainties and unresolved issues:

- Limited scale: prioritisation was based on thin evidence of need, resulting in a patchwork of health and nutrition interventions that misses the vision of comprehensive child healthcare;
- Unclear role and responsibility of health actors: academic, teaching and research institutions were not involved in improving the knowledge and skills base; professional associations were not involved in advocacy; the private sector was not tapped for awareness raising and referrals; and communities were not asked to contribute resources and improve health awareness and behaviour change;
- Financial unsustainability: financial space was not created by planning improved collaboration and teamwork or rational use of resources; central control of health budgets did not promote flexibility for district initiatives and ownership; and community groups involvement was not boosted to mobilise local resources and capacities; and
- Vertical approaches to health interventions stimulating disease-specific results-based linear planning at the tiers of the health system: understanding of interactions and synergies of capacities and resources across and within vertical driven programmes, unpredictability and wider effects, as well as flexibility and experiential learning were not considered or promoted.

The expected outcomes of integration were improved quality, scale-up and sustainability of SAM services. However, the study did not measure these. Considering that (equitable) scale-up was being planned, the effectiveness coverage (quality) and sustainability of SAM services remain major concerns. In the current climate of limited health budgets and expanded international health development assistance, the financial sustainability of SAM was difficult to assess. On the other hand, national NGOs that collaborated with and supported the national health system partially achieved technical sustainability or independence from external technical support, but institutionalised learning was weak (e.g., pre-service education and training was incomplete, or research institutions were not involved).

The study explored the integration of SAM services from a SAM-specific view. This was a necessary first step, but a comprehensive child healthcare view would have been more appropriate and should be considered in a next step. Integration should best be understood as a strategy to enhance coverage and sustainability. But not all aspects of SAM need to be 'integrated', as this depends on the set goal and capacities. Measuring the extent of integration and identifying factors that influenced integration helped explain how SAM services integration had progressed and may help set priorities and a goal and plan for integration-specific activities next. In addition, the study highlighted that integration of SAM leads towards losing visibility when services are mainstreamed into

health policies and activities, and therefore losing special attention and support, which may or may not yet be desirable.

Lessons on the case study method. Feedback from the participatory exploration of integrating SAM into the national health system included:

- At the national level
 - The concepts of various dimensions, components, levels and extent of integration were new;
 - Interactions between factors and applying systems thinking were eye-opening;
 - Gaps in integration came as a surprise;
 - Integration was found to be an essential element that influenced effective coverage and sustainability; and
 - Evidence on implementation and integration should inform scale-up strategies.
- At the district level
 - While the extent of integration was positive, aspects that needed improvement to secure comprehensive child healthcare were identified.

Suggestions for improving the methods of exploring integration:

- The case study should have started at the district level so that information from the district could have informed the national-level discussions;
- A national training of trainers prior to the district level workshop could have taught the concepts and methods to the core participants and adapted the tools for data collection during workshop sessions and interviews; and
- Mind mapping and system dynamics modelling were new and eye-opening methods that were considered useful for use in other programmes and activities.

Conclusion. This study was a first participatory exploration of the SAM integration process over a short time span. The method and tools could be adapted to a new context or expanded scope but should not be new burdens on the already overstrained health service monitoring system.

The study was useful in showing the readiness of the health system to integrate SAM, the extent of integration at the different tiers of the health system and factors that influenced the integration process and interacted in certain system dynamics. Moreover, the participatory approach of the study provided an opportunity for collaborative learning. Key health actors improved their understanding of the concept and process of integration and learned a common language for discussion.

The stepwise exploration provided an experiential approach to learning that proved useful in creating awareness and fuelling curiosity about applying systems thinking to move away from the comfort zone of linear thinking.

Guidance on improving SAM interventions (for quality, scale-up or sustainability) should consider integration and systems strengthening through a systems thinking lens to improve comprehensive child healthcare rather than through a SAM-specific stand-alone lens.

The case study succeeded in informing policy-makers and managers about the integration situation so they could use the information to adjust policies to improve quality, equity and coverage of SAM services sustainably. At the same time, the case study strengthened skills in applying systems thinking, made key health actors aware of complexity and prepared them for unintended consequences. We hope this step may encourage participants to further consider non-linear causal relations and unpredictability in their work.

Recommendations. The following integration-specific priorities or opportunities are proposed for further discussion and action:

For improving SAM implementation in Nepal:

- Stimulate awareness (and improve learning) on integration and systems thinking to guide planning for integration (of SAM, child healthcare, nutrition) and experiential learning on integration (use the case study as a synthesis of learning on integration of SAM to share knowledge; advocate for applying it to comprehensive 'child healthcare' or sectoral or multisectoral nutrition as per the MSNP);
- Improve SAM integration through strategic planning: SAM interventions are already part of the national health system, but strategic discussion and planning—based on learning from this case study—could define what and how to integrate SAM more effectively;
- Strengthen DHOs' capacities to deal with complexities that improve their leadership role and organisational skills for managing various vertical programmes and teams of health professions.
- Strengthen learning about needs and opportunities to achieve integrated child healthcare from the bottom up; and
- [Advocate for a global public-private health partnership to increase access to RUTF, based on learning from similar initiatives (e.g., the Global Alliance for Vaccines and Immunization) – This could create financial space for the MOH and partners to strengthen comprehensive child healthcare and contribute to strengthening the health system instead of impoverishing it].

For continued research:

- Explore expanding methods of assessing primary healthcare system performance (e.g., bottleneck analysis) that can be adapted to context-specific needs at the district level, applying a systems thinking lens. Integration and sustainability

indicators may have a place here. The tool may support the district leadership role and advocate for creating decision-making space;

- Explore missed opportunities by conducting a realist evaluation of the effectiveness of SAM implementation—what works how, for whom, in what circumstances and why. This method will uncover recurring causal patterns, providing a level of abstraction that is meaningful and transferable to other contexts. The exercise would comprehensively combine health system strengthening and integration for improved SAM services and health outcome; and
- Expand system dynamics learning to improve SAM services by modelling and testing scenarios using computer simulations that build on the case study results.

v. Discussion and conclusions

This section summarises, compares and contrasts findings on SAM integration in Burkina Faso and Nepal and concludes the chapter with an overview of which approaches worked, how, for whom and why.

The case studies assessed the process of integration of SAM interventions into the national health systems, using the same variety of methods and tools to explore the actual and perceived SAM integration process.

Situational context

In both countries, SAM policy decisions, management and implementation were coordinated by the government nutrition sections (directorates, departments or divisions of nutrition) that had established links with child healthcare (integrated management of childhood illness [IMCI] and immunization programmes) but less so with hospital services and preventive community health. Both countries had multisectoral strategies in place that included SAM, as well as SAM-specific policies (guidelines), and health and nutrition policies had more or less included SAM even though they did not strive for comprehensive child healthcare. As is commonly the case, child health planners are not directly involved in SAM case management and focus, with good reason, on the diarrhoea-malaria-pneumonia triad. In both Burkina Faso and Nepal, SAM is treated at the macro and meso level much as a vertical stand-alone programme, linked more to preventive nutrition activities than to curative child healthcare, where it should be, and with external funding and supply streams. Also, linkages with HIV and TB activities seemed to be weak. At the service delivery level, SAM intervention may merge with child healthcare, depending on the environment of comprehensive child healthcare (e.g., organisational skills, motivation, teamwork, collaboration, coordination, sharing of tasks and resources and informed supervision).

Integration as a common goal

SAM services were integrated into the national health system in both countries, and SAM figured in all health and nutrition policies. No specific SAM integration strategies were in place, although both countries had formally articulated an integrated SAM approach, with SAM services in secondary and both facility-based and community-based primary care linked by referral systems. SAM activities were also added to other child healthcare services but limited to detection of SAM and referral for treatment during child outreach and child health days (referral-based model).

Extent

The case studies assessed the level (extent) of integration of acute malnutrition interventions in both countries in 2016. Table 6.23 summarises the results, applying the coding of full, partial and no integration. (The Nepal results only reflected the situation in the SAM implementation districts, which covered less than one-third of the country's districts and population.) As the presentation is based on an average, weighing is

accounted for, but ‘full’ integration means that all of the functions were considered fully integrated. Averaging the results lost specificity and provided an uninspiring picture of partial integration that was not very useful. However, the outcomes indicated that improvement is needed and that integration could be one factor for improvement

The major differences between the two countries were difficult to pin down. Indeed, the social-cultural-political and ecological environments were quite different. Weak health systems with similar constraints of financing and workforce and blueprint support seem to provide similar integration maps. This may also be because of the similar central governance system and influence of global health policies and initiatives in both countries. The major difference was that Burkina Faso embraced scale-up of SAM interventions in the entire country in 2009, while in Nepal there was a slow pace of a phased scale-up that unexpectedly jumped forward because of the earthquake emergency response. Currently in Nepal, there was hope that the multisectoral nutrition strategy will create fiscal and decision spaces to expand SAM services. However, health actors had no shared vision of the need to cover the entire country, simply because national health budgets and donor funding were insufficient to cover the high cost. Health lobbyists in both countries took a disease-specific approach to advocating for increased support that may be counterintuitive given their national health priorities.

Factors

The case studies enumerated the key factors that facilitated and hindered SAM integration in both countries (Table 6.26). Many similar factors recurred in the two studies. Gaps in the table were related to misclassification or lack of knowledge of factors rather than comprehensiveness, because the list represents influencing factors perceived by the participants. The comparison of key facilitating (strong or adequate) and hindering (weak or inadequate) factors for SAM integration in both Burkina Faso and Nepal (Table 6.27) revealed similar and different factors of influence and underlying crosscutting role of health actors as key.

Interactions of factors and system dynamics

The CLD allowed exploring the interactions of factors that facilitate or hinder integration and may create feedback loops that reinforce effects positively or negatively (virtuous or vicious reinforcing loops) or dampen effects (balancing loops). The development and testing exercise was participatory and created a momentum for learning by understanding system dynamics and applying systems thinking to uncover complexity and underlying patterns. In every step of the loop development, health actors reflected on cause and effect of the variables added in the loop by considering the interaction of parts and on the effect of their interaction on the whole. As such, the development process and the discussion that came with it may have been as important as the outcome of the CLD.

Table 6.26. Extent of SAM integration in Burkina Faso and Nepal compared

	Burkina Faso	Nepal
Systemic integration		
Governance		
Financing		
Information		
Health workforce		
Supplies		
Service delivery		
Perceived collaboration		
Managerial integration		
Governance		
Financing		
Information		
Health workforce		
Supplies		
Service delivery		
Social mobilisation		
Perceived collaboration	NA	NA
Clinical integration		
Promotion		
Prevention		
Registration and monitoring		
Diagnosis		
Treatment		
Follow-up		
Referral		
Community links		
Perceived collaboration		
Outcome		
Access		
Coverage		
Efficiency		
Equity	?	?
Quality		
Sustainability		
Health outcome (Recovery)		
Effectiveness coverage	?	?

Legend:

Extent of integration:

Full integration
Partial integration
No integration



Outcome:

Good
Mixed
Weak
Unknown



Even if the CLD is a qualitative descriptive method, scenarios of likely or potential interventions can be tested. Again, the CLD is a tool that makes mental models explicit, and as such guides discussion and learning. The method was invaluable for its relative simplicity and its ability to create instant learning and understanding of scenario testing with a systems lens. Similar scenarios were proposed and tested as they considered to carry a high probability for facilitating or hindering SAM integration:

- Increasing (or decreasing, inadequate, delayed or inflexible) national health budgets;
- Decreasing technical and financial support;
- Increasing influence of multisectoral initiatives;
- Improving participatory leadership at the various levels of the health system;
- Increasing competencies of health actors to understand integration and complexity and thus improving coordination and collaboration and more efficient use of limited resources; and
- Expanding local capacity by increasing community engagement and awareness, thus stimulating demand and ownership.

Scenarios can simulate probable future events or interventions that create positive or negative reinforcing effects, or dampening effects, or create opportunities for resource mobilisation or redistribution and financial and technical space. The CLD made system dynamics visual and created deeper understanding of these interactions and how they induced changes in the system, but it also provided opportunities to test interventions to mitigate negative effects. Again, simulations create opportunities to visualise interactions that help understanding and facilitate discussion, and the discussion may be more useful than the actual outcome.

Table 6.27. Summary of key facilitating (strong or adequate) and hindering (weak or inadequate) factors for SAM integration in Burkina Faso and Nepal

	Burkina Faso		Nepal	
	Facilitating factors	Hindering factors	Facilitating factors	Hindering factors
SAM as a public health problem	Recognised burden of SAM	High stunting	/	Understanding of SAM problem Identified needs
Intervention	Proven effectiveness of SAM treatment; Availability of decentralised services Information availability Skill-mix of health workers IMCI, IYCF in place Research institute	Staff rotation affecting presence of trained staff	Policies and guidelines Allocated budget Health facility structure Trained health workers Skill-mix of health workers	Insufficient supplies Supportive supervision Focal point ownership Demand Geographic access High turnover Access to supplies
Adoption system	/	Pre-service education Motivation Supervision Coordination Engagement of partners	Openness for change; Evidence-based decision-making Coordination and communication skills Motivation to help community Incentives	Limited knowledge and skills Pre-service education; Capacity coverage monitoring Technical knowledge, roles and social context Problem solving skills Cultural barriers to openness to change Appraisal reward system Influential blockers Workload
Health system characteristics	Policies in place Partners	Coordination of partners Financial resources Health workforce coverage Logistic system capacity	Leadership Policy Government structure Advocacy SAM indicators included in the health management information system	Delayed budgeting Limited and top-down financial planning Operational planning of supplies Supply management and procurement
Broader context	/	Socio-cultural barriers Influence of community leaders Non-involvement of local groups Food insecurity	/	/

IMCI = Integrated management of childhood illness; IYCF = Infant and young child feeding.

Limitations

The case studies faced several limitations. First, the applied method was 'rapid' and therefore superficial for obtaining detailed results. However, we assume that the results are reliable because of the participatory nature of the exploration, looking for health actors' perceptions, and the large group of stakeholders involved. We therefore have amalgamated diverse perspectives on the various dimensions of the integration process.

Second, more time should have been given to adapting the method and tools to the local contexts. Guidance on generic indicators was not useful and created confusion, and the adaptation should have been done prior to the case study. This would have facilitated the exploration exercise. Moreover, discussions were often cut short because of time constraints and therefore the results were not always as comprehensive as desired or expected. The fact that participants had limited exposure to participatory discussion methods, sharing of opinions and mental mapping techniques in the presence of peers may have influenced their contribution.

Third, system dynamics modelling and scenario testing necessitate the participation of key actors. Because the activity was unexpectedly delayed in Nepal because key actors were not available until after this submission, the exercise will be further developed later and submitted for publication. Fourth, the purposive selection of the districts and health facilities was influenced by the limited time scheduled for the field visits. Also, it was not possible to study the effect of integration of SAM interventions on improvement of health services, system performance or health status using this approach. Instead, national health indicators were explored to understand the health context.

Finally, the case study protocol was not reviewed and approved by an ethics committee because the studies did not involve biomedical research on human subjects. However, the ministries of health and their partners were informed prior to the activities, provided written or oral consent and participated in all steps.

Conclusions

The case studies were a good first test of how to operationalise the assessment of integration progress with a systems lens and simultaneously learning on the subject through reflection by doing. The case study investigation largely depended on the tacit knowledge and perceptions of participants and actively engaged them, limiting the depth of the investigation but less so the reliability of the information, considering the large number of health actors from different levels of the health system that were involved.

The participatory exercise of this mixed group offered learning by doing and improved our and their comprehension of a complex (wicked) problem of integration of SAM. In addition, the case study application was especially useful for participants to learn about integration and apply systems thinking, which will be useful for other applications in their work. For us, it generated causal understanding of integration and identified recurrent patterns that provided wider learning on the integration process.

The case studies were a first participatory exploration of the SAM integration process that was conducted in a short time span. The method and tools should be adapted to every new context. Moreover, the method should not become another assessment tool for the overburdened health service monitoring system. The case study's aim was to inform policy-makers and managers about the integration situation so they could use the information to adjust policies to improve quality, equity and coverage of SAM services sustainably. At the same time, the case study strengthened knowledge but also skills in systems thinking, encouraging participants to apply creative systems thinking to solve daily problems.

CHAPTER 7

Applying simulation modelling to understand severe acute malnutrition integration

This chapter presents a case study that applies agent-based modelling (ABM) to study system dynamics and its contribution to the understanding of integrating severe acute malnutrition (SAM) interventions into national health systems, and the refinement of the initial theory.

i. Introduction

The intention of applying ABM to our inquiry in the understanding of the integration of SAM interventions into national health systems is to explore system dynamics over time and test and learn from scenarios that mimic patterns we had identified in the case studies. We expect that ABM of micro-level system dynamic behaviour over time will uncover unexpected patterns (besides the expected patterns) that influence the meso-level system. The ascending learning from ABM that is generated from the micro level to the meso level will then complement the descending learning from the framework and descriptive system dynamics learning.

In a first step, based on both expert knowledge and scientific evidence, a simple agent-based micro-level model was developed that mimicked interactions between one health centre (agent) and its health workers and SAM children (agent) and their carers in isolation. Both agents have two characteristics (variables) related to SAM interventions and interact based on if-the-else rules. First, interactions were based only on transition probabilities, leading to a simple Markov model. Next, more elaborate rules were introduced, taking advantage of the specific features of ABM. By introducing interventions, the method allowed studying how the system readjusts and finds a new equilibrium.

In a second step, the model was expanded to the meso level, mimicking interactions and follow-on behaviour of more than one health centre and their health workers, and children with SAM and their carers.

The aim of the case studies is to illustrate the actual benefits and limitations of ABM to inform complex SAM interventions strategy designs, and explore the understanding of how a package of SAM interventions that address demand-side and supply-side barriers may improve SAM integration.

ii. Methods

The successive models developed in this study resulted from structured discussions of characteristics of and barriers to the implementation of SAM interventions. We used parameters of key indicators from Niger, representing a high-burden, low-income country.

Agents

A micro-level model was developed with two agents—the child with SAM and his or her carer and a health centre—each having two attributes. The child with SAM has awareness of the illness and access to the health centre (distance). The health facility provides care at a certain level of quality and has staff with a certain level of motivation (Figure 7.1).

 Child with SAM	Awareness	Knowledge of the SAM disease, need for treatment, and where to seek care
	Distance	Physical and financial access to the health centre
 Health centre	Quality of care	Adherence to treatment guidelines, skills
	Staff motivation	Supportive supervision, workload, benefits

Figure 7.1. Two agents with characteristics related to SAM interventions

Interactions

Children and health centres interact and define a typical treatment pathway with four health states: untreated, admitted (for treatment), recovered and died (Figure 7.2). The rules indicating the transition between health states are referred to as case fatality when untreated (R_1), coverage (R_2), defaulting (R_3), case fatality in treatment (R_4) and recovery (R_5). In addition, R_{inc} indicates incidence and R_{rec} indicates spontaneous recovery of children with SAM living in the catchment area of a health centre. The catchment area of a health centre is defined as the area of residence of its users. Agents are linked to one health centre.

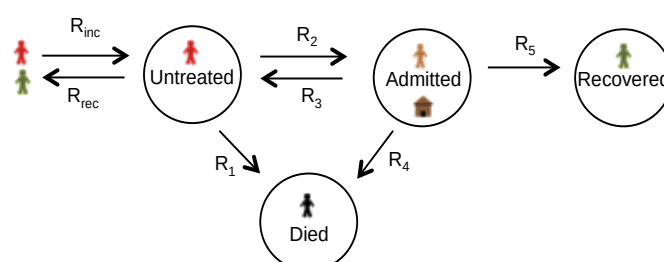


Figure 7.2. Treatment pathways of severe acute malnutrition (SAM) in children under 5 transitioning from untreated to admitted, died or recovered states

R_1 = Case fatality untreated; R_2 = Coverage; R_3 = Defaulting; R_4 = Case fatality in treatment; R_5 = Recovery.

Transition rules with thresholds of acceptability have been developed based on international standards and parameters of SAM in children under 5 in high-burden, low-income countries (Table 7.1).

Table 7.1. Definition and probability estimates of transition states of severe acute malnutrition (SAM) in children under 5 in high-burden, low-income countries

Code	Transition rules (rate)	Definition
R ₁	Case fatality untreated	Proportion of children with untreated SAM who died of SAM disease
R ₂	Coverage	Proportion of children with SAM who were admitted for treatment
R ₃	Defaulting	Proportion of children with SAM who ended treatment against medical advice
R ₄	Case fatality in treatment	Proportion of children with SAM in treatment who died of SAM disease
R ₅	Recovery	Proportion of children with SAM whose health was restored after treatment
R _{rec}	Spontaneous recovery	Proportion of children with SAM who spontaneously recovered without treatment
R _{inc}	Incidence	Proportion of new SAM cases in a given time period

^a Coverage, in this study 'contact coverage', is an indicator of the effectiveness of community-based interventions that measures service access and use; ^b Recovery of SAM is an indicator of the effectiveness of facility-based interventions. A child who has recovered is clinically well, has no oedema and/or has improved mid-upper arm circumference (MUAC) ≥ 125 mm or weight-for-height z-score (WHZ) ≥ -2 .

Micro-level model

The micro-level model was developed to mimic treatment pathways with interactions among individual factors and intervention levers (Figure 7.3). Counselling and engagement are examples of interventions acting on the child's awareness, and transport means and decentralisation are examples of interventions acting on access (distance). Supervision and benefits are examples of interventions acting on health centre staff motivation, and training is an example of an intervention that acts on quality of care.

Three outcomes of interest were monitored to assess the simulation evolution, together with the possible impact of health interventions: overall case fatality, coverage and recovery. Figure 7.4 provides the pseudo-codes of the micro-level model.

Meso-level model

The micro-level model was then expanded to mimic a health district, where more than one health centre interacted with the children in their catchment area to address SAM (Figure 7.5).

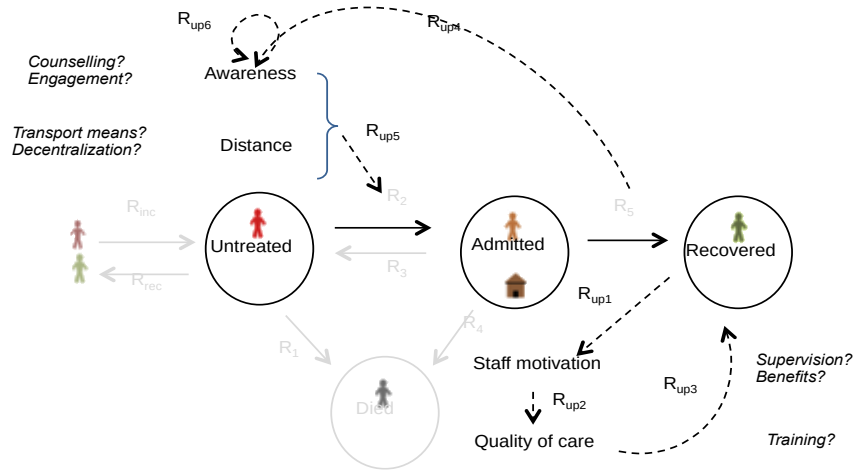


Figure 7.3. Agent-based micro-level model treatment pathways with interactions of individual factors and *intervention levers* (in italic)

R_1 = Case fatality untreated; R_2 = Coverage; R_3 = Defaulting; R_4 = Case fatality in treatment; R_5 = Recovery; R_{rec} = Spontaneous recovery; R_{inc} = Incidence; R_{up1} = Recovery change; R_{up2} = Staff motivation change; R_{up3} = Treatment success; R_{up5} = Admission chance; R_{up6} = Community behaviour change.

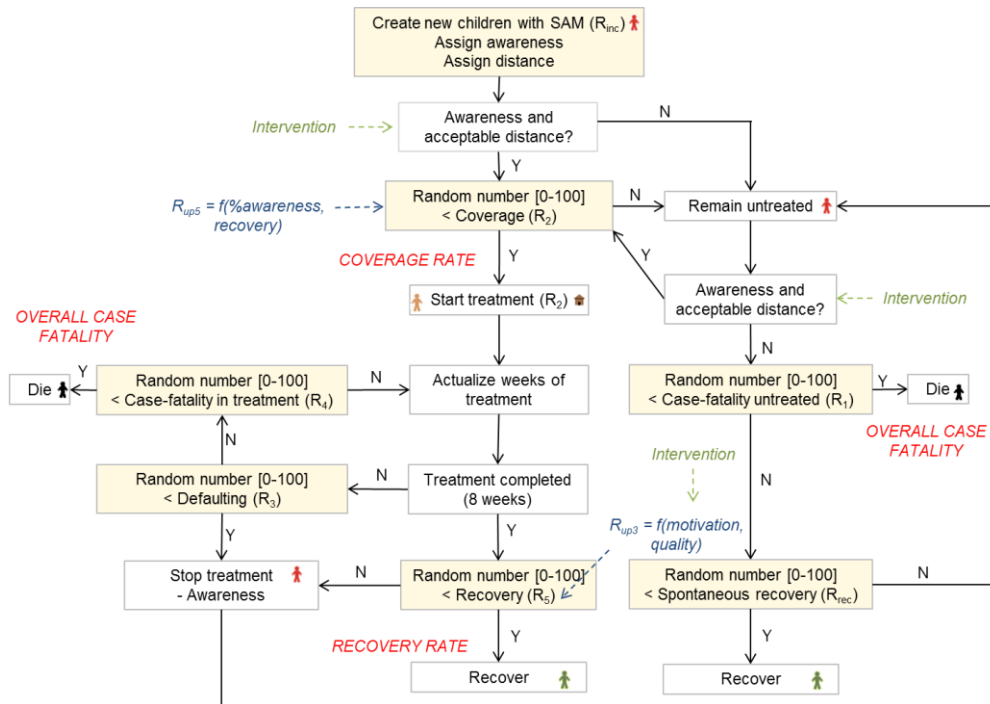


Figure 7.4. Flow chart of the agent-based micro-level model

R_1 = Case fatality untreated; R_2 = Coverage; R_3 = Defaulting; R_4 = Case fatality in treatment; R_5 = Recovery; R_{rec} = Spontaneous recovery; R_{inc} = Incidence; R_{up3} = Treatment success probability due to quality of care; and R_{up5} = improved chance for admission when aware and acceptable distance.

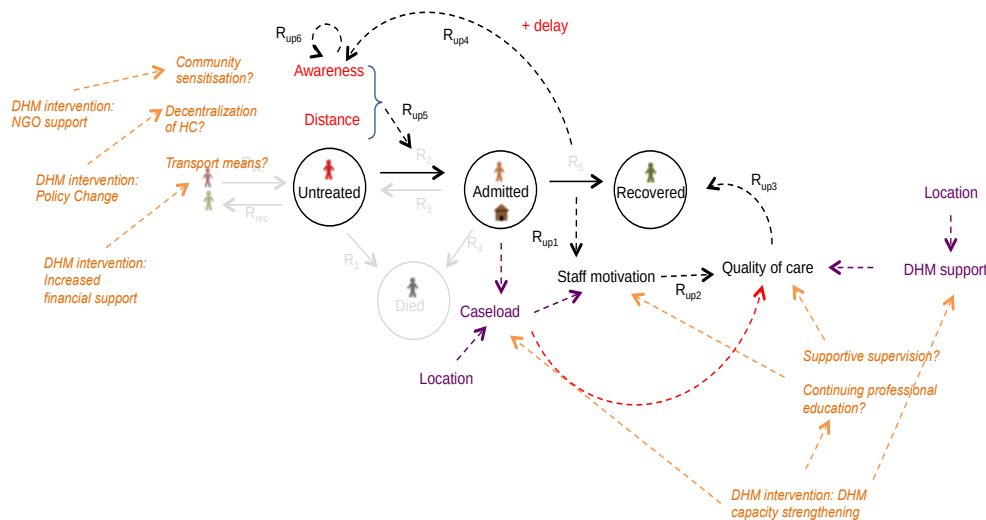


Figure 7.5. Agent-based meso-level model treatment pathways with interactions of individual factors and *intervention levers* (in italic)

Specifications of the meso-level model can be summarised as follows:

Definitions or characteristics:

- District health management (DHM) support consists of supportive supervision and continuing professional education;
- DHM capacity strengthening consists of strengthened leadership and improved organisational management for finances, information, supply and human resource management; and
- Caseload is the number of cases in a day or week. A high caseload means that a higher number of cases attend the health centre than the staff can manage.

Intervention levers:

- Supportive supervision and continuing professional education (CPE) impact staff motivation and quality of care;
- Supportive supervision and CPE are influenced by district level intervention (DHM capacity strengthening); and
- Community engagement, decentralisation and transport means are influenced by DHM capacity strengthening.

Assumptions:

- Caseload: the further the child lives from the health centre, the smaller the population, and the fewer the cases; and
- DHM support: the further the HC is from the centre of the district, the higher the risk of receiving less DHM support.

iii. ABM of a health system at the micro level

Deconinck H, Van Malderen C, Speybroeck N, Macq J, Chiem J-C. Agent-based modelling to inform health intervention strategies: The case of severe acute malnutrition in children in high-burden low-income countries. *Agent-Based Modelling in Population Studies*: Springer International Publishing; 2016. p. 461-86.

iv. ABM of a health system at the meso level

Building on the first application, we expanded the model to the meso level by scaling up services representing a health district with more than one health centre interacting with its clients (children with SAM and their carer). In a first step, the simulation ran the initial micro-level model with one centre and no intervention (Figure 7.6.). Results showed that outcome variables of recovery stabilised around 50%, outcome variables of coverage around 60% and outcome variables of case-fatality in the community around 50%.

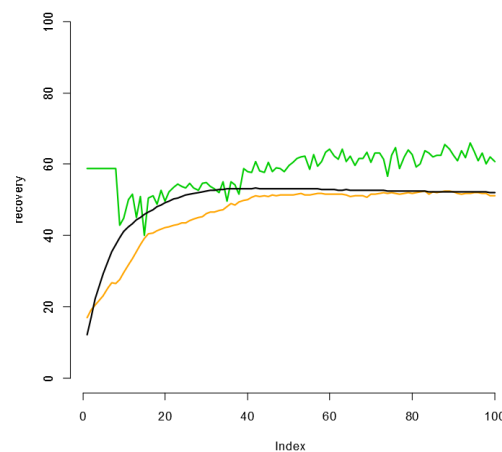


Figure 7.6. Results of recovery (green line), coverage (yellow line) and case fatality (thick black line) with one centre and no intervention

In a second step, two parameter changes in the initial model were introduced:

1. To avoid too much variation in quality of care during simulation, we adapted parameters for quality of care when staff motivation was high or low; and
2. To avoid too much variation in awareness during simulation, we adapted parameters for awareness when cure rate was high or low.

Three health centres with the same incidence and initial characteristics and rules were simulated. All three health centres had values of quality and motivation set at 50, and all children had values of awareness set at 30 and of distance set at 50. Results showed that recovery and coverage were slightly worse than the results for one centre (Figure 7.7).

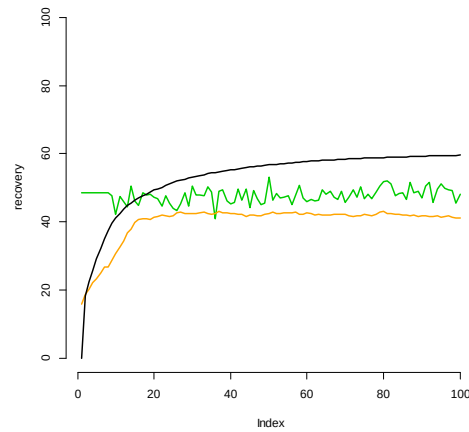


Figure 7.7. Results of recovery (green line), coverage (yellow line) and case-fatality (thick black line) with three health centres and children with equal values for quality (50), motivation (50), awareness (30) and distance (50)

In a third step, **rivalry** was introduced. Children frequented their own health centres unless quality was less than (<) 50 and health centres with quality higher than (>) 50 were accessible. The model simulated that choice of better quality care would improve recovery and thus awareness of the community and staff motivation, therefore improving quality. Results showed that when all admissions happened in the same centre with the better quality, recovery was indeed better, but coverage and case-fatality remained similar (Figure 7.8).

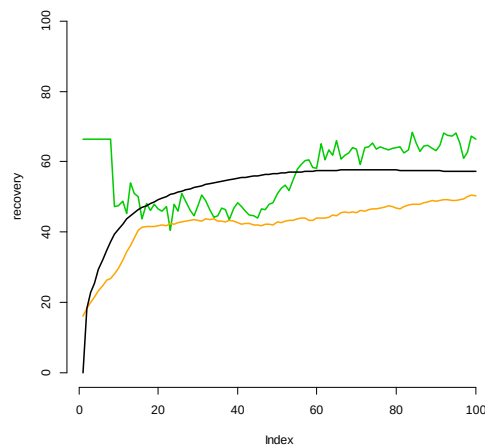


Figure 7.8. Results of recovery (green line), coverage (yellow line) and case-fatality (thick black line) when the model added rivalry

In a fourth step, the model introduced **caseload**. It was assumed that caseload higher than capacity would affect quality and then the other characteristics. If the number of admissions exceeded 35 (total number of admissions at the end of the simulation divided by 3), then the quality would decrease proportionally to the number of excess children every month (e.g., $(50-35)/100 = -0,15$). If the number of admissions was <35 , then quality would increase proportionally to the number of children every month (e.g., $(35-10)/100 = +0,25$). The results in Figure 7.9 showed that there was no advantage from the choice of a centre with better quality. The advantage of dominance of one centre did not seem to persist over time.

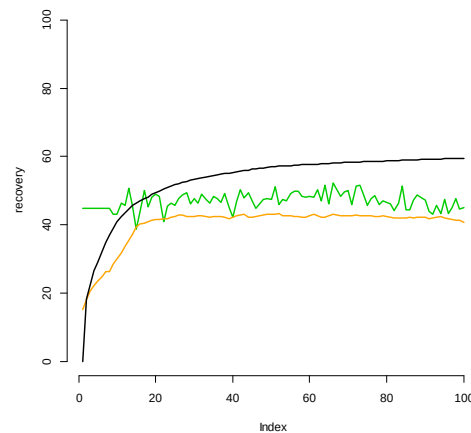


Figure 7.9. Results of recovery (green line), coverage (yellow line) and case-fatality (thick black line) when the model added rivalry and caseload

In a fifth step, **location** was introduced. One centre was close (quality 70, motivation 70, awareness 30, distance 50, capacity 70) and two centres were remote (quality 50, motivation 50, awareness 30, distance 50, capacity 35). The results in Figure 7.10 showed that both recovery and coverage were better than in the other models, but these results were not sustained. This may be because the centre with higher quality attracted children, then lost its advantage because of increased workload, which resulted in children returning to the poorer performing centres. Recovery remarkably stabilised at a much lower level than in any of the previous models.

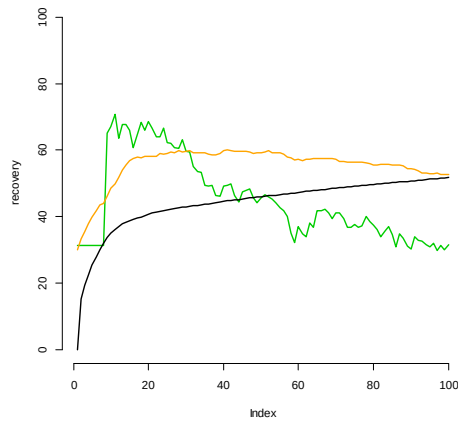


Figure 7.10. Results of recovery (green line), coverage (yellow line) and case-fatality (thick black line) when the model added rivalry, caseload and location

In a sixth step, the following three scenarios were tested to overcome the bottlenecks:

- Increasing the capacity of the closest centre (value 140 instead of 70);
- Increasing the quality and motivation of all centres, and increasing the awareness and reducing the distance of the remote centres; and
- Maintaining intervention 2 and increasing the capacity of the closest centre (value 140 instead of 70) and of the remote centres (value 70 instead of 35).

The results in Figure 7.11 showed that for intervention a) the closest centre remained dominant and sometimes attracted children from the other areas, and case-fatality decreased considerably; for intervention b), there were improvements except for recovery, which may be because of increased caseload; and for intervention c), all three centres achieved high quality and had good capacity, which resulted in good coverage and recovery and case-fatality that steadily decreased.

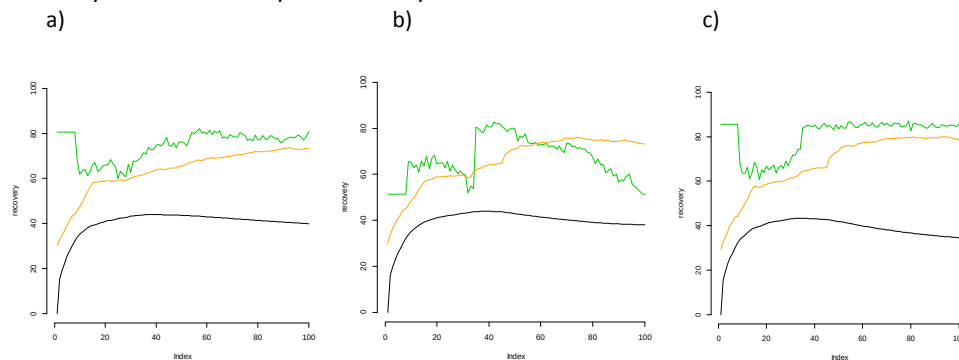


Figure 7.11. Results of recovery (green line), coverage (yellow line) and case-fatality (thick black line) with the three interventions

v. Discussion and conclusions

The emergent system behaviour that was explored by ABM clarified several issues. The first micro-level model mimicked a situation in which one health facility was supported to provide SAM case management as if it were in isolation. The micro-level model was then expanded into the meso-level model that mimicked a health district with elements of rivalry, location and caseload, and district health office (DHO)-led interventions added. Two important elements that affected the system dynamics were introduced:

1. A spontaneous creation of a network around health centres for which there was no support intervention from DHO but with more favourable distance to the DHO (closer to the district centre) receiving more easy support and supplies; and
2. A DHO to regulate health centres performance by implementing different strategies that influence service demand and offer.

Results from the meso model were encouraging and strengthened earlier findings on the benefits of the use of this method for the micro-level model [245].

Comparing ABM with the two standard methods of scientific enquiry, deduction and induction (deduction involves specifying a set of propositions and proving consequences that can be derived from those assumptions, whereas induction involves the discovery of patterns in empirical data) finds some elements of both methods. ABM, like deductive methods, starts with a set of explicit assumptions but does not then go on to test and prove theorems. Instead, ABM generated simulated data that can be analysed inductively. But unlike induction, simulated data come from a rigorously specified set of rules that mimic the real world rather than directly measuring the real world. The purpose of induction is to find patterns in data and that of deduction is to find consequences of assumptions; the purpose of ABM is to aid intuition [81].

The study faced several limitations. Results were promising, but more exploration is needed to better understand the system dynamics and extract learning that is generalizable. A sensitivity analysis would have been needed to study how the uncertainty of the output of the final models can be assigned to different sources of uncertainty in its inputs. Moreover, before further exploration, we want to present the model to an expert audience for participatory development and reflections on outcomes of the tested models. Mutual agreement on parameters, attributes and assumptions would be needed to mimic a real-world setting to the best of our knowledge.

To conclude, applying ABM created several learning opportunities. First, the conceptual model that 'fed' the simulation was an important opportunity for the experts involved in the exercise to both learn and share knowledge, as it demanded thinking concretely through the various steps in collaboration. The discussion and mutual learning and understanding fostered new knowledge (ontological learning). Second, the simulation outcomes showed that some results of observed behaviour over time were expected

(deterministic). In other words, if we do some interventions and we get the expected improvements, then there was no particular learning. Some observed behaviour was unexpected, and ABM helped to explain it, which added to ontological learning. By modelling the tacit knowledge of experts, we were able to show and explain new emerging knowledge. In this case, it would have been useful to profit from this learning by making a 'quick list' of unexpected system behaviour that opened avenues for further learning to continue expanding knowledge.

PART III. DISCUSSION AND CONCLUSIONS

CHAPTER 8

Wrapping up learning

This research study explored pathways of integration of SAM interventions into national health systems by applying various theoretical lenses of systems thinking. The research questions proposed at the start of the study were:

What pathways improve the integration of SAM interventions for children under 5 into national health systems in high-burden low-income countries?

Specifically:

- What can we learn from the integration of SAM interventions to date?
- What can we learn from the integration of other targeted health interventions?
- Does systems thinking contribute to understanding SAM integration?

These questions lead to the initial theory:

If health actors have a shared understanding of the integration pathways of SAM services in a given health system, then they can have a shared strategic vision of integration and propose customized, adapted interventions that seek the optimal modality and degree of integration in terms of need and capacity of the health system by applying systems thinking.

The expected result of this research was the formulation of a theory or set of theoretical propositions to explain the recurring patterns of SAM intervention integration processes discovered by the various study methods. Because the study was a first exploration of the topic, it did not cover the full spectrum of the research investigation but must be seen as a necessary step to guide future research.

This chapter summarises understanding of the integration of SAM interventions, shares lessons learned from applying the methodological approach, including limitations, and ends with recommendations.

i. Synthesis of understanding of SAM integration

This section examines whether the study answered the questions in the introduction of this chapter. It proceeds first through the steps of the exploration and examines the contribution of each step to the understanding of integration of SAM interventions. Next, it examines how the recurring patterns identified in the different steps by the various study methods were able to refine the theory.

Exploring SAM integration

The first step explored the concept of integration and its attributes in the literature and the evidence of its effects in a scoping study. Integration had various meanings and characteristics, but there was agreement that integrated health services were desirable for clients to receive cost-effective continuity of care that responded to their needs and expectations. It was generally assumed that integrated services promoted collaboration, teamwork and rationalised use of limited resources that then contributed to improved sustainable services at scale. We identified the following modes of integration of interventions: add-on (unidirectional) or merged (bidirectional) services; a package of services, a one-stop-shop (single provider) or referral-based services; a continuum of non-integrated through partially to fully integrated services; and vertical, horizontal, mixed (diagonal) or virtual integration.

Different dimensions of integration indicated the importance of looking at integration beyond service delivery at the different levels of health system structures, functions and actors to understand the complexity of multi-level integration. At the micro level, from the perspective of the client, clinical integration of SAM means comprehensive care across time, space and the lifecycle was provided. Professional integration means working in collaboration or in teams, and combining and sharing tasks, information and resources. Organisational integration is forming working alliances. Systemic integration is coherence of policies rules and regulations. Functional integration aligns funding, information, human resources and supply systems. Normative integration ensures shared values, culture and vision. Because integration of health interventions is a process, the intensity of integration across dimensions and tiers is not homogeneous; it is more complex than the yes-no binary form. The extent of integration could be examined by level of interaction on a continuum of none through partial to full, with progress monitored. Determinants, or factors, that boost or hinder the integration process, which may explain the patchwork result of the extent of integration. Factors that affect the extent and speed of integration may relate to the health problem, the interventions, the adoption system, health system characteristics or the broader context.

The policy map found a large basis of guidance and tools that had been developed to support planning, implementation, scale-up and evaluation of SAM case management. Most SAM policies and guidelines were based on evidence from biomedical or effectiveness studies with a probabilistic nature. These explained whether interventions

worked but not how and why they worked under what circumstances. While integration of SAM interventions was often discussed and put high on the research agenda, there was limited guidance based on understanding. A wealth of guidance and evaluations on SAM implementation existed, but not on how to assess the need and improve integration or what modalities to consider. The current guidance focused on scaling up SAM case management based on best practice, and on integrating SAM into an existing package of iCCM, and IYCF into SAM case management.

The evidence map of health service integration provided learning on the various modes of integration of services and found positive perceptions of integrated services but small gains on effectiveness or added value. The literature on integrating SAM services into primary care as a new intervention (or into secondary care as a newly adapted intervention) studied mostly service outcome (contact coverage; barriers to access to services; and performance indicators of recovery, case-fatality during treatment and defaulting indicators; and capacity by number of admissions) and usually found good results. Three studies reported on cost effectiveness. Evidence of SAM treatment integration came from two studies, one on integrating treatment of SAM into iCCM in a pilot setting and one integrating HIV testing and treatment into SAM case management in a hospital setting. Both studies showed promising results. The studies deduced whether SAM service integration worked (or not), but did neither explain how or in what circumstances the service outcome came about, nor provided guidance for other settings. They studied neither sustainability nor the contribution of technical and financial support to the outcome. Evaluations of the countries studied identified that similar support for SAM interventions had been provided, but the modality of introduction (emergency or development context), and breadth (amount), depth (detail) and duration (in years) type of technical and financial support differed.

Policies and strategic plans for integrating SAM focused on service delivery and were described in national guidelines. SAM services were provided in determined geographical areas or countrywide and/or scaled up in phases that partially or completely covered the health districts or facilities in the country. Global and national guidelines (policies) provided details on how to plan, implement and monitor SAM treatment, but missed out on how to achieve integrated comprehensive child healthcare through, e.g., collaboration and teamwork of health actors, pooling of resources. SAM services were assumed 'integrated' if the SAM care package was provided in government-run facilities and the components linked by an established referral system. However, the gap in policy implementations was not addressed. Agency-specific guidance might cover how to introduce (assess capacities), manage, implement and scale-up SAM case management, but not whether, what and how to integrate depending on need and capacity and how to assess, improve and monitor it.

Mixed integration modes in place: SAM services were 'added-on' in primary care and secondary care, or 'referral-based' when treatment was provided in a different location. In fact, in many hospitals, SAM services were provided separated from paediatric departments with own staff, supply and support systems, different from the paediatric

ward (often far better equipped), in which case this could be considered as a not integrated or stand-alone service. Community-based service components (e.g., community involvement, demand generation, promotion of healthy behaviours, detection of SAM and referral, home visits for problem cases, nutrition counselling) were 'referral-based' integration services set-up in parallel systems and managed by (international) NGOs because they had the capacities. Key elements of concern included external emergency funding with short-term cycles of technical and supply support, with supplies accounting for one-third of the cost of SAM treatment.

The global map of systemic integration progress resulting from SAM-specific support interventions revealed a certain level of integration (whether planned or spontaneously evolved) and a mixed picture of progress. Because integration was almost always assessed from a SAM-specific focus, it was not possible to judge whether the mode of integration balanced the need and capacities, or achieved comprehensive child healthcare. For example, SAM may have been added to health policies under the nutrition pillar but not the child health and disease pillar; the division of child health and nutrition in separate pillars was common, which may have emphasised the importance of interventions but may have hampered comprehensiveness of continuum care.

The scoping study concluded that understanding factors (and their interactions) that influence the extent and speed of the integration progress would allow health actors to strategize integration based on need and capacities. It also suggested applying systems thinking, because SAM interventions are complex as their integration into a complex health system creates unpredictable consequences. The scoping study retained six questions to be answered by empirically exploring pathways of SAM integration into national health systems:

1. In which context is SAM integrated?
2. Is integration set as a goal, and if so, why and how?
3. What is the extent (and trend) of the integration process?
4. What factors facilitate or hinder the integration process?
5. How do factors that influence integration interact?
6. What scenarios can be identified to improve SAM integration, and what strategies can be proposed to overcome unintended consequences?

At the end of the learning process, we expected to provide policy guidance to improve the integration process and/or to recommend steps for further investigations.

The **second step**, the scoping study informed the **building of the initial theory** and theoretical framework. Prior learning and the scoping study identified analytical frameworks, indicators and system dynamics models for use in the empirical explorations.

The following initial theory was proposed to explore in empirical case studies how and why a certain outcome of SAM integration was produced:

If health actors have a shared understanding of the integration pathways of SAM interventions in a given health system, then they can have a shared strategic vision of integration and propose customized, adapted interventions that seek the optimal modality and degree of integration in terms of need and capacity of the health system by applying systems thinking –that will contribute to improving sustainable quality services at scale.

The research questions informed then the choice of research methods and the development of data collection and analysis tools.

The **third step** explored the breadth and depth of the integration of SAM interventions into Niger's national health system to test the initial theory (including an in-depth study on one factor inhibiting integration). We first investigated the SAM burden, intervention strategy and performance, policy context and health actor involvement. We then measured the extent of integration and explored factors that influenced the integration progress and trend. A multi-framework approach studied systemic, organisational, functional, professional and clinical integration from a national and district perspective.

Niger's SAM guidelines described a clinical integration strategy. Interventions to treat complicated and uncomplicated SAM were to be provided in all health facilities of the country in either an 'add-on' or a 'referral-based' mode (e.g., in health posts without a nurse) with a referral and counter-referral system between the care components. Community-based SAM interventions, beyond the health posts, were to be provided through community outreach, which in practice was limited to child health days or outsourced to NGOs. The latter implemented community interventions in a parallel system with a referral-based mode for linking with treatment interventions.

The extent of integration was assessed over three time periods (2007, 2010 and 2013) and showed a patchwork of mixed progress. Full integration was achieved in four health system functions, partial integration in 22 and no integration in three, with six functions showing stagnation over the three time periods. Factors that facilitated integration were knowledge and recognition of the SAM problem supported by accurate information; effective decentralised continuity of care; compatibility with health actor goals, support and involvement; and leadership for aligning policies and partners and mobilising resources in a favourable political context driven by multisectoral development goals. Factors that hindered integration were incomplete understanding of the severity of the SAM problem and its causes and consequences; limited utilisation of and trust in health interventions; high health worker workload, turnover and attrition; and high dependence on short-term emergency financial and technical support in a context of high demographic pressure.

The case study concluded that SAM integration in Niger had progressed well with limited integration-specific support but then stagnated. SAM-specific support interventions improved integration spontaneously up to a point, but sustainability of service quality and inadequate financial and technical support to mainstream SAM case management

remained a major concern. The same problems had been identified before but the proposed linear solutions never broke the impasse to cover the unmet needs. The case study, apart from exploring integration pathways for the study, created an opportunity for participants to increase their understanding of integration and applying systems thinking. Moreover, it brought forward the question whether all functions and aspects of SAM interventions had to be integrated, and that based on need and capacity a strategy with a common vision on integration and sustainability had to be conceived. The case study approach offered very different insights on the same issue compared to the usual assessments and therefore is complementary beneficial to identify weaknesses and opportunities to unlock untapped capacities for sustained change.

In the **fourth step**, two case studies in Nepal and Burkina Faso explored the integration of SAM interventions into the national health systems by testing the initial theory with a framework and a system dynamics approach. A rapid and participatory assessment explored perceptions of integration dimensions (systemic, organisational, functional, professional and clinical) at the national governance level, district management level and service delivery level (community and facility-based primary care and secondary care), as well as factors that facilitated and hindered the integration process. The collaborative investigation involved a large group of health actors from various backgrounds who 'learned together by doing' by applying a systems thinking lens and conducting a causal loop analysis to explore the complexity of the health system. Causal loop diagrams described interactions of factors that influenced integration and allowed thinking through probable scenarios and their effects to recommend actions to anticipate negative effects. Participants found the CLD method innovative and eye opening, and understanding and applying systems thinking to deal with complexity inspiring, even if the results were incomplete or not comprehensive, the discussions were very rich. The exercise gave insights into finer-grained explanations of a complex (wicked) problem and the inadequacy of linear solutions to solve complex problems. In addition, participants were given the opportunity to learn about integration and apply systems thinking tools that are not SAM-specific, and can be applied to any health problem. For example, these tools would be useful in the sectoral translation and integration of activities of the multisectoral nutrition strategy.

The **fifth step** explored the integration of SAM interventions with agent-based modelling progressing from a micro-level model to a meso-level model mimicking a real-world situation. The first model mimicked a health facility environment with two agents: 1) children with SAM and their carers that were aware of the illness and the treatment pathway and lived a certain distance from the health centre and 2) a health centre that provided quality care and had motivated staff. Outcomes of interest were coverage, recovery and case-fatality.

Multiple scenarios were investigated using varying parameters and mimicking rules of interventions to improve child health-seeking behaviour (e.g., providing counselling and assisting with transportation) and health centre performance (e.g., providing training and improving supervision). Results pointed to synergies between interventions that improved

early start of treatment and increased recovery from SAM. When these interventions were adequately combined, outcomes of coverage, recovery and overall survival improved.

Building on the first application, the second model was expanded to represent a health district environment with more than one health centre interacting with its clients. Subsequent steps started from the basic model of one centre and no intervention. Results showed first the baseline outcome variables of recovery, coverage and case-fatality in the community. Second, we simulated three health centres with the same incidence and initial characteristics and rules. Recovery and coverage were slightly worse than the results for one centre. Third, we introduced rivalry between centres based on quality, with children and their carers choosing health centres with better quality. When all children were admitted in the centre with the better quality, recovery was indeed better, but coverage and case-fatality remained similar. Fourth, we introduced caseload, assuming that health centres with a caseload higher than their capacity would affect quality and then also the other characteristics. Results showed no advantage from the choice of a centre with better quality, and the superiority in quality of one centre did not persist over time. Fifth, we introduced close and remote location of health centres that facilitate or hinder access. Both recovery and coverage were better in the close located health centres than in the remote located one but these results were not sustained. This may be because the closer centre with better quality attracted children but then lost its advantage because increased workload affected health worker performance, which resulted in children returning to the poorer performing centres. In a sixth step, various scenarios were tested to overcome the bottlenecks. Increasing capacity alone or quality and motivation of staff alone did not improve outcome. Increasing quality and motivation of staff in all centres, increasing awareness and reducing the distance of the centres produced the best outcome.

The case study showed that expanding and changing the ABM model by introducing different factors that influence integration generated new learning each time. It showed ABM's potential to test scenarios by adapting intervention strategies or changing policies and to learn from emerging patterns of new behaviour. As models were based on simple rules, they did not provide a full or realistic picture of a real-world setting, but they added learning from testing scenarios that could not have been possible otherwise. Also, the testing of scenarios was not comprehensive, and learning was not complete. More scenarios could have detected new emergent patterns of behaviours that would have deepened our understanding.

Refining the theory

In this step, we synthesised learning from exploring pathways of the integration of SAM interventions into national health systems by applying various theoretical lenses and methods (discussed in the next section). Empirical exploration of the initial theory identified the following patterns that influenced the integration process:

- **Comprehensive child healthcare balances SAM as public health priority (the problem)**

If SAM, as a primary cause of child death, is considered a public health problem and its burden is known, then health policies, strategies and budgets are better adapted to balance and coordinate child healthcare around people's needs. In high-burden countries, SAM is then prioritized as a childhood illness, together with diarrhoea, malaria and pneumonia, depending on the epidemiological picture. Child health initiatives coordinate comprehensive interventions and resources, adapted to local needs and populations to create effective networks among health, nutrition and other sectors and their actors.

If advocacy for comprehensive child health and nutrition services align and balance SAM (treatment burden, long-term health and cognitive consequences, adapted to the needs of vulnerable populations) with child health priorities, then priorities for SAM are better appreciated. Advocacy efforts do not succumb to (international) health and/or multisectoral lobbyists that crowd out one health priority or another, but instead create effective and balanced networks for comprehensive child health support.

- **A strong model of comprehensive child healthcare in primary care adopts SAM (the intervention)**

Understanding the breadth and depth of integrated comprehensive child healthcare and its benefits and risks encourages and enables health actors (policy makers, health managers and service providers) to identify opportunities to improve (simplify, align, rationalize) the care system and procedures. When integration of SAM is assumed, progress is not monitored or measured, and therefore there is no intent to improve it.

If health actors have awareness, skills, support and opportunity to understand comprehensive child healthcare, then health actors seek new balances by using resources across services (e.g., maximising person-time, funds and supplies), decreasing fragmentation of activities, increasing collaboration and teamwork and sharing tasks. Comprehensive care minimises missing opportunities for SAM treatment and maximises synergies and balances care adapted to the context.

Early detection of SAM and start of treatment is key to success of SAM effectiveness as it simplifies and shortens treatment, which then increases effectiveness, cost efficiency and retention in treatment and decreases workload, attrition and mistrust. Achieving this relies on community-based primary healthcare that may be weak or non-existent. Unpacking SAM care demystifies service complexity.

Some health actors see SAM interventions as a platform to add other elements of care (e.g., water and sanitation, infant and young child feeding, childhood TB and HIV). Some health actors see other health interventions (e.g., iCCM) as a platform

to add SAM interventions. Service delivery platforms offer comprehensive care, and add-on or merge health interventions, or refer clients according to the effectiveness and efficiency of the context to ensure continuity between services and professional teams in place time, and the lifecycle.

- **Motivating and empowering health actors stimulate comprehensive child healthcare (the adoption system)**

Integration has different meanings for different health actors. In most contexts, health actors consider SAM interventions to be integrated and therefore not in need of improvement. For example, health actors consider SAM interventions integrated when the services are provided in public health facilities or when detection and treatment of complicated and uncomplicated SAM are provided and linked by a referral system). Understanding the meanings of integration improves understanding of the actual situation, whether and how to improve it and what outcome may be expected. Understanding attributes of integration will encourage health actors to set integration goals and adapt policies and strategic planning.

If health actors at the various levels of the health system are informed about and understand integration—and are therefore skilled to assess, implement and monitor it—, then they will become active agents that strengthen integrated comprehensive child healthcare by identifying opportunities for synergies adapted to contexts (increased willingness and interest to working together and improved openness to change). Their actions will create opportunities for policy changes (bottom-up effect).

If SAM interventions are initiated and maintained because of (inter)national pressure and driven from the top down instead of in response to a recognised need from the bottom up, health actors are not encouraged to provide them as a routine daily service.

If communities and service users (SAM children with carers) are aware of their health needs, informed about care opportunities and trust the health services (because they offer comprehensive care), then they will increase service uptake and become active supporters (demanders) of comprehensive care, as they are alerted to taking advantage of opportunities.

- **Flexible health systems maximise synergies and optimise resources (health system characteristics)**

Health systems in low-income countries with high SAM burdens have similar weaknesses in key health system functions of governance, health financing, information and knowledge management, health workforce, infrastructure, equipment, drugs and supplies and service delivery. Most national SAM interventions are driven by international financial and technical support and supported by multisectoral initiatives under the Scaling Up Nutrition movement.

If the monitoring of SAM intervention effectiveness is expanded to include sustainability (an appreciation of external technical and financial inputs), and unintended effects are disclosed and opportunities for synergies identified, then health system functions may improve accountability and ownership.

Weak health systems have technical, financial and structural capacity gaps and rely extensively on technical and financial partner support. In general, national health budgets cover only a fraction of SAM intervention costs. There is a general major push for national health budgets to cover costly SAM supply needs. The intention however, is to increase independence and promote ownership and accountability (and support the local economy when RUTF is locally produced). However, it is not easy to understand the opportunity costs or sustainability of governments covering costs of RUTF without studying its long-term and (un)intended consequences. If done well, and the intended and unintended effects are explored, then changes in legislation for financial arrangements to cover RUTF may be durable. If not done well, then the move may be unproductive and possibly harmful. In addition, some organisational (transformational) changes in key health system functions may have no cost or may reveal dormant or untapped capacity and fiscal spaces that remained unexplored.

Flexible health systems consider strategic planning of integration by asking whether integration is desirable and opportune in the given capacity context, decide and plan how and what to integrate or contract out or opt for social franchising and expand partnerships. Interventions that are vertically and horizontally integrated across systems, organisations, services and actors create opportunities to minimise fragmentation and maximise the rational use of resources and create synergies avoiding or factoring in unintended consequences. Synchronising funding cycles and support opportunities with strategic planning cycles further strengthens capacities for implementation.

The SAM support package responds to the identified needs for SAM service delivery and yields good performance results. In addition, it contributes to the integration of SAM services and health system strengthening, but this is unintentional because few activities are specifically designed to measure or achieve this. Integration happens spontaneously up to a certain point and do not progress intentionally thereafter. Monitoring progress and intended and (negative) unintended consequences improves strategic planning and implementation.

- **Collaborative leadership with a vision creates networks and supports change to adapt policy design and implementation to changing contexts and needs (the broader context)**

Collaboration and teamwork can be promoted and learned through reflexion by doing. But managing the various vertically (and internationally) driven health

programmes (SAM support interventions) and health actors (including various technical and financial SAM partners with their own visions, results-based approaches and funding cycles) is complex and needs cohesive and skilled support if SAM integration is to be normalised across the vertical and horizontal levels of the health system. Linking, coordinating, integrating vertically driven programmes that function in short-term results-oriented environments in multisectoral strategies creates opportunities for health actors to study complex interactions, consider delayed effects and adapt to new emerging and changing environments.

Multisectoral partnerships create opportunities to access untapped capacities, align health actors and share responsibility and accountability. Multisectoral approaches have both stimulated and hampered SAM interventions at the national level but lacked sectoral leadership to link, coordinate or integrate multisectoral visions and activities for behaviour change. A strategic vision (and systems thinking skills) of how to plan the linking, coordinating, integrating process of a multisectoral nutrition strategy, and unstick implementation of these plans at the central level.

- **Systems thinking to manage complexity**

Applying systems thinking (identifying interactions among parts that affect the whole) helps uncover opportunities that may strengthen functions and structures. Health actors live and function in a complex environment and have not learned to address complexity, however they do it implicitly. Creating explicit awareness of complex systems and giving the tools and skills to apply systems thinking improve their regular tasks. The tendency to provide linear solutions to abstract problems is counterproductive. Accepting complexity and learning to manoeuvre within this complexity is rewarding and enlightening.

The analysis of these patterns led to the following refined theory:

Understanding integration pathways and the complexity of the health system environment enables health actors to ...

- *Recognise SAM as a public health priority that receives sufficient and balanced attention according to people's needs (the problem);*
- *Simplify SAM services to fit into comprehensive child healthcare (the intervention);*
- *Create motivated and empowered actors and teams to provide comprehensive child healthcare (adoption system);*
- *Flexibly adapt health system functions to changing contexts (the health system);*
- *Create collaborative leadership with a vision of networking and supporting change (the broader context); and*
- *Apply systems thinking as a tool to maximise synergies and minimise unintended*

consequences, and build skills to adapt integration strategies to fast changing complex contexts,

... which identifies customized, adapted SAM interventions that seek the optimal modality and degree of integration in terms of need and capacity of the health system by applying systems thinking,

... which improve integrated of SAM services,

... which contribute to sustainability of quality SAM services at scale that promote comprehensive child healthcare and improve child health outcome.

The refined theory is explanatory, as it was developed by exploring pathways (what factors influenced the integration process and how) of outcomes (level of integration of SAM into key health system functions and performance of SAM services). It provides an abstraction of the findings of the study in terms of what works for whom, how and why. The refined theory is a theoretical proposition that is abstract enough to be transferred and applied to other contexts and be further refined by subsequent inquiries.

Table 8.1 provides examples of findings from the case studies that through generative causation of empirical data identified recurring patterns (demi-regularities) and formulated theoretical propositions. Examples were both positive and negative for the same proposition, and were often valid across contexts, proving their abstractive strength. In addition, the examples were equally relevant for integration as for SAM implementation support and system strengthening, indicating the fuzzy concepts with indistinct boundaries.

Table 8.1. Examples of generative causation that identified recurring patterns (demi-regularities) in the process of severe acute malnutrition (SAM) intervention integration across the case studies

Niger	Burkina Faso	Nepal	ABM
Recognise SAM as a public health priority that receives sufficient and balanced attention according to people's needs (the problem):			
In 2007, after 2 years of ignoring SAM, the new government acknowledged the nutrition crisis and recognized SAM as a public health problem, was a tipping point to integrate SAM.	No SAM surveillance system was in place until recently, but the ripple-effect of the Sahel nutrition crisis and the response in neighbouring countries gradually raised awareness of the burden, which had previously gone unnoticed, with a focus on preventive multisectoral nutrition.	The first pilot district generated SAM prevalence information and made the SAM burden visible. The 2015 earthquake generated resources that enabled SAM monitoring and further exposed the problem.	Awareness of treatment opportunities and the visible recovery of SAM children increased the visibility of SAM as a problem.
Simplify SAM services to fit into comprehensive child healthcare (the intervention):			
The delay in accepting MUAC as an independent indicator to identify children for start of SAM treatment increased workload, justifying the demand for partner support.	The delay in detecting SAM because of limited community screening complicated treatment.	The few nutrition rehabilitation homes were linked with hospitals, while outpatient care provided in primary healthcare was not considered difficult or different from other child healthcare; Simplified treatment created financial space and reduced level of effort.	Skill development improved quality and reduced level of effort that allowed treatment of more cases and also attracted more cases.
Create motivated and empowered actors and teams to provide comprehensive healthcare (adoption system):			
If SAM activities were partner driven, interruptions in partner support or funding made services deteriorate or collapse.	Providing training and improving supportive supervision were motivating.	District health management teams (DHMTs) had public health backgrounds with skills to manage multiple vertical programmes adapted to the context.	Motivation of staff is closely interwoven with all factors and is sensitive to change.
Flexibly adapt health system functions to changing contexts (the health system):			
Decentralisation of SAM care to health posts was demand driven, but weaknesses in referral or supplies hampered quality.	The culture of top-down policies facilitated absorbing new activities without questioning why and how, as the MUAC debate revealed.	Central management of vertically driven health programmes and limited budget flexibility did not encourage local problem solving.	Changes in factors such as quality of services, transport means and supervision have immediate and longer-term effects on service use and effectiveness.
Create collaborative leadership with a vision of networking and supporting change (the broader context):			
Academics were involved in guideline	SAM decision makers, managers and focal	The public health background of	DHMT not only influences quality and

development but not training; internationally driven research missed local linkage; Most SAM decision makers and managers were medical doctors, some (with a public health background, which enabled comprehensive clinical care. Focal points, on the other hand, were preventive nutritionists with weak links to and influence within and across the tiers of the health system.	points were mostly nutritionists led by a strong and independent nutrition directorate and with limited experience and expertise to manage clinical care, constraining the formation of comprehensive networks.	(mal)nutrition decision makers, managers and focal points encouraged 'natural' systems thinking, balancing population priorities and needs.	motivation of staff but indirectly influences trust, service uptake and client choice of facilities
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Apply systems thinking to maximise synergies and minimise unintended consequences, and increase skills in [managing?] complexity and integration to adapt strategies to fast-changing contexts.

Managers with clinical or public health backgrounds and preventive nutritionists in vertical programmes focused specifically on SAM and lacked a systems perspective, even in an era of intense attention to multisectoral nutrition.	Programme management and service delivery were designed and monitored using logical frameworks with linear pathways of inputs-activities-outputs-outcomes that did not consider systems approaches; quality improvement approaches listed solutions for each problem without considering interactions or unintended consequences.	The public health background of (mal)nutrition decision makers, managers and focal points encouraged 'natural' systems thinking in balancing population priorities and needs.	ABM mimicked real-life situations, making system dynamics explicit, providing insights and enabling testing of intervention scenarios or perturbations, providing opportunities for learning.
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ABM = Agent-based modelling; DHMT = District health management team; MUAC = Mid-upper arm circumference.

ii. Lessons on studying integration with the applied methods

This section examines whether the study methods were appropriate to understand pathways of integrating SAM interventions into national health systems and whether findings are transferable to other contexts. It also discusses limitations and overall recommendations.

Appropriateness of methodological approaches

This study of SAM integration opted for a theory-driven approach to understand pathways of integration and therefore explore how and why interventions were integrated and produced the observed outcomes. The theory-driven approach allowed studying the complexity of contexts and interventions and learning how things work in real-world settings by generating explanations of causal processes (identifying uniformity). It also allowed retroductive reasoning (theorising what is inspired by evidence to explain the observed outcomes) that encouraged discovering unobservable patterns starting from the observable. Moreover, the approach aligned well with the study's scope of exploring pathways and outcomes of integration of SAM interventions in varying contexts. It opened the black box of the causal pathway of an intervention, exploring and explaining why it worked (or not).

The theory-driven approach allowed applying a variety of methods with a systems thinking lens that provided multiple perspectives and confronted various opinions from different angles and contexts to identify causal inferences. Because it was method-neutral, it allowed choosing and mixing study methods to explore the initial theory and adapting data collection and analysis methods to the contexts studied. The various methods and study settings uncovered hidden patterns or mechanisms that enabled and hindered integration, and these led to knowledge and learning that allowed abstractions and refinement of the theory. Although the results were incomplete, the narrow scope of the study was a necessary first step to inform further exploration.

The lack of understanding of the concept of integration and the need to synthesise the evidence on integrated health and SAM services led to the decision to start with a scoping study. We expected the results to provide learning about concepts, policies, evidence and knowledge gaps but also to a foundation for building the initial theory and identifying assumptions for empirical testing. The study method was opportune for various reasons. Given the incipient nature of the study of SAM integration, we purposely started broadly and drew from a wide range of policies, evidence and practices to learn. Even before the scoping study on integration, we had conducted another scoping study on health system strengthening, because we had no clear understanding how to frame the study focus.

The case studies used a framework approach that identified a priori key elements and

themes that were used to formulate the indicators and questions and to select the health actors to participate in interviews and group discussions. The selected integration frameworks (to study dimensions and extent, factors influencing progress outcome) took into account the complexities of integration and allowed exploration of interactions. The framework elements were analysed by abductive reasoning based on the attributes of integration and remained transparent and open to change.

As the investigation and analysis progressed, participatory methods engaged health actors in an experiential approach to learning together and adapting and summarising themes, facilitating understanding by reflecting on doing. The case studies provided opportunities to study –in close collaboration with key health actors– dynamics, feedback and delays of interrelated and interdependent parts of health sub-systems. Participants in the workshops used various mind mapping techniques to identify the extent of integrating SAM interventions and factors that facilitated or hindered the integration process. They then developed a CLD by gradually introducing factors and closing the loop, while discussing and validating in each step the meaning of the causal link and relevance of the links in the loop. Analysis of the CLD created opportunities to explore probable scenarios and the meaning of the changes they created in the system. The CLD method is simple and straightforward, and visualizes systems dynamics in a simple way. As such, it facilitated a deeper understanding of current states and constraints and how to mitigate those constraints. The CLD guided participants to apply systems thinking in a very accessible way and generated rich discussions on their usual topic in different dimensions as they had never done before. The CLD helped then the testing of scenarios and discuss the consequences or effects of probable decisions. The CLD may also form the basis of simulation models that may further test the system dynamics of intervention scenarios with quantitative methods.

ABM was applied to simulate the complexity of SAM interventions, first in a health facility and catchment area and next in a district health subsystem with health centres and clients. It was well suited to study the dynamics of such systems. We started from a conceptual model to develop a micro-level model that applied assumptions from evidence or tacit knowledge of experts to mimic a real-world situation. Thus, instead of exploring how macro inputs (policies, resources, service delivery, contexts) influence actions at the micro level (macro-micro level changes), we started from agents with certain attributes that interact at the micro level. The actions of agents changed their own behaviours (micro-micro level changes) and those of others through feedback and delays, generating new outcomes and accumulating changes in time that then influenced and drove higher-level changes (micro-macro level changes) [212]. Deliberate changes in the system created learning opportunities and accumulated insights into patterns generated over time when the system reached a new equilibrium with outcomes that were not always expected. The application focused on the dynamic processes in which agents adapted to new situations that generated variation and accumulated learning in each step. The model easily and flexibly adapted changes of if-then rules, modifying transition rates and using history and time to uncover patterns behind probabilities and fostering new knowledge (ontological learning). Simulation outcomes resulted in expected behaviour, which proved that the

model was working, and unexpected behaviour, thus providing new knowledge.

The ABM application added value to our study in several respects. First, learning how factors interact from the bottom up to influence outcomes at the micro level and how they create macro-level dynamics generated different learning than the other methods. Second, the model mimicked real-world settings, and tested different scenarios by changing variables and parameters that resulted in different desirable and undesirable outcomes, something one cannot do in real life. Third, various steps in the simulation required the involvement of experts who understood the field context and created a collaborative process of iterative learning. Learning by doing was useful for both modeller and expert to improve insights into the study subject and also transfer (exchange) knowledge and skills for applying systems thinking methods. Fourth, it was useful to demystify ABM as a system dynamics tool that can be used for future bottleneck and policy analysis. It is possible to develop a generic model and guidance for adapting parameters to local contexts that district managers can use test outcomes of proposed actions. As such, ABM could become an additional operational and decision-making tool using systems thinking.

Dynamics of applying various theoretical lenses

Health systems are complex adaptive systems, and integration interventions and SAM interventions are both complex interventions that act in a complex context. Therefore, a systems thinking lens was applied from the outset, leading to multiple methods to explore the theory through various lenses and from various angles.

From an epistemological perspective, the use of different methodologies stimulated flexibility in learning from various perspectives, levels and aspects of health systems in different ways depending on their ontological and epistemological position. In the above, we described how the various study methods focused on various aspects, dimensions and contexts of integration of SAM interventions. Through retroductive reasoning, we aggregated insights by moving iteratively from theory to empirical evidence and back to theory. In addition, learning flowed from a broad base, mixing results of qualitative and quantitative research on evidence and practices. Next, the case studies used a framework approach to focus on specific aspects of integration extent and factors but kept the macro perspective. The Nepal and Burkina Faso case studies added a system dynamics perspective that showed how the tiers in the health system interacted to produce outcomes. Finally, the ABM approach took us to the micro level learning on interactions from the bottom up.

Dealing with complexity seemed too complex when it remained in the field of the unknown. However, bringing complexity into the daylight, talking about it and learning and applying methods to explore it, demystified it. It made people realise that complexity was part of their daily experience, from educating children to functioning at work or watching nature. Applying systems thinking methods was convincing (even addictive). But

enthusiasm may be dampened by the lack of evidence on their use and their uncertain validity.

Within the scope of this study, we were able to reach a certain point in understanding pathways of integration, but we named it the incipit. We were able to test some innovative methods that proved promising and merit further application. By reaching this point in understanding pathways of integration, we are in a better position to develop research protocols, explore specific aspects of integration of SAM interventions in depth and testing and further refining the theory in subsequent research.

Transferability of findings

The methodological applications in the various studies allowed synthesising learning on a complex topic where history and context mattered and situations were unique. We did not aim to look for generalisations. However, the accumulated findings identified patterns that allowed refining the theory. The theory can then be further tested in other contexts. Indeed, it was not difficult to synthesise abstractions from the aggregated findings and accumulated learning in the case studies.

In addition, the study methods offered different perceptions and different possible explanations, which may be an indication that the problem we studied is wicked, meaning there are no final explanations, only one acceptable explanation for the time being, depending on perceptions [46]. This points to the need for a paradigm shift in decision-making about the organisation of health services. We need to learn to manage uncertainties that cannot be handled only in 'ideological' ways through constructivist approaches, but with methods that allow enough abstraction for learning in new contexts.

The results in the case studies were repeatedly validated by the health actors (experts) and assured by participatory learning and iterative reflection. (The sensitisation analysis helped validate the results in the agent-based models, but validation mostly depended on expert opinion.) Validation of the refined theory will be further strengthened by multi-layered iterations of cumulative learning on the subject to deepen the understanding.

Our study scope of exploring the integration of SAM interventions from a disease-specific lens did not always seem correct. As noted earlier, the aim of integrated services is to offer comprehensive continuity of care across services, time, place and lifecycle that responds to clients' needs. It may have been logical to start from comprehensive child healthcare in all its dimensions and then to study how to fit SAM into it. This leads to our key argument that also from the study subject view, our research is a start. We hope therefore that this learning may be expanded to study the comprehensiveness of child healthcare. Moreover, many low- and middle-income countries have noble multisectoral nutrition strategies that seem stuck at the national and sectoral level. It would be interesting to apply systems thinking methods to study whether and how these strategies produce their intended outcomes (or not).

Limitations

During the study design and process, in an active and iterative process, we critically questioned our research for quality and rigour. We identified weaknesses that need mentioning.

Study subject

The subject of integration of SAM interventions was not straightforward, and the research steps meandered through a learning pathway. If we had known where we would end up, we might have taken a different route that generated more complete and plausible explanations. However, it was clear from the start that more focused and in-depth research to evaluate the impact of integration of SAM would have been premature because the knowledge basis was missing. Therefore, the study explored integration implementation broadly, with a systems lens, rather than evaluating the impact of integration on specific health service outcomes, with an intervention lens. Moreover, the integration of health interventions was a wicked problem, difficult to solve because of incomplete knowledge of the integration concept, the range of people and opinions involved and the connectedness of integration with other health system problems. Therefore, if the research questions and plausible explanations seem limited and general, we hope the results will stimulate further research to test the knowledge we generated against new empirical evidence and expand the ontological learning. Moreover, based on this study, a synopsis will be developed to provide guidance to health actors interested in integration and systems thinking.

Study context

Studies in low-income settings involved the usual logistical challenges of uncontrollable or unforeseeable obstacles that hampered the rigorous application of data collection methods and analysis.

Two important (though familiar) obstacles related to secondary data access. The first was the data property phobia that hampered us accessing databases. The second was the immense production and loss of data in the absence of good information and knowledge management systems. Access to information was dismayingly difficult despite a huge number of surveys and evaluations conducted, and surveillance and monitoring systems put in place, often duplication by various partners for various programmes and donors.

Study methods

The literature review on the integration of health services other than SAM retrieved all systematic reviews to capture learning. The literature review on SAM on the other hand may have been superficial, in the sense that we could have dug deeper to extract hidden evidence but were often misled by wrong terminology use on health system support and strengthening and integration.

Studying complex interventions in complex contexts is frighteningly complex until one actually does it. Collaborative learning by doing was inherent in the research methods used to study complexity. The data collection methods and tools used in the case studies were developed and improved along the way, but we cannot say that they were validated. They were also insufficiently adapted to the country contexts prior to the data collection and created unnecessary confusion. The adaptation before use would have been appropriate and could have been an introductory learning sessions, but this would have required more time than the study time frame allowed.

Different researchers may have proposed a different programme theory that may have found different plausible explanations when tested against the evidence. More time might have resulted in more rigour or further exploration. For example, there was limited time to simulate and test the identified causal explanations of integration in the agent-based model and to test the ability of decision-makers to use the model.

Study bias

Concerns about subjectivity in the data collection and interpretation of results were counter-balanced in various ways. First, the iterative process of conceptualising the case study methods and refining the initial theory guided the data collection and interpretation. Second, case studies were conducted with different methods in differing contexts. Third, health actors were actively involved in the subsequent steps of the inquiry, enabling them to gain understanding of the study methods and develop knowledge and skills to interpret and validate results. Nevertheless, the study would have benefited from the involvement of SAM experts to generate cumulative learning from agreement and disputation.

Concerns about information bias arose from design limitations, understanding of the fuzzy study topic, and time constraints. For example, the Niger context was studied in depth, while the Burkina Faso and Nepal assessment of perceptions was rapid and did not allow in-depth verification. Moreover, group discussions and group work risked capturing the perceptions mainly of influential people. Also, not all participants were comfortable expressing their opinions, and peer control might also have constrained them. We tried to minimize prejudgment through repetitive questioning with various methods and participatory techniques to explicit mental maps, experiential learning, and informed validation and triangulation of information.

Concerns about selection bias related to participating health actors, sites and countries were less relevant, because the case studies in different contexts and applying various methods generated a range of theoretical propositions with a level of abstraction that was transferable to other settings.

Recommendations

Recommendations for future policy action

This study did not intend to develop or propose an assessment method or tool for decision-makers or health managers to monitor integration of SAM into health systems. However, learning from the study may provide strategic guidance to improve understanding of integration, health services and health outcome creatively. It may articulate a strategic vision that draws policy implications for improving integrated child healthcare and provide opportunities for applying systems thinking, or promote its added value. The existing district bottleneck analysis tool for SAM would benefit from including few indicators on integrated child healthcare and applying a systems approach.

The findings of this study could be the basis for consultative meetings with health actors involved in SAM policy design and implementation at global and national levels to strengthen knowledge and skills of health system strengthening, integration and systems thinking, and expand the knowledge base on SAM policy implementation. At district level, learning from the case studies could encourage and enable health actors to optimize and adapt their tasks to changing contexts, learn to consider complexity and apply systems thinking as a tool to improve their working environment and effectiveness.

Recommendations for future policy and systems research

This study is a first step that contributed to the understanding of integration of SAM interventions. The proposed theory was our explanation of how the research problem could be explored. It may be useful to explore other theories and then compare them and test them against the evidence to see which theory best reflects the process of integration of SAM interventions, continuing from where this study ended.

A logical next step would be to conduct a realist evaluation to accumulate explanations on the outcomes that are produced bottom up that can be tested against the evidence to further refine the theory. For example, a study of missed opportunities in current SAM implementation using a realist evaluation method could uncover demi-regularities that underpin what worked how and for whom in what circumstances. Another study could explore the effectiveness and impact of integrating SAM into child healthcare by simulating system dynamics –applying a stock and flow diagram or ABM– that mimics real-life settings and tests scenarios that would not be possible in real life. Based on our learning, we took the opportunity of developing a study protocol that proposes a combination of realist evaluation and system dynamics modelling (Annex 10).

Policy and systems research on SAM services specifically—and nutrition actions in general—is a field that need increased attention. Major multisectoral nutrition strategies are being rolled out in many countries that will merit from being studied with a systems thinking lens as part of their monitoring and evaluation system. The conceptual framework of health system strengthening for SAM interventions with system-wide effects may be a useful tool for designing research (Figure A2.1).

iii. Conclusions

While evidence is increasing on the integration of health interventions into primary care, few studies have applied a systems thinking approach to consider complexity, and few have studied comprehensive child healthcare that includes SAM.

We studied the integration pathways of SAM interventions into national health systems using a theory-driven approach to explore how and why integration progressed in various contexts. Different theoretical lenses and methodological approaches were used to discover pathways of integration from different angles, yielding cumulative learning. By first exploring and improving understanding of concepts and attributes of integration, and using conceptual frameworks and the evidence base, we proposed a set of assumptions to test empirically in case studies and by simulation modelling. We studied the breadth and depth of integration of SAM interventions into the tiers of national health systems by exploring policies, effectiveness and perceptions of health actors on how and why integration of SAM interventions worked (or not). We explored policies that drove the integration progress and factors that influenced the speed of integration. We mimicked a real-world model and simulated interactions of factors that influenced integration to study system dynamics over time and uncover hidden patterns of how outcomes were produced from the bottom up.

The different methodological approaches looked at the study topic through the different lenses, dimensions and interactions that generated a patchwork of explanatory results on integration. The theoretical lenses zoomed in to the community level and out to the national level, and meandered in various pathways to generate causal explanations and identify recurrent patterns from various perspectives. Even then, we may suppose that the picture of pathways to integrate SAM was incomplete.

The applications and results of the study methods showed that the participatory approach of the inquiry cleared the fog around a fuzzy subject and deepened participants' understanding of integration. In addition, making mental models explicit through the application of systems thinking methods facilitated dialogue on integration improvement and demystified complexity. As such, our initial learning about integration pathways may inform policy guidance to improve comprehensive child healthcare and the lives of millions of malnourished children.

We hope that this study will inspire and encourage further research to gain more insights into integration using a systems approach.

PART VI. ANNEXES

Annex 1. Study definitions of key concepts

Access is the extent to which a population can reach the health services it needs, either delivered by the public or private sector, and the opportunity to have healthcare needs fulfilled [246].

Dimensions of access are *availability (or physical access)*, *affordability (or financial access)*, and *acceptability (or cultural access)* [247]. Access is often confounded with *utilisation* that is defined as the quantity of healthcare services and procedures being used [248].

Accountability is the obligation to report, or give account of one's actions, e.g., to a governing authority through scrutiny, contract, management, regulation and/to or an electorate or beneficiaries through information sharing on progress and efficiency [249].

Adopt is to take up or follow (www.thefreedictionary.com)

Agent-based modelling (ABM) are simulations where elemental units (agents) of a system are given simplified instructions to interact and respond to each other allowing emergent patterns [55].

Assimilate is to take in and understand fully (www.thefreedictionary.com)

Assumption is something that you accept as true without question or proof [250]

Care is the application of knowledge to the benefit of a community or individual [251].

Levels of healthcare are:

- *Primary care*: Basic or general healthcare focused on the point at which a patient ideally first seeks assistance from the medical care system. It is the basis for referrals to secondary and tertiary level care,
- *Secondary care*: Specialist care provided on an ambulatory or inpatient basis, usually following a referral from primary care,
- *Tertiary care*: The provision of highly specialized services in ambulatory and hospital settings, and
- *Intermediate care*: A short period of intensive rehabilitation and treatment to enable people to return home following hospitalization or to prevent admission to hospital or residential care.

Case finding can be active, routine or enhanced:

- *Active case finding* identifies people with a disease who have not sought diagnostic services on their own initiative and refers them for treatment. It requires face-to-face contact and on-site symptom-based screening.
- *Routine (passive) case finding* identifies a disease in people who seek healthcare for another disease.
- *Enhanced case finding* is community involvement and awareness in case detection [252], to make populations aware of the symptoms of a disease [253], and to encourage people with symptoms to seek diagnosis [254]. Enhanced case finding is commonly used in tuberculosis interventions in the community, but also in SAM as part of awareness raising leading to self-referral, or spontaneous presentation for care, such as mothers of children

with SAM can be taught to identify other affected children in their community [255].

Case management is a targeted, community-based and proactive approach to care that involves case-finding, assessment, care planning and care coordination to integrate services around the need of people [249] rather than disease.

Causal loop diagram (CLD) or causal loop analysis (CLA) is a system dynamics tool that produces qualitative illustrations of mental models and focuses on highlighting causality, interactions and feedback loops. Feedback loops can be either reinforcing or balancing. CLDs can help to explain the role of such loops within a given system [55].

Civil society is a community of citizens linked by common interest and collective activity [90].

Clinical integration is the extent to which patient care is coordinated across the system's different functions, activities and operating units. The degree of coordination of care depends on the patient's condition and the decision made by his or her health team. [256, 257]

CMO configuration is a causal explanation of propositions by showing that a mechanism (M) acting in context (C) will generate outcome (O). Empirical inquiry will fine tune the understanding of the precise operation and scope of the Cs, Ms and Os, and build causal explanation under an incremental process of revision (generative causation) [258]; is a conceptual tool in generative causation to examine the interactions between intervention, context, mechanism and outcome in the form of the CMO configuration [101].

Collaborative care is care that brings together professionals and/or organisations to work in partnership with people to achieve a common purpose [249].

Community-based primary healthcare (CB PHC) [259] involves improving the health of a geographically defined population through outreach beyond static health facilities.

It includes three types of interventions [259]:

- Communication with individuals, families and communities to improve key practices;
- Social mobilisation and community involvement for planning, delivering and using health services'; and
- Provision of healthcare in the community, including preventive services (e.g., immunisation) or curative services (e.g., community case management of pneumonia).

Complex system can be defined as a collection of individual elements (agents) with the freedom to act in ways that are not always predictable and whose actions are interconnected so that one agent's actions change the context for other agents. Characteristics of complex systems are self-organisation, constant change, feedback loops, non-linearity, time lags between inputs and outcomes, history (path) dependence, and unintended consequences, shaping and being shaped by the context. **Complex adaptive system** adapts, learns and evolves with time showing new emergent behaviours [59].

Continuity (continuum) of care is a term used to indicate one or more of the following attributes of care:

1. The provision of services that are coordinated across levels of care - primary care and referral facilities, across settings and providers;

2. The provision of care throughout the life cycle;
3. Care that continues uninterrupted until the resolution of an episode of disease or risk;
4. The degree to which a series of discrete healthcare events are experienced by people as coherent and interconnected over time, and are consistent with their health needs and preferences [260].

Coverage is the extent of interaction between the health service and the people for whom it is intended [260, 261].

Health coverage for people with health needs can be differentiated as [261]:

- *Availability (or geographic) coverage*: having the service available
- *Accessibility coverage*: able to use the service, with determining factors of distance, financial reasons, socio-cultural values and norms
- *Acceptability coverage*: willing to use the service
- *Contact coverage*: using the service
- *Effectiveness coverage*: receiving effective care

Critical realism, placed between the positivism and relativism knowledge paradigms, understands social realities to exist independently of social actors but the actor's interpretation of that reality has influence over the nature of social change [262]. Critical realism seeks to identify causal mechanisms underpinning social phenomena (such as health policies and systems) but also adopts an interpretative understanding. It addresses questions on what works for whom under which circumstances and why by deductive and inductive theory testing and building [74, 263].

Demi-regularities are patterns that cannot be explained by universal laws, but the repetition of their occurrence calls for an explanation, and it seems plausible that there are some underlying causal patterns that are identifiable [101]; Is a partial event regularity, which indicates the occasional, but less than universal actualisation of a mechanism or tendency, over a definite region in time and space [264]; Are semi-predictable re-occurring patterns in the data [265].

Disability adjusted life expectancy (DALE) summarizes the expected number of years to be lived in 'full health'. It is a summary measure of population health expressing healthy life expectancy [266].

Disability adjusted life years (DALY) sums 'years of life lost' due to premature mortality and 'years lost due to disability' for people living with a disease or health condition or its consequences. It is a disease or health condition-specific measure of population health expressing years of lost healthy life [266]. One DALY can be thought of as one lost year of "healthy" life. The sum of these DALYs across the population, or the burden of disease, can be thought of as a measurement of the gap between current health status and an ideal health situation where the entire population lives to an advanced age, free of disease and disability [267]

Effectiveness coverage (people who need receive effective care) is a summary indicator measuring the impact of a health service indicating the unmet need. It encompasses the role, behaviour and perceptions of the service provider, user, financier and steward but not efficiency, equity and sustainability of services [261].

Efficiency refers to obtaining the best possible value for the resources from all stakeholders and

sectors.

Efficiency can be allocative or technical [247]:

- *Allocative efficiency* means allocating resources in a way that ensures the maximum possible overall benefit. Once allocative efficiency is reached, it is impossible to change the allocation and make someone better off without making someone else worse off.
- *Technical efficiency* (or productive efficiency) means producing the maximum possible sustained output from a given set of inputs.

Equity refers to fair allocation of resources or treatment of outcomes among different individuals or groups.

Equity can be horizontal or vertical [247]:

- *Horizontal equity* means equal treatment of equal need irrespective of location, ethnicity, socio-economic status or age, and
- *Vertical equity* is the extent to which individuals with different characteristics should be treated differently (e.g. financing healthcare through a social health insurance system may require people with higher income to pay a higher insurance contribution than people with lower income).

Experiential learning is an experiential approach to learning through reflexion on doing [50].

Framework is a structure, overview, outline, system or plan consisting of various descriptive categories [68] that helps to identify the elements and relations between these elements that one needs to consider for analysis.

Governance is (i) the exercise of political, economic and administrative authority in the management of a country's affairs at all levels, comprising complex mechanisms, processes, relationships and institutions through which citizens and groups articulate their interests, exercise their rights and obligations and mediate their differences; (ii) the traditions and institutions by which authority in a country is exercised for the common good, including the processes by which those in authority are selected, monitored and replaced; the capacity of the government to effectively manage its resources and implement sound policies; and the respect of citizens and the state for the institutions that govern economic and social interactions among them; (iii) the process of creating an organizational vision and mission - what it will be and what it will do - in addition to defining the goals and objectives that should be met to achieve the vision and mission; of articulating the organization, its owners and the policies that derive from these values - policies concerning the options that its members should have in order to achieve the desired outcomes; and adopting the management necessary for achieving those results and a performance evaluation of the managers and the organization as a whole [256].

Health actors are individuals, groups or institutions, also known as stakeholders, who have varied roles, interests, values and power distribution in relation to interventions or the health system. They include, e.g., policy makers, managers, health workers, patients, professional associations, patient groups, training, academic and research institutions, religious authorities, affected or targeted communities, faith-based entities, donor agencies and civil society organisations.

Health intervention is an activity or set of activities aimed at modifying a process, course of action or sequence of events to change one or several of their characteristics such as performance or expected outcome [260]. Interventions can be clinical, organizational or systems interventions [55]

Health system is defined as 'all organisations, people and actions whose primary intent is to promote, restore or maintain health' [61].

Health system strengthening is improving critical health system functions and managing their interactions in ways that lead to better health through improved access, coverage, (quality), efficiency and sustainability [268] [61, 269].

Hypothesis is an idea or explanation for something that is based on known facts but has not yet been proved [250]

Implementation research is defined as the scientific inquiry into questions concerning implementation—the act of carrying an intention into effect. Intention can be policies, programmes or individual practices (collectively called interventions).

Implementation research can consider any aspect of implementation, including the factors affecting implementation, the process of implementation and the results of implementation, including how to introduce potential solutions into a health system or how to promote their large-scale use and sustainability. The intent is to understand what, why, and how interventions work in 'real world' settings and to test approaches to improve them [53]. For health policy and systems research, see Gilson (2012) [50], Adam (2014) [85], and Sheikh et al. (2014) [270].

Implementation strategy is a strategies needed to deliver or implement new interventions, a term used to distinguish them from clinical and public health interventions [55].

Innovation in service delivery and organization is a set of behaviours, routines, and ways of working that are directed at improving health outcomes, administrative efficiency, cost effectiveness or users' experience and that are implemented by planned and coordinated actions [120].

Diffusion of innovation is passive spread, *dissemination* is active and planned efforts to persuade target groups to adopt an innovation, *implementation* is active and planned efforts to mainstream an innovation within an organization, and *sustainability* is making an innovation routine until it reaches obsolescence [120].

Integrated community case management (iCCM) is a strategy to extend case management of childhood illness beyond health facilities so that more children have access to lifesaving treatments.

iCCM commonly covers diarrhoea, pneumonia, malaria, newborn health and malnutrition. Global guidelines on iCCM include case finding and referral for SAM as part of the iCCM strategy. In the iCCM model, community health workers are identified and trained to diagnose and treat key childhood illnesses and identify children in need of immediate referral. The eight benchmark components of successful iCCM programs are: 1) coordination and policy setting; 2) costing and financing; 3) human resources; 4) supply chain management; 5) service delivery and referral; 6) communications and social mobilisation; 7) supervision and performance

quality assurance; and 8) monitoring, evaluation and health information systems [271]. iCCM is gaining in importance because of its potential for improving universal health coverage with equity.

Integrated services (integrated care) are (is) the management and delivery of health services (care) such that people receive a continuum of health promotion, disease prevention, diagnosis, treatment, disease management, rehabilitation and palliative care services through the different levels and sites of care within the health system and according to their needs throughout the life course [272].

Integrating is to make into a whole by bringing all parts together (or merge); **Integration** is the action or process of integrating. Integration can evolve from assimilation (take in and understand fully) through adoption (choose to take up or follow) to normalisation (make ideas or actions appear culturally 'normal') (www.thefreedictionary.com).

Intervention is an activity or set of activities aimed at modifying a process, course of action or sequence of events, in order to change one or several of their characteristics such as performance or expected outcome [256].

Leadership is the action of leading a group of people or an organization, or the ability to do this [256].

Leapfrogging means using a new technology, operating model or pattern of behaviour to accelerate the development of a system by helping it skip over development stages that had previously been unavoidable. It is taking a short cut in reaching a more advanced development stage without accumulating inefficiencies along the way [273].

Mechanism is the processes or pathway through which an outcome is brought into being (what enables the programme to work). It is the underlying social and psychological driver that causes the reasoning of actors (the process describing human actions that have led to uniformity depending on choice making). In Realist evaluation, the aim is to identify underlying mechanisms that explain the outcomes that were influenced by a context (expressed in a CMO configuration) [76].

Middle range theory is a theory that lies between the minor but necessary working hypothesis and the all-inclusive systematic efforts to develop a unified theory that will explain all observed uniformities of social behaviour, social organisation and social change [57]. Translated in realist inquiry terminology, it is the level of theoretical abstraction that provides and explanation of demi-regularities in the context-mechanism-outcome (CMO) interactions of a set of interventions [274].

Model is an orderly map of relationships, showing causal or convenient pathways; it is deliberate simplification of a phenomenon or a specific aspect of a phenomenon described [68].

Pay for performance (P4P) is a financial reward system for employees where some or all of their monetary compensation is related to how their performance is assessed relative to stated criteria. Performance related pay can be used in a business context for how an individual, a team or the entire company performs during a given time frame [275].

Performance-based funding (PBF) is defined as the transfer of resources (money, material goods) for health on condition that measurable action will be taken to achieve predefined health system performance targets such as particular health outcomes, the delivery of effective interventions (such as HIV prophylaxis), utilisation of services (like HIV counselling and testing), or quality care [276].

Person (Patient)-centred care is a care approach and practice that sees the person as a whole with many levels of needs and goals that are coming from their own personal social determinants of health [249]. Patients receive information on the illness and care pathway and are involved in the decision-making. It supports active involvement of patients and their families in making clinical decisions. It respects and responds to individual patient preferences, needs and values and ensures combining a biomedical, psychological and social perspectives [277].

People-centred care is focused and organised around the health needs and expectations of people and communities rather than on diseases. It encompasses clinical encounters as well as attention to the health of people in their communities and their crucial role in shaping health policy and health services [278].

Primary care is a process in the health system that supports first-contact, accessible, continued, comprehensive and coordinated care to people and communities [249].

Programme theory is a set of explicit and implicit assumptions by stakeholders about what action is required to solve a health problem and why the health problem will respond to this action [72].

Quality of care is the degree to which health services for individuals and populations increase the likelihood of desired health outcomes that are consistent with current professional knowledge [279]. Overarching attributes of quality of care are *effectiveness, efficiency, accessibility, patient-centred care, equity and safety* [280]. Quality of patient care focuses mostly on technical quality, appropriate referral, continuity of care and patient-centredness [281].

Resilience is the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions [256].

Scale-up is the deliberate effort to increase the impact of a health service innovation, successfully tested in a pilot or experimental project, to benefit more people and foster lasting policy and programme development [131].

Secondary healthcare (SHC) is healthcare services provided by medical specialists and other health professionals who generally do not have first contact with patients. SHC is not synonymous with hospital care—most but not all SHC is delivered at the hospital, where primary care can also be delivered [275].

Stewardship is the very essence of good government, the careful and responsible management of the well-being of the population. It includes health policy formulation (defining the vision and direction of health system), regulation (setting fair rules of the game with a level playing field) and intelligence (assessing performance and sharing information). [256]

Sustainability is the capacity of a system to continue its normal activities well into the future [282]; the capacity to maintain health services at a level that will provide ongoing prevention and treatment for a health problem after termination of major financial, managerial and technical assistance from an external donor [283],

Types of sustainability often described are [247]:

- *Financial sustainability*: the capacity to maintain an adequate level of funding to continue activities (e.g. replace donor funds), and
- *Institutional sustainability*: the capacity to assemble and manage necessary nonfinancial resources to successfully carry on normal activities (e.g., capacity of government, communities and civil societies in supporting the health system with different aims but shared goals).

Systems thinking is an approach to problem solving that views problems as part of a wider dynamic system demanding a deep understanding of linkages, relationships, interactions and behaviours among the elements of the entire system; its application accelerates a more realistic understanding of what works, for whom, and under what circumstances; it goes beyond the input-black box-output paradigm by opening the black box and considering feedback, processes, flows, control and contexts [58].

Tacit knowledge is knowledge-in-practice developed from direct experience and action. It is highly pragmatic and situation-specific knowledge that is subconsciously understood and applied, difficult to articulate, usually shared through interactive conversation and shared experience [90].

Theoretical proposition is a theory that explains both the data and what is actually happening from constant comparison.

Theory is a set of analytical principles or statements designed to structure our observation, understanding and explanation of the world. A 'good theory' provides a clear explanation of how and why specific relationships lead to specific events [68].

Theoretical framework is a conceptual tool useful in making sense of a complex social reality. It helps design a research question, guide the selection of relevant data, interpret the data, and propose explanations of causes or influences [284].

Theory of change is a comprehensive description and illustration of how and why a desired change is expected to happen in a particular context. It is focused in particular on mapping out or 'filling in' what has been described as the 'missing middle' between what a programme or change initiative does (its activities or interventions) and how these lead to desired goals being achieved. It starts with defining long-term goals and then maps backward to identify necessary preconditions [285].

Universal health coverage (UHC) aims at all people being able to obtain the health services they need without financial hardship [268, 286].

UHC consists of three inter-related components:

- Access to the full spectrum of quality health services -promotive, preventive, curative, rehabilitative and palliative- according to need,
- Use of these services does not expose the user to financial hardship, and

- Coverage for the entire population.

Progress towards UHC has therefore three objectives: quality of essential services (sufficient to make a difference), financial protection and equity in service use (reduce gap between need and utilization). UHC is the goal of a health system, and health system strengthening is the means to achieve it.

Vertical programmes are focused on people and populations with specific (single) health conditions. Their three core components are: intervention strategies, intervention delivery, and monitoring and evaluation [249].

Wicked problem is a problem that is difficult to solve because there are different perspectives and different solutions that may be contradictory. (Wicked here denotes resistance to resolution) [46].

Annex 2. Learning from disease-specific health systems strengthening interventions: a scoping study

At the inception of the study project, we lacked the direction, clarity and focus needed to frame the research question for improving SAM interventions. We were not clear whether and how to focus on health system strengthening or integration, or scale-up. We were clear on few things: the field of health systems and policy interventions is complex; we were interested to study interventions with applying a systems lens, to consider system-wide effects and not just the disease-specific outcome; we expected a dearth of evidence on health system interventions for SAM and therefore wanted to learn from disease-specific interventions to learn from for SAM.

We adopted the scoping study method for reviewing complex health system strengthening interventions that improve SAM and/or other diseases, conditions or initiatives outcomes. The results of the health system strengthening scoping study are shared in this annex, on which the core study on integration of SAM interventions has been built. In the quest for learning, we first aimed to identify and learn from HSS interventions with system-wide effects. But the paucity of information and the lack of distinguishing disease-specific health system support or health system strengthening made us adapt research methods.

i. Methods

The first step of our learning started with examining concepts and evidence of implementation of health system strengthening (HSS) interventions that improve SAM services beyond service delivery and with a systems perspective. Figure A2.1 shows a conceptual framework—developed by Bennett and Fairbank (2003) [287] to analyse health system interventions of the Global Fund to fight AIDS, tuberculosis and malaria—that we adapted for our purpose for SAM, and that represented our interest.

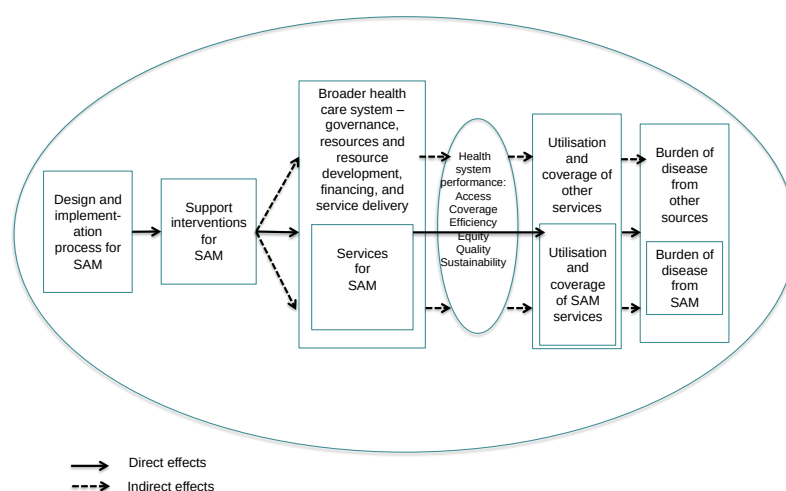


Figure A2.1. Conceptual framework of SAM health system strengthening interventions for SAM with system-wide effects

Research question

Our research question was:

What disease-specific health system strengthening interventions improved disease outcome, and what was the system-wide effect.

Because of expected scarce evidence, we also envisaged to learn from health system strengthening interventions to improve other health services than SAM that had been wider studied (Figure A2.2). The outcome of interest was: Improved understanding of health system concepts and approaches, and interventions, and learning for SAM-specific health system strengthening interventions.

The scoping study consisted of:

- Conceptual map, to explore existing terminology and conceptual frameworks
- Policy and framework map, to identify important documents from international and professional bodies, and a
- Literature map, to describe the scope, content (and gaps) in the evidence base on health system strengthening interventions for SAM and diseases, conditions or initiatives. We limited the review of the literature to publications describing the evidence on health system strengthening with a system perspective in low-income countries (Figure A2.2).

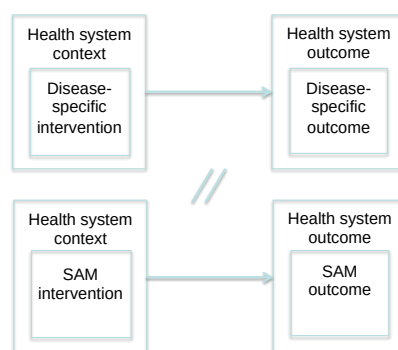


Figure A2.2. Knowledge framework of disease-specific or SAM-specific health system strengthening interventions with a system perspective

Identifying relevant studies

We used targeted searching of the literature, snowballing and pearl harvesting.

SAM interventions. Of all SAM-specific resources that were found (n: 159) none reported on system strengthening but on system support. Further purposive searches of published and grey literature relevant for SAM implementation, integration and scale up did not find system strengthen interventions system perspective.

Other health interventions. The search on other diseases, conditions or health initiatives used the following search strings:

(health (system OR systems)) AND (strengthen OR strengthening)
AND

(scaling AND up) OR (scale?up) OR expansion OR integrate OR integration OR integrating OR implementation OR implementing OR implement
AND
(((((developing OR "less developed" OR "lesser developed" OR "under developed" OR underdeveloped OR ((low OR lower OR middle) AND income) OR poor OR poorer) AND (country OR countries OR nation OR nations)))) OR (((low OR lower) AND (gdp OR gnp OR (gross AND domestic AND product) OR (gross AND national AND product)))) OR (((lmic OR lmic OR "third world")))) OR (("Asia/epidemiology" OR "Africa/epidemiology" OR "low?resource?setting" OR poverty))*

Next, we searched the potential system-wide effects of the selected interventions by combining the following search terms related to each intervention:

Interaction OR interact OR interactions OR "systems effect" OR "systems effects" OR "systems thinking" OR "systems lens" OR "system effect" OR "system effects" OR "system thinking" OR "system lens"

Information sources were:

- Electronic reference libraries of indexed and non-indexed⁸ resources:

CMAM Forum Library ENN Library FHI 360/HSS Library Google Google Scholar	IDS/British Library for Development Studies iDS/ELDIS database Medline Other agencies websites WHO databases
--	--
- Information requested from health system specialists (email requests for information on December 17, 2014)
- Discussions with health system experts

Figure A2.3 describes the process of selecting the records searched. In each box, the first number (Other) refers to the number of records for other diseases, conditions or initiatives. The second number (SAM) refers to the number of records specific for SAM.

Study selection

Typical for scoping studies is that the study selection method does not discriminate among studies based on methodological criteria [87]. But a minimal set of criteria used for inclusion were:

- The document presented an example that focused on integration of scale-up of SAM in children under 5 or a disease relevant to SAM;
- The identified example strengthened the health system;
- The document was set in an LMIC in Africa or East and South East Asia; and

⁸ Non-indexed resources are not available in electronic libraries but may include pertinent books, monographs, theses, project documents and reports.

All studies were entered into a bibliographic reference database (EndNote 7.1®). Duplicates were removed and articles screened by title and abstract. Remaining articles were selected based on analysis of their full text. A second reviewer was consulted when questions arose about whether to include articles. If both reviewers disagreed, a third reviewer made the decision.

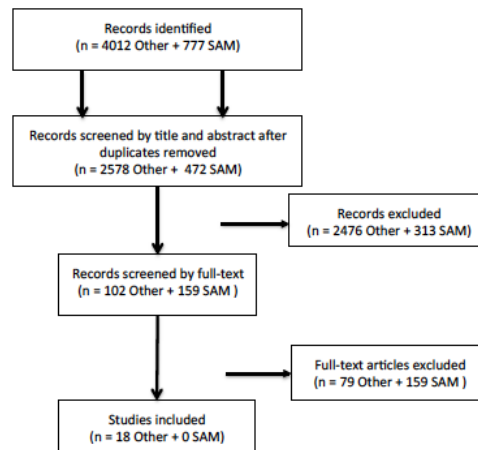


Figure A2.3. Flow chart for document selection (n= number of resources of diseases, conditions and health initiatives ‘Other’ + number of resources of ‘SAM’)

Charting data and collating, summarizing and reporting results

Information on evidence from the selected documents was extracted for the following variables:

- Title
- Reference and URL
- Study method
- Country
- Geographic coverage and extent
- Study population
- Disease topic
- Objective
- Service component: promotion, prevention, case finding/screening/referral, diagnosis/triage, treatment, follow-up
- Health system intervention: governance and policy, financing, information, workforce, supplies, service delivery, demand generation, other
- Effect on the health system: access, coverage, cost/efficiency, equity, quality, sustainability, health status, other
- Conclusion and recommendations

A narrative review was used to extract contextual or process-oriented information from each study. Major study concepts have been summarised as relevant. An analytic framework was used to provide an overview of the breadth of the literature.

Expertise and consultation

The study team consisted of Hedwig Deconinck and Jeroen De Man mixing expertise in health systems and SAM research. From the inception, expert opinion was sought on the study methods. Results were shared and discussed with SAM experts.

ii. Results

Conceptual map

Health system

WHO defines the health system as ‘all organisations, people and actions whose primary intent is to promote, restore or maintain health’ [61]. The goal of the health system is improved population health with equity, improved responsiveness of individual healthcare (respect for persons, client-oriented, and user and provider satisfaction), and improved risk protection with financial risk pooling (fairness in financial contribution). Attributes of health system performance are *access, coverage, efficiency, equity, quality, and sustainability* [61]. The national health system or public health sector is part of the broader health system, and may have financial and technical support partners regulated under their stewardship [61]. The WHO meeting in Alma Ata (1978) put primary care and the district health central to reach “Health for All” [99]. A WHO meeting in Harare (1987) defined strategies to strengthen health districts, which established and gave political endorsement to the district health system as the backbone of primary healthcare in the “Harare Declaration” [288]. Interventions to strengthen the health system are intended to improve critical health system functions and manage their interactions in ways that lead to better health through improved access, coverage, (quality), efficiency and sustainability [268] [61, 269]

Health system conceptual framework

In 2000 the WHO proposed a first framework that identified the elements and relations between health system functions, characteristics and goals of a health system [62]. Since then over 60 frameworks were developed for generic or specific use. Health system frameworks aim to understand the health system, and the dynamic relationship between health system functions. They are tools for analysing health system functions, identifying factors that influence health systems, or for planning and evaluating interventions. The choice for a particular health system tool is guided by the purpose and strategy it best fits [289].

Examples of health system frameworks

- 1967 Piot, Model of coverage [290]
- 1978 Tanahashi et al., Framework for effectiveness of coverage [261]
- 1984 Kleczkoski, Infrastructure framework [291]
- 1992 Kaplan, Balanced score card [292]
- 1999 Sicotte, Conceptual framework for the analysis of health care organizations’ performance [293]
- 2000 WHO, Health system performance framework [62]
- 2002 LaFond et al., Mapping capacity in the health sector [294]
- 2003 Roberts et al., Reforms framework and control knobs [295]
- 2003 Bennett and Fairbank, Analytical framework with system-wide effects [287]
- 2004 Potter and Brough, Framework for systemic capacity building [296]
- 2004 Sarriot et al., Sustainability assessment framework [297]

- 2007 WHO, Health system building blocks framework [61]
- 2007 Mossialos, Health information technology usability framework [298]
- 2008 WHO, Primary healthcare framework [299]
- 2008 International Health Partnership (IHP+), Common framework for monitoring performance and evaluating progress in scale-up for better health [300]
- 2009 de Savigny and Adam, Dynamic building blocks framework [58]
- 2009 Atun et al., Systems framework for integration of targeted health interventions [111]
- 2009 Peters, Descriptive health services framework [301]
- 2009 WHO, National platform for country health system surveillance (CHeSS) [302]
- 2010 WHO, Monitoring and evaluation of health systems strengthening framework [303]
- 2010 Scaling Up Nutrition (SUN) Movement, Scaling up nutrition framework [304]
- 2011 Shakarishvili et al., Framework for investment analysis [305]
- 2011 Berman and Bitran, Causal framework for health system performance [306]
- 2011 O'Neill et al., Service availability and readiness assessment (SARA) framework [307]
- 2011 Sheikh, Health policy and systems, alternative perspectives on systems hard and systems software [63]
- 2012 Jacobs et al., Access barrier framework [308]
- 2012 USAID, Community and formal health systems overlap [309]
- 2012 Van Olmen et al., Dynamic health system framework [310]
- 2013 UNICEF, EeDSQ framework [311]
- 2013 Lancet Series, Framework for actions to achieve optimum foetal and child nutrition and development [312]
- 2013 Levesque et al., Conceptual framework of patient-centred access to healthcare [246]
- 2013 USAID Maternal and Child Integrated Program (MCHIP), Conceptual framework for planning, implementing and evaluating the effectiveness of proven technical interventions in routine field situations at scale [313]
- 2014 Marchal et al., Multipolar performance framework [314]
- 2014 WHO and World Bank Group, Framework for monitoring progress to universal health coverage [315]
- 2014 Global Fund, Community systems strengthening framework [316]

Some frameworks succeeded better than others to capture the system dynamics to underline the multiple relationships and interactions of health system functions. In our study we opted for the adapted WHO conceptual framework (Figure A2.4.) representing the six building blocks (or health system domains) for the basic functions a health system must carry out effectively to achieve its goals [247]. Health system functions were grouped into the six standard domains of (leadership and) governance; health workforce; information systems; medical products, vaccines and technologies (henceforth called 'supplies'), health financing, and service delivery. The framework differentiated the weight and function of the domains in the system: governance and financing pulled the system, and workforce, information and supplies supported the system in the delivery of services, that influenced the health system performance and impacted on health, risk protection and responsiveness of the population and individuals.

The health system, represented in the framework, also recognises a seventh domain that envelops all system functions and that consists of the 'people' - as individual, group, institution, organizations or community system. People have perceptions about their own health, development and needs, steered by their respective interests, values and norms, and affinities and power connections that influence their actions and behaviours. They influence the system in two ways: They are health actors driving the system as policy, intervention, service planners and providers on one side (supply-

side) and as beneficiaries or policy and service users who also play a role in transformative change on the other side (demand-side). The adapted framework we selected for use [247] matched well with people-centred care that organises care around the health needs and expectations of people and communities rather than around diseases [317].

It is also useful to note that health system functions are grouped under one domain but may fit under more than one domain, and flexibility in application is advised. For example, systems for hiring health workers fall in the workforce domain but are linked to leadership and governance (policy) as well as health financing. It is about the health system function rather than the domain, or about how health system functions perform, and how they influence and interact with each other across domains.

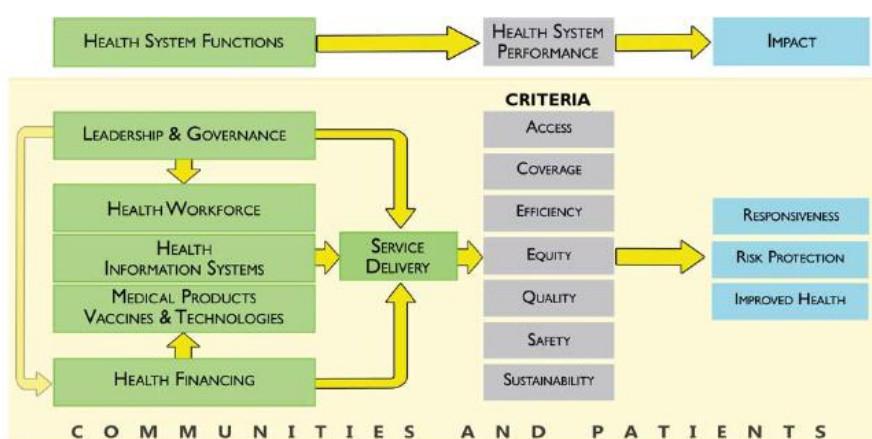


Figure A2.4. Conceptual framework for health system performance [247]

Health system goals

The goal of a health system with its resources, actors and interventions inputs is to improve health of the individual or a population with equity, be responsiveness to the needs, thus provide, individualised care that respect the person's need and expectations (client-oriented promoting user satisfaction), at a minimal financial individual risk (risk protection and fairness in financial contribution) and overall cost for the society. The outcome of health systems is referred to as '*the triple aim of care, cost and health*' [318] [29].

Health system attributes

Health system characteristics indicate performance and may differ across the various conceptual frameworks but generally comprise of concepts that express access, coverage, efficiency, equity, quality, safety and sustainability of health system functions.

- **Access** is central to the performance of healthcare systems. It has been defined as the extent to which a population can reach the health services it needs, either delivered by the public or private sector and the opportunity to have healthcare needs fulfilled [246].

Different types of access have been defined:

- Islam (2007) proposed two types of access: *Financial access* (also referred to as

economic access or affordability), or the extent to which people are able to pay for health services, and *physical access* (also referred to as geographic access and/or availability), or the extent to which health services are available and reachable [247].

- McIntyre and Birch (2009) proposed three dimensions of access: Availability (or physical access), affordability (or financial access) and acceptability (or cultural access) [248]. They suggested that each dimension focused on a set of clearly distinguishable issues, but the interaction between the dimensions determined access. Levesque et al. (2013) [246] proposed five dimensions of accessibility: Approachability, acceptability, availability and accommodation, affordability and appropriateness [246].
- Oliver and Mossialos (2005) described supply and demand side factors that influence equal access for equal need [319]. On the supply side, healthcare resources must be distributed according to population size, local input costs, healthcare needs and income mix for each regional population. Incentives/directives to locate and keep sufficient facilities and keep sufficient staff in disadvantaged areas can overcome inequitable capacity constraints.

Health service 'access' is often confounded with 'utilisation' but they are not the same [248]. Utilisation is the quantity of healthcare services and procedures used (a supply-side view). However, studies of determinants of utilisation also looked at individual, community and health system factors and considered both supply-side and demand-side barriers to health service [320]. Access may also be confounded with 'coverage'.

- **Coverage** indicates unmet needs. Tanahashi (1978) distinguished various levels of coverage: Availability coverage (or geographic coverage) measuring the proportion of people for whom the service is available; accessibility coverage, measuring people's ability to use the service (including awareness); acceptability coverage, measuring people's willingness to use the service; contact coverage, measuring people's use of the service; and effectiveness coverage, measuring overall effectiveness of care [261]. All sorts of barriers (e.g., cultural and social values, norms and behaviours, and physical, financial, knowledge, competence and motivation factors) may affect coverage at the various levels that then affect the overall outcome of effectiveness coverage. As such, effectiveness coverage combines availability, access, use, capacity, appropriateness and quality and encompassed the role, behaviour and perceptions of the service provider, user, financier and steward.
- **Efficiency** refers to obtaining the best possible value for the resources from all stakeholders and sectors. Efficiency can be allocative or technical. *Allocative efficiency* means allocating resources in a way that ensures the maximum possible overall benefit. In other words, once allocative efficiency is reached, it is impossible to change the allocation and make someone better off without making someone else worse off. *Technical efficiency* (or productive efficiency) means producing the maximum possible sustained output from a given set of inputs [247].
- **Equity** refers to fair allocation of resources or treatment of outcomes among different individuals or groups, adapted to their need and vulnerability. *Horizontal equity* is 'equal treatment of equal need'. For example, access to healthcare means equal access for all individuals irrespective of factors such as location, ethnicity, socio-economic status or age. *Vertical equity* is the extent to which individuals with different characteristics should be treated differently. For example, financing healthcare through a social health insurance

system may require people with higher income to pay a higher insurance contribution than people with lower income [247].

- **Quality** of health services is defined by the Institute of Medicine as the degree to which health services for individuals and populations increase the likelihood of desired health outcomes that are consistent with current professional knowledge [321, 322]. Quality of 'clinical' care or quality of 'health services' may be confusing terminologies but basically discuss the same characteristics, one from the individual's perspective, the other from the population, or public health perspective.

The quality of care concept has evolved over time:

- Donabedian's (1988) frequently cited quality of care model (a model that defines the structure, process and outcome) considered: the performance of practitioners; the contributions of patients; the healthcare system; how broadly health and responsibility for health are defined; whether maximally effective or optimally effective care is sought; and whether individual or social preferences define the optimum [323].
- Bruce (1990) described quality of care elements as: The structure of a programme (political support, resource allocation and management); the service-giving process (methods, information given to clients, technical competence, interpersonal relations, follow-up and continuity mechanisms and the appropriate constellation of services); and the outcome of care (individual knowledge, behaviour and satisfaction with services) [324].
- Unger et al. (2003) added to the definitions components of: Effectiveness; efficiency; safety; patient-centeredness; integrated and comprehensive care; continuity within and beyond a single episode of disease (dimension of time); and continuity beyond the visits to one specific health institution (dimension of place) [28].
- Eisele et al. (2003) added a systems approach dimension and defined quality as 'that kind of care which is expected to maximize an inclusive measure of patients' welfare after one has taken account of the balance of expected gains and losses that attend the process of care in all of its parts' [325].
- WHO (2006) defined quality healthcare as a process for making strategic choices in health systems, focusing on health systems as a whole and on quality of outcomes they produce [280]. Overarching attributes proposed were:
 - *Effective*: Adhering to an evidence base and resulting in improved health outcomes for individuals and communities, based on need
 - *Efficient*: Maximising resource use and avoiding waste
 - *Accessible*: Timely, geographically reasonable and provided in a setting where skills and resources are appropriate to medical need
 - *Acceptable/patient-centred*: Taking into account the preferences and aspirations of individual service users and the cultures of their communities
 - *Equitable*: Not varying in quality because of personal characteristics such as gender, race, ethnicity, geographical location or socioeconomic status
 - *Safe*: Minimising risks and harm to service users.
- **Safety** as a service delivery output can be defined as the degree to which the risk of injury, infection and other harmful effects are minimised [256]. Safety is more commonly measured as part of quality.

- **Sustainability** is variously defined as: The capacity of a system to continue its normal activities well into the future; the capacity to maintain health services at a level that will provide ongoing prevention and treatment for a health problem after termination of major financial, managerial and technical assistance from an external donor [283]; and the potential to sustain beneficial outcomes for an agreed period at an acceptable level of resource commitment within acceptable organizational and community contingencies.

Other definitions that in use are:

- Sarriot et al. (2004) defined sustainability as a process in which both service user and demander participate, with the support partner contributing to the development of conditions that enable individuals and communities to participate [297].
- Islam (2007) described two types of sustainability: *Financial* (the capacity to maintain an adequate level of funding to continue activities (for example, to replace donor funds), and *institutional*, the capacity to assemble and manage necessary nonfinancial resources to successfully carry on normal activities [247].

The multidimensional aspect of quality and the lack of a universal yardstick resulted in quality assessment problems similar to those of access and coverage. Specific methods and tools have been developed to assess the quality of patient care, focusing on technical quality, appropriate referral, continuity of care and patient-centredness [281].

Health systems are complex adaptive systems

A health system is a complex, open system that adapts and evolves with time [76]. The distinctive features of health and other complex systems are self-organisation, constant change, feedback loops, non-linearity, time lags between inputs and outcomes, history (path) dependence, and unintended consequences of policy intervention [48]. Applying system thinking in health attempts to maximise synergies⁹ across health system functions and mitigate negative impacts. It also flags that health interventions separated in time and space may not immediately show visible or accurately predictable effects and are therefore difficult to evaluate in a classical way [59]. Moreover, most health interventions affect one or more health system functions [58] and affect the entire system, whether they are studied or not. A system thinking approach is therefore needed to illuminate the range of effects and potential synergies of interventions to identify problems and solutions for improving service delivery [79]. Recognising the dynamic relationships amongst the health system functions of the health system domains encourages the application of systems thinking in health. Understanding the health system's dynamics may help to reach sustainable solutions [85]. But practical guidance on how systems thinking concepts, approaches and tools can be applied in health systems research and practice are still limited [79, 326]. Examples of methods and tools on systems thinking applications used across scientific fields were summarized and are listed in Table 2.2 [82].

Understanding and working with complexity requires a paradigm shift from linear, reductionist approaches to dynamic and holistic approaches. Sheikh et al. (2011) debated that the WHO building

⁹ A synergy is a situation in which different entities combine advantageously so that the whole becomes greater than the sum of the parts (de Savigny and Adam, 2009).

blocks framework [62] approach conceptualizes health systems in the functional or instrumental terms of its constituent ‘hardware’ and encompasses both the ‘suppliers’ of health policy, services, and interventions, and the ‘demanders’ or communities and households who benefit from them, and as citizens, also play important roles in policy change. However, they argued that in addition to the hardware, the ‘software’—by which we mean the ideas and interests, values and norms, and affinities and power that guide actions and underpin the relationships among system actors and elements—were also critical to overall health systems performance. Sheikh et al. (2011) drew attention to “the role of software and its interplay with the visible and quantifiable hardware of systems”, and “the emerging recognition that health systems and policies are artifices of human creation, embedded in social and political reality and shaped by particular, culturally determined ways of framing problems and solutions” [63]. Peters (2014) suggests that applying systems thinking provides new opportunities to understand and continuously test and revise our understanding of the nature of things, including how to intervene to improve people’s health [82].

Policy map

Numerous documents with technical guidance for strengthening the health system have been developed. We summarized here key documents for assessing health systems and strategies that foster systems strengthening.

Health system analysis

Health system analysis used a wide array of concepts, approaches, methods and tools to assess and evaluate health system functioning, performance and capacity. WHO developed extensive guidance on health system analysis, and individual agencies have developed their own methods and tools adapted to their specific interventions. Different terminology reflecting differences in approaches were used for health system assessments and the differences lied in the focus or how the process of the assessment was conducted or being emphasised. This is illustrated in the three quotes that added gradual more emphasis on processes and interactions:

- Health system performance assessments focus on the ‘*outcomes*’ of health system functioning. They measure performance and produced outcomes on individual and population wellbeing [306].
- Other health system assessments focus on the ‘*inputs and processes*’ of health system functioning. Health system diagnostics go a step further to analyse the ‘root causes’ of the identified weaknesses and bottlenecks to service resources, access and use and quality of care [327]. Some bottleneck analyses aim at identifying gaps in demand and supply of services to assess effectiveness coverage [21] and be disease-specific or health platform-specific. The former looks at supporting the health system with a disease-specific lens, and the latter at strengthening the health system strengthening, considering the whole (sub)systems.
- Health system ‘*capacity*’ assessments focus on how individuals, groups and organisations, institutions, and countries develop, enhance and organise their functioning, resources and knowledge to improve the health system. Health actors reflect on their abilities, individually and collectively, to perform health system functions, solve problems and achieve objectives [256]. Health system capacity assessments have also been adapted for managing crisis [328].

Assessment methods may be applied at the macro level (i.e., architecture and oversight of systems), meso level (i.e., functioning of organizations) or micro level (i.e., the individual in the system) of implementation. They may address a specific health system domain or a mix of health system functions across domains. They can be adapted to look at bottlenecks in a health system from a disease-specific and/or overall perspective and may apply a systems lens (or not) [82]. They may be adapted to different diagnostic purposes by changing the denominator, for example, a population-specific analysis of urban and rural sub-populations. However, warnings suggested that diagnostics looking at technical functioning only could lead to health policies that exacerbate health inequalities [311].

While the purpose, method and outcome of the different methods may differ, assessments seek to identify weak health system functions and understand the determinants of adequate health system performance. They inform the development of better policies and strategies to strengthen the health system and improve its performance thus the aim of care, cost, and health. Most health system analysis learning comes from high-income countries, but there is a growing body of learning from experiences in low- and middle-income countries [329]. Some examples of methods and tools on health system analysis are listed below.

Examples of health system assessment methods

- **WHO, UNICEF and World Bank Group, Marginal budgeting for bottlenecks (MBB) (2002)** provides guidance for use at national levels to estimate the potential impact, resource needs, costs and budget implications of country strategies to remove implementation constraints in health systems [330]. The MBB approach estimates the marginal or incremental resources required to overcome constraints and achieve better results and relates these resources to the country's macroeconomic framework. The MBB systematically analyses five key sequential determinants in the service chain: 1) availability of services in a given area; 2) accessibility of service locations to users; 3) utilization of services; 4) continuity—utilisation of services with complete schedules, such as doses of vaccines; and 5) quality—correct and effective utilisation of services. Alternative strategies may help bridge gaps in service delivery. Incremental costs and consequences in terms of improvements in health outcomes and the ratio between the two can be computed to draw an incremental cost-effectiveness ratio.
- **Murray and Evans, Health system performance assessment (2003)** is a comprehensive manual that provides guidance to: Develop a framework for describing, analysing and ultimately improving the performance of health systems in both developing and developed countries; develop effective and affordable tools that can be used by national decision makers to provide timely and relevant information on the performance of their systems; develop tools for national decision makers that maximise the potential for shared learning across countries; and periodically assess the performance of health systems in the WHO Member States and report this information to national policy makers and the global public health community [331].
- **Sarriot et al., Sustainability assessment (2004)** places sustainability at the centre of primary healthcare programming and views it as a combination of process and outcomes to which projects can contribute [297]. The framework is organized around three interrelated dimensions of evaluation:
 - *Health and health services.* The components of health and social services outcomes

consist of the elements of quality, cost, accessibility, equity, appropriateness and coverage—whether through public or private, community- or facility-based service delivery.

- *Organisational capacity and viability* needs to be developed at local level. Organisational capacity is the capacity of local organisations to maintain essential services and activities. Organisational viability relates to financial viability, but also to other essential support and relationships –connectedness– on which an organisation depends to fulfil its mission.
- *Community capacity in its social ecological context* addresses the conditions in which a project evolves. The first component is community competence referring to elements that affect the community, such as cultural acceptance of positive changes, social cohesion and collective efficacy. The second is the ecological, human, economic, political and policy environment, including elements in the environment of the local system that are often outside a project's scope of intervention but represent important transitional stages of development which NGOs cannot ignore.
- **USAID, Health system assessment (HSA) approach (2007/2012)** is a practical manual released in 2007 [247] and updated in 2012 [332] describing the five steps in the assessment process (shape the assessment, mobilise the assessment team, collect data, analyse findings and develop recommendations and prepare the assessment report). The modules include templates, country examples, lessons learned, and relevant tools for use in future assessments. It also provides guidance on indicators to assess each of the health system building blocks, country stories, and templates and a bibliography with supplementary material.
- **USAID, Service Provision Assessment (SPA) (2011)** survey tool for health facility assessments provides a comprehensive overview of a country's health service delivery. It collects information on the availability of different facility-based health services in a country and readiness to provide those services [333]. The SPA questionnaires were updated in 2012 in collaboration with international agencies to make them easier to use and to include additional information. The inventory questionnaire collects information for the calculation of USAID and WHO's service readiness indicators but does not include SAM.
- **International health facility assessment network (IHFAN) (2011)** is a multi-agency network committed to strengthening health facility-based data collection and use worldwide IHFAN provides resources (including tools and white papers) to help users better understand existing health facility assessment tools [334]. It provides a core set of indicators for cross-country comparison of health systems performance. Moreover, it provides technical assistance for developing training courses to improve country capacity in health system data analysis and use.
- **Berman and Bitran, Health system performance analysis (2011)** measures health system performance by defining indicators, judging the adequacy of performance relying on benchmarking, then providing a link to policy development by setting causal hypotheses on how changes will affect performance [306]. Evidence-based information is then used to formulate policy and action proposals to improve performance. The analysis is considered a valuable step in creating a well-designed health systems strengthening strategy.

- **Jacobs et al., Access barriers analysis (2012)** is a framework to help policy makers and health planners identify the different dimensions and aspects of geographic accessibility, availability, acceptability, and affordability barriers to access to health services and to devise interventions to address these barriers [308]. The framework is also useful in assessing the appropriateness of existing interventions to address the identified access barriers.
- **FHI 360, Health system rapid diagnostic tool (2012)** is a practical rapid diagnostic tool that takes actors in a participatory process through five phases and 17 steps to measure the strength of priority health system functions [327]. It is a how-to guide for designing and implementing a customised health system performance diagnostic. The emphasis is on a country-led design and planning process that is applicable for investigating the health system with a project, district, region or national perspective.
- **O’Neil et al., Service availability and readiness assessment (SARA) (2013)** is a health facility assessment tool designed to assess and monitor the service availability and readiness of the health sector and to generate evidence to support the planning and management of a health system [307]. SARA is designed as a systematic survey to generate a set of tracer indicators of service availability and readiness. The survey objective is to generate reliable and regular information on service delivery (such as the availability of key human and infrastructure resources); the availability of basic equipment, basic amenities, essential medicines, and diagnostic capacities; and the readiness of health facilities to provide basic healthcare interventions relating to family planning, child health services, basic and comprehensive emergency obstetric care, HIV, TB, malaria and non-communicable diseases.
- **UNICEF, District health system strengthening (DHSS) approach (2013)** for equitable and effective coverage provides guidance on the four components of Diagnose, Intervene, Verify and Adjust (DIVA) [311]:
 - The ‘Diagnose’ component analyses bottlenecks of interventions at the district level and evaluates the capacity and equity of district health systems. The step-wise EeSDQ approach evaluates enabling environment (Ee), supply (S), demand (D) and quality (Q) constraints through six determinants of an intervention’s effectiveness coverage:
 - Supply side constraints*
 1. Availability of essential health commodities
 2. Availability of trained human resources
 3. (Physical) accessibility of service delivery points for the interventions
 - Demand side constraints*
 4. Initial utilisation of interventions (fitting characteristics of service delivered and user expectations)
 5. Continuity/completeness in the continuous utilisation of interventions (or continuous coverage, that includes appropriateness)
 - Quality constraints*
 6. Quality of interventions delivered (or effective coverage) through adherence to guidelines

- The 'Intervene' component consists of a causality analysis to assess root causes of identified bottlenecks with inputs from district health team and communities and leads to implementation plans. Supply-side bottlenecks analysis looks at health systems processes and managerial shortcomings. Demand-side bottlenecks analysis looks at factors such as awareness, acceptability, perceived value, and trust from client and community perspectives. Quality analysis examine how well interventions adhere to global and national quality protocols.
 - The 'Verify' component monitors the bottleneck reduction and changes in equity level of coverage.
 - The 'Adjust' component provides actionable data for district health system strengthening interventions to improve quality and equity.
- **WHO and World Bank Group, Monitoring progress towards universal health coverage at country and global levels: Framework, measures and targets (2014)** proposes a framework for monitoring universal health coverage as part of a comprehensive framework for monitoring national health system performance [315]. It supposes that monitoring universal health coverage is integral to tracking overall progress in health and performance, which requires regular assessment of inputs (finances, health workforce and medicines), outputs (service provision), coverage of interventions, health impacts and the social determinants of health. In this context, monitoring of universal health coverage concerns two discrete components of health system performance: 1) levels of coverage with health services; and 2) financial protection, with a focus on equity. The document states that progress in achieving universal health coverage through these components is an important goal of health systems, but it is not a substitute for other health goals, such as improved survival or healthy life expectancy.

Health system strengthening interventions

Interventions that aim at strengthening weak system functions improve the health system performance (i.e., improving access, coverage, efficiency, equity, quality, safety and sustainability) and impact on care, cost and health outcome. Interventions may, as suggested above, target a single health system function, for example training health workers; a single domain, for example, improving financing for health; several functions across domains, for example, decentralising healthcare to health posts with improved cadres and equipment; or more rarely all domains, for example, reforming the health system. Health system strengthening is a complex undertaking, involving both political and technical knowledge and actions, and it may require significant time to implement and even longer to produce results [247].

The triple aim of a health system (care, cost, health) invited a focus shift from activities that support the health system for a specific health service towards activities that alleviated constraints to strengthen the system. The former focused on a targeted service delivery, and measured its performance and impact. The latter focused on multifaceted health system strengthening interventions, and measured the performance and impact on the overall health system [29].

Health system strengthening versus health system support. Some authors made a clear distinction between health system strengthening and health system support, while other authors were vague or unclear themselves. One could argue that the line between the two is not always obvious because all interventions affect the health system. Support interventions in general are disease- or intervention-specific and do therefore not take into consideration system effects. For example, interventions for a particular health problem may be cost-effective for that particular health problem, but may ignore synergies and interactions that may have unintended effects (good or bad)

on other health problems or on the health system as a whole, and not spend available funds efficiently. The study of the literature learned us that distinguishing between support and strengthening of the health system is crucial to understand the scope of the intervention outcome but is not done. Doing so, would help policy makers and health managers to weigh the overall benefits from a system-wide perspective, and foster public health improvements.

It is useful to be clear on the strategic differences between health system support and strengthening, and their related capacity needs. Criteria for identifying interventions that either support or strengthen the health system have been developed [305], and where adapted to SAM interventions in Table A2.1.

Table A2.1. Examples of criteria for health system support or strengthening with disease-specific or system-wide effects

Investment	Criteria	Examples of interventions
Health system strengthening (HSS)		
HSS with system-wide effects	Activities to strengthen components and elements (functions) of the health system which are not linked to a specific disease- or thematic area but encompass broader, sector-wide or multisectoral areas	- Developing primary care infrastructure - Building health worker capacity in managing health responsibilities for a population - Strengthening ministries of health policy-making capacity - Developing a social health insurance system
Function-specific HSS	Activities to strengthen one health system function	- Developing drugs procurement regulations and supply-chain management system
Disease-specific HSS	Activities to strengthen various or one system function that contribute to health outcomes for one disease or thematic area	- Strengthening skills of health workers in SAM case management by training the comprehensively adapted IMCI training that includes SAM
Health system support (HSs)		
Disease-specific HSs	Activities to improve health outcomes across one or several disease or thematic areas, but not to strengthen specific components and elements (functions) of the health system	- Training health workers in diagnosing and treating SAM - Establishing and maintaining SAM monitoring systems
Programme-specific HSs	Activities to improve programming	- Proposal writing, monitoring and reporting, administrative costs, overhead

Distinctive interventions for disease-specific support, disease-specific health systems strengthening (or selective health system strengthening) and health system strengthening with sector-wide or system-wide effects were also described as follows [335]:

- **Health systems strengthening** interventions address key health system functions for a group of diseases to improve outcomes with system-wide effects (a systems approach).
- **Disease-specific health systems strengthening** interventions address key health system functions for improving disease outcomes. They report on the system-wide effects because the interventions were initially designed to affect the entire system (a systems approach).

- **Disease-specific health system support** interventions address key health system functions and actions needed for successful quality implementation but do not take into consideration system effects. They improve outcomes primarily by increasing inputs. Support interventions target a specific disease and report on the specific disease outcome. A SAM example would be: Training health workers in SAM guidelines improves SAM survival. Support interventions have positive or negative effects on the health system that are not explicitly studied or reported. A SAM example would be: Removing health workers from the workplace for SAM training may interrupt care delivery, however, training may improve health worker motivation and quality of care.

Strategies for health system strengthening

The need for effective health system strengthening strategies has grown in the past decade, driven by the major global health initiatives and the progress monitoring of the millennium and sustainable development goals [336]. Intrinsically linked is the need to understand the dynamics and capacity of health systems and their actors to absorb and integrate new interventions or take interventions to scale.

Various guidance on, and models and approaches of health system strengthening strategies have been developed and implemented, targeting specific domains, health system functions or overall transformation of the health system. Opportunities to reinforce the health system with a systems approach were not always seized as developing or optimizing synergies between support programmes are not easy tasks [337]. Some examples of methods and tools on health system strengthening are listed below.

Examples of health system strengthening strategies

- **Potter and Brough, Systematic capacity building (2004)** proposed systemic capacity building with four levels of capacity needs for the health system. Presented in a pyramidal framework, from top to bottom they are: Tools; skills and competences; staff and facilities; and the system, structures and roles. They suggest that health system support interventions mainly focus on the top two of tools, skills and competencies. These interventions are pertinent for service delivery, but they do not lead to processes that bring lasting change and performance. Health system strengthening interventions mainly focus on the basis of the pyramid, i.e., on organisational systems and processes, stewardship, role capacity, accountability systems, and performance management systems to enable the system to achieve its triple aim (improving care, cost and health) [296].
- **WHO (2008)** developed a toolkit on monitoring health system strengthening for service delivery providing guidance on: Data sources (facility reporting systems, surveys, censuses and special studies) and methods to assess the availability, utilisation and quality of service delivery; healthcare quality indicators (effectiveness, safety, patient-centeredness and timeliness); and investments to improve data availability and quality [338]. Methods are not disease- or service delivery-specific, but propose using 'tracer interventions', i.e., report on one or few health interventions that are relevant for the health services overall,

adapting the tool to the basic package of services provided at the envisaged service delivery platform, or using it for continuous quality improvement¹⁰ [339].

- **Peters et al. (2009)** proposed a framework to guide the design of health system strengthening strategies for service delivery that consider interactions of key health system functions with enabling and inhibiting factors and the context [301]. The framework is a tool in the design to improve disease-specific service delivery with systems thinking.
- **Marchal et al. (2009)** argued that most health system strengthening strategies are selective, i.e., they target a specific disease [340], and as such, their effects may undermine progress towards the long-term goal of effective, high-quality and inclusive health systems. They underlined that in complex and open health system, the context must be understood, because a weakness at one level may be the consequence of a root cause at another level. Thus, health system strengthening requires major personal, organisational and institutional change, and therefore, there are no quick fix solutions. Key actions that may overcome health system constraints and foster change identified were:
 - Define the aim of health system strengthening
 - Address deep-seated tensions between the public and private sectors to balance roles and funding and obtain the right mix of service provision
 - Consider the complex nature of the health system
 - Address the health workforce brain drain
- **IHP+ (2010)** provided an operational framework for the monitoring and evaluation of health systems strengthening that provides guidance on how to operationalize the framework at the country level and how global partners can work together to support its implementation [300]. The operationalization of the framework used the Country Health System Surveillance (CHeSS) platform for subnational, national and global reporting, aligning partners at country and global levels around a common approach to country support and reporting requirements.
- **WHO (2010)** provided guidance and tools for developing a strategy and monitoring and evaluating health system strengthening interventions for developing a health system strategy, indicators and plan [303].
- **Swanson et al. (2010)** proposed 10 principles for health system strengthening: holism, context, social mobilisation, collaboration, capacity enhancement, efficiency, evidence-informed action, equity, financial protection and satisfaction [341].

¹⁰Continuous quality improvement (CQI) is a cyclical process of continuously measuring a performance gap; understanding the causes of the gap; testing, planning and implementing interventions to close the gap; studying the effects of the interventions; and planning additional corrective actions in response.

- **Gwatkin and Ergo (2011)** discussed how equitable health systems in Mexico and Brazil reached the poor first because they were designed to do so and would have failed if they had not been [342].
- **Health Systems 20/20 (2011)** summarised learning on health system strengthening strategies to eliminate barriers from 250 activities in 51 countries [343]. It found that applying systems thinking to health systems accelerated strengthening.

Overarching lessons on health system strengthening were:

- Health systems strengthening was a nonlinear process benefitting from a holistic approach that paid attention to how individual health functions interacted and affected one another, and affecting several health functions simultaneously
- Each country followed a unique path, and health system strengthening interventions should target constraints that affect multiple health programmes
- Standardised, precise definitions were needed to distinguish between activities that support and strengthen a system, although both are important.

Specific lessons from prioritised strategic health system strengthening activities were:

Governance

- Health governance: Governance structures and processes influenced how actors in the system are linked and interact, which affected the quality and sustainability of health services. Better governance should be integrated across all parts of the health system.

Financing

- Costing and sustainable planning: Cost-effectiveness studies did not measure efficiency of implementation. Cost-effective interventions must be implemented sustainably, at scale in an effective manner. Instead of using generic costing tools, unpack cost data to measure efficiency of services.
- Financial risk protection: Health insurance and fee exemptions do not automatically result in increased access and coverage for poor and vulnerable groups. They only improve equity if they are purposively designed and implemented, reduce out-of-pocket spending, and increase access to quality health services. Small isolated community-based insurance schemes have limited impact on equity and are vulnerable to bankruptcy.
- Performance-based incentives: Carefully designed and implemented performance-based incentives have great potential but need further research on effective design and implementation arrangements.

Information

- Resource tracking: Government mandate to produce health resource tracking data with strong government ownership; distilled key policy messages and dissemination; building local and regional technical capacities; user-friendly software.
- Measuring and monitoring health systems performance: Improved metrics and methods are needed to systematically capture the effects of complex systems strengthening interventions.

Workforce

- Human resources for health: Key issues in the development of a national human resource strategy are financing (aligned with labour workforce realities), management (including, e.g., performance management systems, information rearing systems, accountability) and compensation (key to productive, motivated and stable workforce).

- Capacity building: Building the technical and management capacity of local and regional institutions increases country ownership and boosts sustainability of health systems.
- **The World Economic Forum (2014 and 2015)** proposed that health systems in emerging economies need leapfrogging as a means to put them on a path to sustainability [134, 273]. The principle of leapfrogging is to choose innovations that allow taking a short cut in reaching a more advanced development stage without accumulating inefficiencies along the way. It can occur at the macro or micro level. At the macro level, leapfrogging means the transformation of an entire system (for example, comprehensive infectious disease services). At the micro level, leapfrogging means discrete but significant changes within specific components of the health system (for example, task shifting). The two concepts can be mutually reinforcing. Leapfrogging opportunities have been shared (Table A2.3) and further expansion is being planned. Also, design elements behind successes, and best ways to overcome barriers and enhance enabling factors are being explored. To be considered leapfrogging, a change must create a transformative impact satisfying three criteria: Accelerate a health system's development; be cost-effective; and be scalable.

Three types of innovations enabled leapfrogging:

- *New technology* encompassing new health-related activities and products that are simpler, more affordable and more durable than existing solutions
- *New operating models* referring to any modification in an organisational set-up and process design (e.g., changes of roles, workflow, incentives)
- *New behaviour patterns* referring to the evolution of preferences and conduct of individuals (e.g., adoption of different lifestyle) and organisations (e.g., role interpretation) within the health system

Literature map

Evidence on disease-specific health system strengthening interventions with system-wide effects

The findings from the literature review on health system strengthening interventions with system-wide effects relevant to SAM interventions are summarized here. The review did not yield relevant information on each health system domain, and overall, evidence on system-wide effects was limited. Promising innovations and system effects are summarised per health system domain, and when more than one domain was applicable, the most relevant was chosen. The selected interventions and their potential system-wide effects were discussed per health system domain.

Governance

1. Building capacity at the middle level (or meso level) of governance

A study in Cambodia, Lao PDR, Kenya, Uganda and Peru shows that the middle level of governance (e.g., district or provincial level) seems to overemphasize vertical aspects of compliance, rather than horizontal aspects of coordination [344]. This finding is in line with other studies [345] and suggests that the middle level of governance may be the bottleneck for the scale-up of programs. It also indicates that building knowledge capacity (rather than managerial capacity) at this level is important for successful scale-up.

2. Separating technical and the operational/programme management functions

A multi-country study on non-communicable diseases (NCDs) suggests separating NCD-specific units and sector-wide organizational units [346] (e.g., health policy and planning units, human resource development units, drug and logistics units). NCD-specific structures could strengthen technical capacity for NCDs in ministries of health and provide institutional identity and visibility, especially when ministries have similar structures for other public health problems. These NCD-specific units should focus on technical aspects such as developing clinical guidelines and advising on proposed interventions and research. In addition, NCD-specific units should focus on strategizing, guiding and coordinating policies and activities across different stakeholders within and beyond the ministry of health. This should ensure including NCD-related activities as appropriate to the epidemiologic picture. However, these units should not directly implement NCD plans and management or deliver NCD-related services. These roles should be left to system- and sector-wide organisational structures.

3. Building stronger multisectoral partnerships

A multi-country study [346] on NCDs shows that multisectoral coordination and collaboration are often weak and insufficient. Resources needed to organise and manage such coordination mechanisms appear inadequate, and the inter-ministerial bodies seem to have limited effectiveness in most LMICs. Coordinated efforts are needed to build stronger multisectoral partnerships covering multiple public health problems. An overall coordinating body should harmonise these efforts from different partners and agencies.

Financing

4. Social franchising

Social franchises are networks of private providers operating under contracts with a common agency and providing standardised products and services under a common brand [347]. While the franchisor is often a non-governmental organisation (NGO), the number of government and for-profit social franchises is growing. Social franchising is theorised to increase healthcare access and utilisation by expanding the number of healthcare outlets and the products and services they offer, as well as by generating consumer demand through branding and marketing [348]. By organising independent private providers into a common network, franchising facilitates standardisation and regulation. Providers are incentivised to join and remain in the network by gaining access to training, high-quality commodities and promotional support. These incentives can improve the quality of care and encourage 'self-regulation' of compliance with quality and affordability standards. The providers are typically of higher quality than non-franchised private providers [348]. However franchising systems need to be adequately structured and regulated. This again calls for a strong decentralized structured acting as a knowledge steward or manager.

Health system effects: Franchising may be a particularly useful strategy in areas where a large unregulated private sector provides most health services. Franchising can also be implemented effectively by governments to strengthen public sector healthcare delivery and is an efficient way to introduce new services into existing private sector healthcare.

Information

5. Real-time monitoring and reporting

National monitoring and evaluation systems in resource-limited settings tend to be chronically challenged, with persistently incomplete reporting and inaccurate data posing a major threat to

their utility [349]. Real-time data allow staff and stakeholders simultaneous access for planning, implementation, decision-making and evaluation, which may reduce the amount of time spent reconciling discrepancies [350]. Automated trend and summary reports for regional, district and site-level data could give timely feedback to site and district staff. An experimental study in Uganda found that a real-time, electronic performance-monitoring system for tuberculosis at primary health facilities increased tuberculosis case detection and could help improve provider adherence to accepted standards [351]. The system captured individual data on symptoms of tuberculosis from every patient evaluated in primary health clinics. This data permitted the direct calculation of number of cases at risk and suspected of tuberculosis, and the monitoring of service quality for an individual clinic or provider. Extra staff were hired to do this surveillance and evaluation work.

Health system effects: Electronic data collection decreases the burden that hand-written registers place on busy health workers in primary healthcare clinics, and also decreases the likelihood of loss, transcription errors and delays in transmitting data to central health authorities. Each site hired one extra data assistant to enter the data. This real-time monitoring system allowed evaluation of the real-world effectiveness of new interventions and technologies to increase case detection.

6. Integrated monitoring and evaluation systems

Integration of disease-specific monitoring and evaluation staff, systems and processes into the health system is believed to increase efficiency by reducing duplication and administrative burden. Lack of integration may bypass the district health information system and undermine policy intents of integrated district management. Integration is lacking among as well as within disease-specific programmes [350]. Aggregated data combined in an integrated reporting system are essential to assess the relationship between activities in different areas of the health system and to guarantee the continuum of care. A well-designed database could enable facility-level integration of information across traditionally siloed programme areas.

7. Longitudinal tracking of programme and facility characteristics

Conventional monitoring and evaluation variables rarely capture critical contextual information about facilities, staffing and communities with relevance across different disease areas. Such contextual information can facilitate implementation planning and more holistic evaluation of programme performance [350].

8. Geographic information systems

Geographic information systems (GIS) allow visualisation of geographic factors such as population density, disease incidence and prevalence, other health indicators, distribution of health facilities and proximity to major roadways [350]. GIS also provide a way to assess how service programs relate to communities, to one another and to the larger health infrastructure.

Workforce

9. Strengthening human resources information systems

Open source software can track health provider training, certification and licensure; maintain personnel information; model long-term health workforce needs; and inform policy analysis and development related to factors such as recruitment, deployment and retention [352]. These software applications should also be used to track and provide data on community and other non-facility-based providers for more effective workforce planning and support. The Open Source solutions hold great promise for decreasing implementation and ongoing maintenance of these

workforce planning and support systems, as well as providing a global community for support and continuous improvement.

10. Engaging the private sector

A study in Pakistan found that using interlinked innovations such as involving the private sector, mobile-phone-based screening by community members, conditional cash incentives and mass communication campaigns could substantially increase case notification in dense urban settings [353]. A retrospective case study from Nigeria found that private practitioners contributed substantially to case detection and treatment of tuberculosis and HIV [354]. Successful strategies to improve private healthcare services changed the market conditions for informal private providers by changing incentives and accountability, rather than relying on training and building individual capacity [355]. To understand the effectiveness of these strategies, more research is needed to assess contextual factors and document outcomes over longer periods.

11. Task-shifting

A cluster-randomised trial in a province of South Africa showed that primary care nurses' roles could be safely expanded to include antiretroviral therapy initiation and re-prescription. This improved health outcomes and quality of care but might not reduce time to antiretroviral therapy or mortality [356].

Health system effects: A country case study [357] in Burkina Faso evaluated task-shifting from a systems perspective and identified the following positive health systems effects: Increased health provider sense of responsibility and worthiness, increased satisfaction from using newly acquired skills in other, non-HIV tasks and improved patient-provider relationships. Negative unintended effects were staff frustration from lack of medicines and supplies, and lack of necessary infrastructure to be able to perform the new tasks. Moreover, task shifting of clinical care crowds out actors for health and nutrition promotive and prevention activities.

12. Engaging CHW in the health system

Research and evaluations mainly during the past two decades offer compelling evidence that CHWs are critical for health systems to achieve their potential, regardless of a country's level of development [358]. In low-income countries, CHWs can make major improvements in health priority areas, including reducing childhood undernutrition. They can be effective in active case finding and tuberculosis treatment delivery, contribute to capacity building and improve routine tuberculosis recording and reporting systems [359]. CHW activities should be integrated into the health system, with CHWs receiving appropriate training, support from facility-based health providers, mentoring and supervision, and appropriate infrastructure and equipment. It is also essential to find the right balance in the number of tasks CHWs can perform, embedded in a long-term vision. Too many tasks overwhelm CHWs with new knowledge and skills that they rarely practice, which impacts on maintaining the skills. Non-monetary incentives are critical to the success of any CHW programme [360].

13. Training of CHW through information and communication technology

Multimedia applications with digital content could lower the cost and enable more effective training [361]. 'Blended' approaches that combine live training with multimedia applications align with the most effective pedagogical techniques: They foster interaction, repetitive learning and supervision and monitoring. Digital content, including videos, animations and other multimedia applications, is useful for engaging CHWs, who have limited if any education and literacy. Multimedia can also enable faster and better training. In turn, mobile training and resources provide a link for remote

repetition of training, supervision and monitoring. While content must be locally customised, up to 80 percent of training content could be standardised and shared. Open source, digital content, which supports 'blended' approaches to training could facilitate this sharing. With mobile phone access as high as 80 percent among CHWs in some countries, mobile technology could be used more for training and informal learning. Every CHW with a mobile phone can use it to solve problems and seek advice from peers and supervisors—with just a phone call or SMS. Text messages could also be a novel and cost-efficient way to raise awareness, promote behaviour change, identify performance gaps, incentivise new practices, refresh skills, and increase cohesion among co-workers and peers [362].

14. Integrating traditional birth attendants into the national health system

An implementation review study found that integrating traditional birth attendants into a national health system through a family health promoter programme increased access to reproductive health services by women in rural communities in Timor-Leste [363]. Regular communication between health workers and community leaders in recruiting family health promoters, and the use of supportive supervision tools to identify weaknesses in the management of this initiative were important. Traditional birth attendants could support a variety of tasks including outreach and case finding, health and patient education, referrals, home visits and care management. Enabling health system factors for this initiative are human resources for supervision and coordination, an adequate referral system, minimum incentives and basic infrastructure.

Service delivery

15. Integrated community case management (iCCM)

Community-based management of diarrhoea, pneumonia and malaria in children were brought together in a package known as integrated community case management (iCCM). The iCCM package includes the identification (but not treatment) of severe acute malnutrition and home visits (but not treatment) for newborns [26]. Several national health systems have struggled to implement iCCM [364] since it does not align with the country's health policies and systems [365]. iCCM packages should be tailored to match country's health profile needs, and include the promotion of political ownership. Awor et al. (2014) [366] propose to involve the private sector in iCCM programs to increase the coverage.

Health system effects: In Malawi, health managers and practitioners were supportive for lower-level health workers to provide limited clinical services [367]. CHWs can benefit from increased motivation and an enhanced relationship with the community when curative services are added to their activities. Managers may be unlikely to support an iCCM programme if they feel the scope of curative services is too broad. Giving CHWs greater responsibility without necessary support damages their motivation and trust in their supervisors.

16. Integrating primary care

In Zambia, a model to integrate antiretroviral therapy into outpatient department services was piloted in two urban primary healthcare clinics [368]. The model focused on three key modifications: 1) amalgamation of physical space and patient flow; 2) standardization of medical records and screening forms; and 3) introduction of routine provider initiated testing and counselling (PITC). Disease-specific outcomes were increased case finding and reduced stigma associated with antiretroviral therapy services.

Health system effects: For the overall outpatient department services, the study found improved collection of vital signs but significantly increased patient waiting time, which may affect patient satisfaction.

People

17. Practicing participatory learning action in social groups

Women's groups aimed to enhance appropriate case seeking and prevention by educating and empowering themselves through dialogue. They held meetings systematically, coordinated by facilitators who received 7 to 11 days of basic training in a health topic and participatory facilitation techniques. This technique was a cost-effective strategy to improve maternal and neonatal survival in resource-poor settings. Policy makers should consider women's groups as a core strategy to complement efforts to improve safer motherhood and newborn care through better midwifery obstetric care [369].

Rosato et al. (2008) [370] underline that scale-up is not an end but a process to support communities to develop their own solutions. Flexibility is therefore needed to address differences between and within communities. A case study in Zambia recognised the importance of enabling and building the capacity of existing community-based organisations and community structures instead of building new parallel structures [371].

Evidence on SAM-specific health system strengthening interventions with system-wide effects

The review of the literature on SAM-specific resources did not report on system strengthening but on system support.

Evidence on innovations that enabled health system change

Innovations on technology, operating model change and behaviour change enabled 'leapfrogging' for transformational change of health systems with examples of projects [273] and are summarized in Table A2.2. The innovations allowed leapfrogging, or jumping stages, and accelerated development of health systems because they proved to be cost-effective and scalable.

iii. Discussion

Innovations for health system strengthening provided us with learning on possible intervention strategies. A next step should consider further test or evaluate these interventions with adapted methods and enhance learning relevant for overall and SAM-specific service delivery. Table A2.3 lists the interventions from the studied sources that proved their efficacy.

Learning from the evidence on health system strengthening interventions for SAM

There is growing evidence base and learning from health system strengthening interventions in low- and middle-income countries and there is a wide This enhanced confusion and sustained a lack of consensus on key concepts of health system strengthening for improving care, cost and health that

requires a systems approach. Nevertheless, health system support for service delivery and a single service-specific outcome of either cost or health remains also necessary. To progress on health system strengthening, much more emphasis needs to be put on common goals and common processes for service delivery that peripheral health system actors should lead, and their capacity to look at the whole and adapt to the continuously changing environment. Therefore, strong leadership is needed based on knowledge skills rather than management skills.

Putting the decentralised leadership at the centre of the health system is therefore key to success. Decentralised leadership is a pivotal element for strengthening the health system where partnerships are created and capacities are built for improved service delivery. Strengthening capacities at the district health system level of governance is about creating an enabling environment of structures, systems and roles for staff and infrastructures, to use skills and tools that lead to improved service delivery.

Accelerating change

A change in architecture is needed for strengthening the system for improved service delivery with systems thinking, that includes the following three interacting elements:

1. Decentralised level leadership supporting the horizontal axis;
2. Central level leadership supporting the vertical axis; and
3. Knowledge focus instead of a management focus as core element of comprehensive primary healthcare (or support programme) leadership.

The first element repositions the governance structure of the district health system as a managerial or stewardship body. Leadership at this level allows a systems approach that strengthen, integrate and coordinate structures, partnerships and health activities that are adapted to the public needs. Leadership is driven by knowledge rather than management skills. The second element defines a distinction between the central and decentralised level of governance. The third element lays the emphasis on knowledge. But knowledge will not work unless the middle level of governance is put at the centre of the health system. As a result, specialized knowledge bodies rather than an administrative managerial system is at the centre of primary healthcare. For example, franchising of services becomes interesting for the public sector when the district management team is able to, e.g., regulate, coordinate and support the partner, collect and use the information, ensure quality service delivery, understand interactions in the system, and cover the public needs. This example may apply for the other innovations. Moreover, in case public sector budgets are short but intelligence is present, public sector actors are in a favourable position to embrace innovation that leads to transformational change of their health system at national or decentralised levels. Other examples include pooled financing, synthetic and integrated information systems, use of ICT, and multifunctional health workers as drivers at the centre of service delivery. Inter-agencies and multisectoral coordination and knowledge bodies are useful and needed but will only function when they fall under an umbrella of a sector-wide organisational structure that enhances sectoral governance at the central and decentralised levels. Moreover, a stronger knowledge focus rather than managerial focus of these bodies will drive stronger partnerships and alliances.

For SAM, management and knowledge structures should be adequately located within the overall system with decentralised and flexible leadership at the core of the system.

Table A2.2. Examples of innovations in technology, operating model change and behaviour change that allow leapfrogging by health system domain [273].

	Technology	Operating model change	Behaviour change
Governance	A nationwide, integrated electronic health record system can improve quality and efficiency of care by avoiding data silos. (Example: Electronic Health Record System in Estonia)	Inter-sectoral governance can bring health considerations into all aspects of public policy making in a holistic manner. (Example: National Committee on Public Health in France)	Excise taxes and marketing bans on unhealthy products coupled with subsidies for fruits and vegetables encourage healthy behaviour. (Example: Sugar Tax in Norway)
Financing	Smart cards for health insurance buyers can streamline administration, facilitate data collection and mobility, and improve the quality service delivery while preserving patient privacy. (Example: RSBY biometric smart card in India)	Micro-insurance products can increase access to care for low-income populations while limiting exposure to financial risk. (Example: Hygeia Community Healthcare in Nigeria.)	Rewarding health insurance buyers for healthy lifestyles by adjusting premiums to measurable exercise activities and consumption habits can improve health and cut cost. (Example: Discovery Insurance Group in South Africa.)
Information	Mobile technology can be harnessed to communicate to broad population segments, especially in rural and low-income areas. (Example: Kenya's Integrated Mobile MNCH Information Platform)	Defined goal standards for measuring health outcomes can allow meaningful international benchmarking and sharing of best practices. (Example: Int. Consortium for Health Outcomes Measurement, ICHOM)	Providing food labelling to help consumers make better health-conscious choices. (Example: Traffic Light nutrition labelling in the United Kingdom)
Workforce	Clinical decision support software can empower health workers to improve the quality of services they provide. (Example: <i>Diagnostic software used by Minute Clinic walk-in clinics in the United States</i>)	Empowered community health workers can promote health and provide primary care supported by and acting as a gateway to more qualified health workers. (Example: <i>Pesinet child health programs in Africa</i>)	Increasing workforce awareness of financial considerations can reduce cost by promoting transparency and rewarding suggestions for process improvements. (Example: <i>Physician cost awareness policy by Narayana Health in India</i>)
Supplies	Refocusing medical production innovation on value to create products balancing quality with cost can increase access to care for low-income populations. (Example: <i>Philips's infant warmer; QIAGEN CareHPV Test</i>)	Strengthening supply chains for medical products , for example through supply chain integration, can make products more accessible and affordable for low-income populations. (Example: <i>Deliver Project by USAID</i>)	Incentivising the workforce to prolong product longevity through careful handling, regular maintenance, and safe reuse of devices sold as single-use products. (Example: <i>Re-using steel clamps at CARE hospitals in India</i>)
Service delivery	Mobile technology can be used to prevent disease and create demand for healthcare via mobile phone-based health education programs and counselling hotlines. (Example: <i>Masiluleke Project in South Africa</i>)	A holistic approach to prevention and health promotion can bring health considerations into every aspect of people's daily lives. (Example: <i>Heath Promotion Board in Singapore</i>)	Using social marketing employing proven commercial marketing techniques to promote can improve individual's health choices. (Example: Greenstar social marketing for family planning in Pakistan)

Care can be moved from hospitals to homes by **smart phone** technology enabling remote support and tracking of therapy adherence.
(Example: *Helius* software tool by Proteus Digital Health in the UK)

Telemedicine can improve the quality of care for remote communities by leveraging centrally-located expertise.
(Example: *Fortis and GE Healthcare tele-ICU in India*)

Insights from behavioural sciences can be used to effect behaviour change in the demand and provision of medical services.
(Example: *Abdul Latif Jameel Poverty Action Lab study in immunization incentives in India*)

Table A2.3. Health system interventions for improving SAM

Health system interventions	
Governance	Building capacity at the mid-level of governance for stewardship to adapt policy, regulate and coordinate partners, and organise resources systems and services, separating technical and operational management functions Building advocacy skills at intermediary and district level Building multisectoral partnerships and inter-sectoral governance Expanding social franchising and public private partnerships Expanding health actors involvement in health: Engaging and empowering community health workers and volunteers; Engaging the private-for-profit sector; Maximising involvement of professional organisations and civil societies; Involving traditional birth attendants and religious leaders, and other social and community groups
Financing	Promoting SWAp or pooled funding with increasing health budgets Promoting community contributions Supporting free care for children under 5 and vulnerable populations: Waiver/voucher/conditional care Expanding health insurances: Micro-insurance products; Smart cards for health insurance buyers; Rewarding health insurance buyers for healthy lifestyles Testing adapted motivation means: Pay for performance, other incentives
Information	Defining goal standards for measuring health outcomes Information and communication system with innovative technology: Integrated electronic health record system; Mobile technology for communication in vulnerable areas; Use geographic information systems; Longitudinal tracking of programme and facility characteristics; Real-time monitoring and reporting; Tracking of human resources Sharing of knowledge and information system
Workforce	Expanding information and communication technology (ICT) for continuous learning and professional development; Clinical decision support software; e-Learning Increasing health workers' capacities and motivation: Task-shifting and task-sharing; Increasing awareness of financial considerations can reduce cost; Updating pre-service curricula; Installing learning sites for internships and on-the-job mentoring; Expanding peer support; Transformative learning: Understanding and competencies in addressing complex health systems (expanded from biomedical-centric approaches); Practicing participatory learning action in social groups
Supplies	Strengthening supply chains for medical products procurement, distribution and storage; Incentivising the workforce to prolong product longevity; Fostering medical production innovation; Improving forecasting and tracking of use Using social marketing employing commercial marketing techniques
Service delivery	Decentralising primary care - integrated community case management (iCCM) Integrating health services with patient-centred continuity of care Expanding mobile technology to prevent disease and create demand; Insights from behavioural sciences can be used to effect behaviour change in the demand and provision of medical services: Telemedicine can improve the quality of care for remote communities; Moving care from hospitals to homes by smart phone technology Learning from real world implementation for continuous improvement; Enabling continuous quality improvement (QI) system

Figure 1.3 shows district health system interactions that are at play on vertical and horizontal axes for SAM and other service delivery at the platforms of service delivery that are supported horizontally by decentralised governance (the district health management team) and vertically by the central governance (policy makers). On the vertical axis, the higher-level health system and its actors, support the health district level and the SAM-specific service delivery but also all other services of the delivery platforms. On the horizontal axis, SAM-specific services and actors of the three delivery platforms are integrated in the services, linking with people and context. Health system functions interact in non-linear ways by reinforcing or weakening, interrupting or accelerating each other for service delivery.

Regarding scaling-up and integrating SAM, based on the learning from the discussions on system strengthening above, key actors should explore whether strategies to promote scale and integration improve efficiency and impact to achieve the triple aim of improved population health, individual care and risk protection in their context. However, to study impact may be tricky as many factors interact and influence impact. There is a need to first explore integration to understand the concept and the evidence, and learn whether integration is desirable in all settings of all activities in which contexts of capacities, resources and health priorities. Learning on health system strengthening has underlined the importance of systems thinking. Nevertheless, health system support interventions take an important place under the umbrella of the health system development approach. If these interventions ignore a systems thinking lens, their impact on disease-specific health and cost-effectiveness can not be evaluated, and therefore may promote or demote impact in the overall contribution to systems strengthening.

Planning for health system improvement

A paradigm shift is needed when envisaging a health system strengthening approach instead of a health system support approach. Similarly, transformative change from a biomedical-centric approach towards understanding the complexity of the health system and applying methods and tools would uncover the complexity. A health system strengthening strategy applying systems thinking approaches will pay attention to interactions and stimulate change, use more effectively resources. This will require a collaborative and iterative learning process. Ten guiding principles for health system strengthening (holism, context, social mobilization, collaboration, capacity enhancement, efficiency, evidence-informed action, equity, financial protection, and satisfaction) underpin the strategic planning that is adapted to the context, situation, needs, possibilities and stakeholders, and their perceptions [341].

Figure A2.5 shows a framework for strategic planning of health system interventions, applying a systems lens based on the Deming cycle of Plan-Do-Study-Act [372]. The framework shows the distinct steps in the planning and implementation process of Diagnose-Design-Implement followed by Adapt the design-Monitor implementation-Verify the change or progress. It is an open and virtuous circle because planning, implementing and learning is an ongoing, iterative process that adapts to change. Implementation research contributes to learning and improvements at the various stages. It informs and ensures the application of evidence-based strategies, methods, tools and actions.

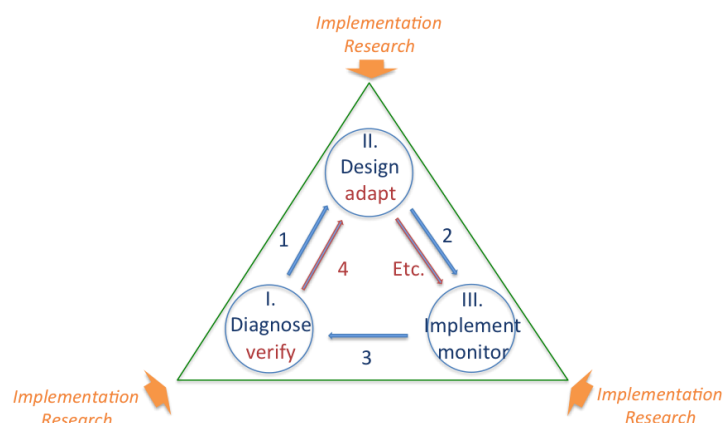


Figure A2.5. Framework for strategic planning of health system interventions with systems thinking

The framework takes into consideration factors that influence the planning process and outcomes for decision-making. These factors include the epidemiological picture and health priorities; health system characteristics and capacities; the complexity of the proposed interventions; the roles, responsibility and perceptions of key actors; availability of resources; and the socio-political, economic and cultural context. Contingency planning to address emergency or prepare for fragile situations are part of the planning process.

Table A2.4 summarises methods and tools for use in the strategic planning process of diagnosis and design.

Recommendations for next steps in learning about integration of SAM interventions into national health systems that evolved from the scoping study can be summarised as:

1. Expand learning on the integration of SAM and other health interventions into national health systems, and propose an initial theory
2. Conduct a realist evaluation on two contrasting cases of successful SAM implementation at the district level, to test and refine the theory
3. Finalise an initial planning and implementation framework, based on the new learning

Table A2.4. Diagnostic and design steps and approaches in planning process health system strengthening

Step 1. Diagnostic	Intermediate step: Research	Step 2. Design
Objectives: Diagnose the strength of key health system functions and performance of the health system	Identify what works to address the gaps how, for who, in the given context	Design strategic intervention plan to address bottlenecks, strengthen key health system functions/the health system
Process: Involve stakeholders, analyse the situation, and confirm goals based on prioritised needs	Collect knowledge and evidence on effective interventions	Involve stakeholders to design the plan based on knowledge, information, perceived and prioritised needs and capacities
Questions to answer: What health system functions are weak/bottlenecks, what needs prioritised	What intervention works for which purpose, how, for who, in what context	How to implement the interventions, in what timeframe, with what budget, actors and other resources, and how to monitor progress and evaluate impact
Outcome: Needs identified and prioritised, goals and objectives with benchmarks stated	Evidence-based and promising interventions identified	Strategic plan with interventions for strengthening including M&E developed
Approaches or methods: • Assessment, evaluation or review of intervention inputs, processes, outcome or impact • Health system assessment, diagnostic, or bottleneck analysis (focusing on health system functions, i.e., inputs, process), with or without root cause analysis of identified weak functions or bottlenecks • Health system performance assessment (focusing on health system performance, i.e., outcome of performance indicators: access, coverage, efficiency, equity, quality, safety, sustainability) • SWOT analysis	• Literature review of evidence and promising practices - Lessons learning - Scoping review - Systematic review • Descriptive studies: e.g., cross-sectional and longitudinal surveys, case studies • Intervention studies • Cost-effectiveness studies • Theory-driven approach (focus on what works, for whom in what circumstances and why): e.g., realist review, realist evaluation • Systems approach (focusing on interactions and synergy effects): e.g., simulation modelling, causal loop analysis, participatory impact pathways	• Strategic planning to define aim and objectives, benchmarks, budget allocation and roles of actors and in participation with key actors. The planning process includes the following steps [58] - Reviewing the situation analysis, prioritise needs & interventions - Conceptualising the effects of the proposed interventions - Developing a strategic and action plan with interventions that optimise synergies and other positive effects that includes an M&E plan - Planning for M&E includes: • Defining indicators • Choosing methods and design that fits the nature of the intervention and context • Planning for implementation research • Developing M&E plan with timeline, budget and resources • Planning of process to adapt and redesign the intervention plan

M&E = Monitoring and evaluation; SWOT = Strengths, weaknesses, opportunities and threats.

iv. Conclusions

This study presented learning about health systems and health system strengthening for health interventions. It identified promising innovations and discussed them from a systems perspective. Several claims to strengthen health systems have made a debatable contribution to health service delivery. The paucity of information on contextual elements and system-wide effects did not allow evaluation of promising innovations. Therefore, findings do not provide magic bullets for system strengthening, however, it has emitted sparks of useful learning. The literature indicated that differences in countries, contexts, health system characteristics as well as complex interactions with potentially unintended effects are influential when integrating or scaling up disease-specific health services. Moreover, a change in architecture is needed to redefine the role of decentralised governance. District health teams should lead health system strengthening innovations carried by knowledge rather than management.

Learning from innovative system interventions was key and their relevance for SAM-specific system strengthening has to be explored. Planning and implementation of health system strengthening interventions for integrating or scaling up SAM have to be goal oriented (begin with the end). They need to be flexible to changing contexts with monitoring systems that detect unexpected and unintended changes, processes and outcomes. The evidence gap should therefore stimulate implementation research on innovative interventions for system strengthening with systems thinking that also integrates SAM support interventions.

Scoping of health systems and health system strengthening helped to define the place of integration and scale-up as health system strategies for improved health outcome, and was a useful first step to narrow the research question on the integration of SAM interventions into national health systems.

Annex 3. Examples of frameworks, methods, guidance documents and tools for introducing, integrating and scaling-up a health intervention

Examples of integration frameworks

- 1995 Rogers, frameworks on the innovation-decision process, and variables determining how, why and at what rate innovations spread through cultures, looking at the innovation, communication channels, time and the social system [119]
- 2001 Contandriopoulos et al.*, frameworks on the dynamics of change for integrating clinical care by domains, time and dimension of integration [373]
- 2004 Criel et al, framework for analysing the relationship between disease control programme and basic healthcare [127]
- 2004 Greenhalgh et al., framework combining determinants of diffusion, dissemination and implementation of innovations in service organizations [120]
- 2005 Fulop et al.*, framework on dimensions of integrated care [117]
- 2006 Axelsson and Axelsson*, framework on the relationship between differentiation, fragmentation and need for integration, and different forms of integration in public health [374]
- 2008 WHO, integrated care matrix of user and provider integration [110]
- 2009 Ham and De Silva*, extent of coordination and merger of care matrix [375]
- 2008 Grepin et al, framework for analysing the integration of neglected tropical diseases [376]
- 2010 Atun et al., framework for analysing the adoption and diffusion of innovations in health systems [107]
- 2010 Shigayeva et al., framework for communicable diseases integration [122]
- 2012 Ghooos and Berton, framework for the integration of the management of SAM [377]
- 2013 Valentijn, framework for integrated care based on the integrative functions of primary care [113]
- 2015 MEASURE, results framework for integrated services [378]
- 2015 WHO, framework for people-centred and integrated health services [379]

Examples of (introduction and) scale-up frameworks

- 1980 Korten, framework on the process of programme learning curves to be effective, efficient and expand to reach maturity [380]
- 1995 Rogers, frameworks on the innovation-decision process, and variables determining how, why and at what rate innovations spread through cultures, looking at the innovation, communication channels, time and the social system [119]
- 2002 Taylor-Ide and Taylor, model describing scaling up dimensions of quantitative, functional, political and organizational development [381]
- 2003 Kohl and Cooley, framework on scaling up management (SUM) by developing a plan, establishing pre-conditions, implementing the process on promoting factors of extension and sustainability [382]
- 2003 Hanson et al., framework for understanding the constraints to improving scaling-up

[383]

- 2004 Greenhalgh et al., framework combining determinants of diffusion, dissemination and implementation of innovations in service organizations [120]
- 2009 WHO and ExpandNet, framework for scaling up health services within a system context by determining the innovation, identifying the user organization, defining and analysing the environment, and identifying the resource team [384]
- 2011 Subramanian et al., model contrasting meaning of scaling up, resources required and management, implementation and monitoring and evaluation perspectives [385]
- 2014 MEASURE, frameworks on successful scale-up involving institutionalizing the practice and expanding or replicating it, and criteria for reviewing practices brought to scale [386]
- 2015 World Economic Forum, Framework on scale-up and systems transformation [134]

Examples of methods, guidance documents and tools on integration

- **Rogers (2003)** [119] developed key concepts on diffusion of innovations that have been discussed above. His approach on the innovation-decision process, and variables determining how, why and at what rate innovations spread through cultures, looking at the innovation, communication channels, time and the social system have been widely used and applied.
- **Contandriopoulos et al. (2001)** [373] provided guidance on analysing the dynamics of change for integrating clinical care by domain, time and dimension of integration.
- **Greenhalgh et al. (2004)** [120] reviewed 495 studies on diffusion of service innovations, and produced a wealth of learning. She defined innovation in service delivery and organization as a novel set of behaviours, routines, and ways of working that are directed at improving health outcomes, administrative efficiency, cost effectiveness, or users' experience and that are implemented by planned and coordinated actions. Steps in innovation spread distinguished were diffusion (passive spread), dissemination (active and planned efforts to persuade target groups to adopt an innovation), implementation (active and planned efforts to mainstream an innovation within an organisation) and sustainability (making an innovation routine until it reaches obsolescence).
- **WHO (2008)** [110] developed a technical brief as a practical aid for people involved in discussions about integrated health services. It maps the meanings of integrated health services and discusses arguments and lessons for integration.
- **Shaw et al. (2011)** [135] explored the meaning of 'integrated care' in a brief synopsis of concepts and guidance to inform practical integration efforts, and how integration may be measured.
- **Suter et al. (2009)** [129] reviewed 219 articles on health systems integration identified ten key principles of successful integration which may be used by decision makers to assist the integration process. The ten key principles for integration identified are:
 1. Comprehensive services across the care continuum
 2. Patient focus
 3. Geographic coverage and rostering
 4. Standardized care delivery through inter professional teams

5. Performance management
 6. Information systems
 7. Organizational culture and leadership
 8. Physician integration
 9. Governance structure
 10. Financial management
- **WHO (2015)** [130] provided extensive guidance on a global strategy on people-centred and integrated health services. They call for a new vision for service delivery, explain what people-centred and integrated services are and the values that underpin them, building upon existing global strategies. Five strategic directions that health systems need to make to become more people-centred and integrated care are 1) empowering and engaging of people, 2) strengthening governance and accountability, 3) prioritizing primary and community care services, 4) coordinating of services around the needs of people, and 5) enabling environment that brings together the different stakeholders. They also provide guidance on how to lead and manage change, and on the monitoring, evaluation and learning process.

Examples of methods, guidance documents and tools on scale-up

- **Korten (1980)** [380] described a model of a learning process to building programme strategies and organizational competence. It suggests that a new programme should progress through three developmental stages in which the focal concern is successively on learning to be effective, learning to be efficient, and learning to expand.
- **Uvin (1995)** [387] discussed alternative strategies and a model that described dimensions of scaling up of programs and organizations that NGOs used to both scale up and sustain interventions or approaches. The four dimensions were:
 1. Quantitative: Increasing the number of beneficiaries reached by adding on or expanding to new areas through geographical expansion. This has been the most common type of NGO-programme scale-up.
 2. Functional: Expanding the number and types of technical intervention areas in a programme to increase its breadth or depth. Many NGOs have used this strategy in a second phase of a project or as part of extension funding requests for Child Survival and Health Grants Programs.
 3. Political: Addressing national-level barriers to effective programmes and services, expanding impact through deliberate influence, networking, policy change, legal reform or capacity building. Several recent articles have called for more attention to this type of scale-up.
 4. Organizational: Improving an organisation's ability to support an initiative or programme effectively and sustainably by building alliances through organizational capacity building. NGOs use this strategy to both scale up and sustain interventions or approaches.
- **Taylor-Ide (2002)** [381] developed a SEED scale and model involving three principles for scaling up of 1) forming a three way partnership of community members, officials and experts; 2) basing action on locally specific data; and 3) using a community work plan to change collective behaviour.

- **Kohl and Cooley (2003)** [382] developed a Scaling Up Management (SUM) framework for those planning, implementing and funding pilot projects with the intention of scaling up. The three steps were 1) developing a scaling up plan, 2) establishing the preconditions for scaling up, and 3) implementing the scaling up process based on the identification of factors that can promote extension and sustainability.
- **CORE Group (2005)** [388] summarised approaches and challenges to achieving scale in community-focused health programmes to guide partners in supporting governments to scale up maternal, newborn and child health services.
- **WHO's ExpandNet global network (2009/2010/2011)** [131, 384, 389] developed guides and tools to plan scale-up of new, tested interventions. The guidance for developing a scaling-up strategy in nine steps is based on five principles. Twelve key recommendations were shared on how to design pilot projects with scaling up in mind. It looked beyond service delivery and therefore considered the role of policy, legal, political scaling up, the physical expansion of services and programs, diversification, and spontaneous scaling up. While the guidance focused on the start-up and expansion of a new or small-scale intervention, it probably is also useful and could be adapted for planning or assessing the progress of scaling up ongoing health interventions.

The five key principles of the 9-step process of analysis, planning, and decision-making for scaling up are:

1. Applying systems thinking
2. Focusing on sustainability
3. Enhancing scalability
4. Respecting human rights
5. Including equity and gender perspectives

The nine steps for developing a scale-up strategy are:

1. Planning actions to increase the scalability of the innovation.
2. Increasing the capacity of the user organisation to implement scaling up.
3. Assessing the environment and planning actions to increase the potential for scaling-up success.
4. Increasing the capacity of the resource team to support scaling up.
5. Making strategic choices to support vertical scaling up (institutionalisation).
6. Making strategic choices to support horizontal scaling up (expansion, replication).
7. Determining the role of diversification.
8. Planning actions to address spontaneous scaling up.
9. Finalising the scaling-up strategy and identifying next steps.

The twelve key recommendations on how to design pilot projects are:

1. Engage in a participatory process involving key stakeholders.
2. Ensure the relevance of the proposed innovation.
3. Reach consensus on expectations for scaling up.
4. Tailor the innovation to the sociocultural and institutional setting.
5. Keep the innovation as simple as possible.

6. Test the innovation in the sociocultural and institutional settings where it will be scaled up.
 7. Test the innovation under routine health operating conditions and resource constraints.
 8. Develop plans to assess and document the process of implementation.
 9. Advocate with donors for financial support beyond the pilot stage.
 10. Prepare to advocate for necessary changes in policies, regulations and other health system components.
 11. Develop plans for promoting learning and disseminating information.
 12. Plan scale-up cautiously until the required evidence is available.
- **Windisch et al. (2011)** [390] applied a systems perspective to appraise health system strengthening for scaling up antiretroviral therapy in Uganda. They found serious system prerequisites missing. Consequently they suggested to address root causes and capacity across the system synergistically. This synergy would then enable systems to match and accommodate investments in disease-specific interventions.
 - **Subramanian et al. (2011)** [385] in a systematic review of 102 articles identified six scale-up models and described weaknesses in the mechanistic way global health initiatives were scaled up, regardless adequate funding. Promising pathways for scaling up interventions in complex and dynamic environments involved 1) learn by doing in ways that engage key stakeholders, 2) use data to address constraints; and 3) incorporate results from pilot projects.
 - **Yamey (2011)** [391] synthesised from prior models and learning a range of enabling factors of **scaling up** global health initiatives based that are placed in six categories:
 1. Attributes of the specific tool or service being scaled up are simplicity and scientifically robust technical policies.
 2. Attributes of the implementers should be:
 - Strong leadership and governance;
 - Engaging local implementers and other stakeholders; and
 - Using both state and non-state actors as implementers.
 3. The chosen delivery strategies may be:
 - Applying diffusion:
 - Faster diffusion: relative advantage; compatibility; simplicity; trialability; and observability;
 - Types of adopters: innovators; early adopters; early majority; late majority; and laggards;
 - Stages of adoption: awareness; interest; evaluation; trial; and adoption) and social networks theories (how people interact; and who are early adopters);
 - Cascade and phased approaches to scale-up;
 - Tailoring scale-up to the local situation, and decentralizing delivery; and
 - Adopting an integrated approach to scale-up.
 4. Attributes of the “adopting” community: an engaged, activated community.

5. The socio-political context includes political will and national policies, and country ownership.
 6. The research context of incorporating research into implementation (learning and doing).
- **WHO et al. (2013)** [392] developed a guide to fostering change to scale up health services that bundles prior learning linking change practices with proven clinical and programmatic practices, and is a key tool for all actors involved in the introduction, integration and scale-up of health interventions.
 - **Spicer et al. (2014)** [393] shared key activities that catalysed innovations to scale up health innovations based on learning from Ethiopia, India and Nigeria. They recognised the importance of understanding factors that influence scale-up, evidence and capacities. The 11 key activities that catalyse scale-up were:
 1. Designing innovations for scale;
 2. Integrating scale-up within programme plans;
 3. Building organisational capacity;
 4. Advocating effectively with government decision makers;
 5. Generating and communicating strong evidence;
 6. Ensuring government involvement throughout a project;
 7. Invoking policy champions and networks of allies;
 8. Aligning with government systems, policies, priorities and targets;
 9. Harmonising efforts with other development partners and implementers;
 10. Supporting and building the capacity of government for scale-up; and
 11. Working with community leaders, media and others to stimulate diffusion of innovations among communities.
 - **MEASURE (2014)** [386] developed practical guidance and tools for monitoring scale-up of health practices that included how to assess practices and focus monitoring resources, and 10 considerations for monitoring scale up:
 1. Define the innovation, objectives and scope
 2. Create a framework
 3. Identify resources to implement the M&E plan
 4. Select key indicators
 5. Establish data sources and reporting systems
 6. Develop a data use and dissemination plan
 7. Collect data
 8. Analyse data and determine if progress is on track
 9. Make programme adjustments based on findings and recommendations
 10. Continue the M&E process
 - **The Lancet Every Newborn Study Group (2015)** [394] reported on health system bottlenecks and strategies to accelerate scale-up of newborn care summarises lessons and underlines the importance of the context. They identified the following key factors:
 1. Workforce planning to increase numbers and upgrade specific skills, task sharing, and incentives for rural health workers;

2. Financial protection measures such as expansion of health insurance, conditional cash transfers, and performance-based financing; and
3. Dynamic leadership including innovation and community empowerment.

Furthermore, they propose a country-led data-driven process to improve national health plans, address the quality gap, and systematically scale up care to reach every mother and newborn, in particular the poorest. However, they miss adding a systems perspective.

- **The World Economic Forum (2015)** [134] identified key lessons learned and enablers for **scaling-up single leapfrogs** (see discussion on leapfrogs as means for transformational change above). The project suggests that a sound strategic plan for scaling up leapfrogs should balance the following three dimension of scale-up:
 - Horizontal scale-up, or **replication** of the model at a large scale within the existing system or parallel to it. The objective is to increase coverage and impact by bringing the innovation to different geographic locations and population segments. A leapfrog can be replicated by franchising, creating new branches, partnering, or transferring key principles of the innovation to another actor.
 - Functional scale-up, or **diversification** of the model to address additional health issues by offering new services and products. The objective is to increase impact by extending the initial value proposition to additional needs. A leapfrog can diversify in multiple ways, with a large number of variations.
 - Vertical scale-up, or **integration** of the model into the existing health system by adjusting the model, the system, or both. The objective is to increase impact by identifying and improving links and compatibilities between the model and the existing system. A leapfrog can integrate with the existing health system in various ways ranging from sharing know-how with government to becoming an implementation partner. Moreover, they identified the following ten key lessons for successful scale-up:
 1. Anchor innovation in fundamental human behaviour.
 2. Adapt to survive, diversify to thrive.
 3. Empower communities to shape and own the model.
 4. Broaden your horizon beyond health.
 5. Target the gap.
 6. Engage with government at all levels and at all stages.
 7. Engineer system reactions.
 8. Create win-win situations through mutually beneficial partnerships.
 9. Connect with other innovators through an umbrella initiative; and
 10. Collect, evaluate and communicate results.

They also discussed enablers that support a leapfrog's scale-up. Enablers for scale-up they suggested, lie outside the leapfrogger's control and fall into five categories:

1. Market conditions
2. Institutions and policy
3. Population and society
4. Infrastructure

5. Stakeholders and partnerships

While not every category was necessary to the success of a leapfrog, some types of enablers are critical to a particular innovation type. The authors further discussed achieving health system transformation from building on the scale-up of leapfrogs. They underlined that the plethora of available and affordable innovation in technology, operating models and behaviour change are creating great opportunities. More on this will certainly be forthcoming.

Annex 4. Evidence on integration from the literature reviews

This annex provides the narrative of the review on integration of health services and on integration of SAM. Chapter 3 discussed the learning.

Evidence on integration of health services

This section summarizes results from systematic reviews that studied effects of integrating health services into primary healthcare (PHC) on service access and use and/or health outcome in low and middle-income countries (LMICs). The narrative covers six Cochrane systematic reviews (indicated with *), 11 other systematic reviews and one comprehensive review that are organised by date of publication.

Dehne et al. (2000) [179] reviewed operational experiences with sexually transmitted infections (STI) and family planning (FP) integration (62 papers). Results found that the tasks of STI prevention, such as education for risk reduction and counselling, have been integrated into FP services much more frequently than the tasks of STI diagnosis and treatment. Some STI and FP integration efforts appear to have been beneficial, for example, when the integration of STI and HIV prevention had a positive impact on client satisfaction, and on the acceptance of family planning. Less clear is whether STI prevention, when concentrated among traditional FP clients, is having a positive impact on STI risk behaviours or condom use. A few projects have reported increases in STI caseloads following integration. In some projects, FP providers were trained in STI case management, but few clients were subsequently treated. Conclusions: There is little evidence that STI prevention efforts, when concentrated among traditional FP clients, are having a positive impact on STI risk behaviours or condom use. The integration of STI and HIV prevention and care into FP does not drive away traditional FP clients. The available evidence shows neither benefits of full programmatic integration nor of systematic integration of wide range STI prevention and care activities, and shows weak monitoring and evaluation. As a consequence, large investments are being undertaken without a clear definition of expectations, without optimal pre-conditions for STI and FP integration, and with no indication of the most effective tasks to integrate and in which settings.

Briggs et al. (2007) [115]* reviewed the effects of strategies to integrate primary healthcare (PHC) services on producing a more coherent product and improving healthcare delivery and health status (five papers). The studies made three types of comparison: 1) integration of care by adding a service to an existing service (mothers attending a immunisation clinic were encouraged to have FP services); 2) integrated services versus single special services (sex workers could have services for STI in a normal clinic, in an after hours clinic or by a special team; and providing FP services at a maternal and child health (MCH) centre or separately at another clinic) 3) packages of enhanced child care services (integrated management of childhood illnesses, IMCI) versus routine child care. Results found there was no clear evidence that integrating PHC services improves the delivery of health services or people's health status in LMICs. Conclusions: People should be aware that integration may not improve service delivery or health status and if policy makers and planners consider integrating healthcare services they should monitor and evaluate them using good study designs.

Church et al. (2009) [180] reviewed evidence of the impact of integrating any component of STI or HIV prevention, care, and treatment into a family planning setting in developing countries (44

papers). Results found that poor or insufficient training and motivation (linked to poor supervision and management), heavy workloads, staff burnout, lack of incentives, and medical hierarchies are important constraints to the provision of integrated services. Integrated services can have a positive impact on client satisfaction, improve access to component services, and reduce clinic-based HIV-related stigma, and that they are cost-effective. Evidence of FP services reaching men and adolescents and of their impact on health outcomes is inconclusive. Several studies found that providers frequently miss opportunities to integrate care and that the capacity to maintain the quality of care is also influenced by many programmatic challenges. The range of experiences indicates that managers need to determine appropriate health-care service-delivery models based on a consideration of epidemiological, structural, and health-systems factors. Conclusions: Solid conclusions about the most effective models of service integration or the best modalities for delivering a comprehensive range of sexual and reproductive health (SRH) services is difficult, partly because of the context-specific nature of the effectiveness of healthcare delivery systems, but also because of limitations within and across the studies providing the evidence. Most studies focus on the small-scale picture by evaluating specific interventions, rather than on models of care. They do not clarify, for example, whether (or under what circumstances) it is more efficacious and cost-effective for one provider to offer a full range of services (often termed 'room-level' or 'provider-level' integration), for clients to be referred to a more specialized provider within the same facility (termed 'facility-level' integration), or for clients to be referred to specialized facilities for certain tasks.

Wallace et al. (2009) [187] reviewed benefits, challenges and characteristics of integrating child and maternal health services with immunization programmes (27 papers). Results found that integrated services were vitamin A supplementation, bed net distribution, deworming tablet distribution, intermittent preventive therapy of malaria (IPTM) in infants and referrals for family planning services. Two key characteristics of success were compatibility between interventions and presence of a strong immunization service prior to integration. Overburdened staff, unequal resource allocation and logistical difficulties were mentioned as risks of integration. Rapid uptake of the linked intervention and less competition for resources were listed as two key benefits of integration. Conclusions: The theoretical strengths of integrating other health services with immunization services remain to be rigorously proved in practice. When additional interventions are carefully selected for compatibility and when they receive adequate support, coverage of these interventions may improve, provided immunization coverage is already high. Evidence for the effectiveness of integration in increasing efficiency of resource use was insufficient and most benefits and challenges were not statistically quantified.

Atun et al. (2010) [111] explored a broad range of evidence on the extent and nature of the integration of targeted health programmes that emphasize specific interventions into critical health systems functions; how the integration or non-integration of health programmes in different contexts has influenced programme success; how contextual factors have affected the extent to which these programmes were integrated into critical health systems functions (55 papers). Health systems combine both non-integrated and integrated interventions, but the purpose, nature and extent of integration varied enormously. Seldom are interventions wholly un-integrated or fully integrated into health system functions. More evidence is needed in order to fully conclude on the effectiveness of health programme integration, particularly from country case studies with robust designs using a common methodology and replication logic. The analysis showed few instances where there is full integration of a health intervention or where an intervention is completely non-integrated. Instead, there exists a highly heterogeneous picture both for the nature and also for the extent of integration. Conclusions: Health systems combine both non-integrated and integrated interventions, but the balance of these interventions varies considerably.

Kuhlmann et al. (2010) [181] reviewed the integration of FP services with other health services if effective to reduce unmet need (nine papers). Results found that the integration interventions ranged from simple referrals between providers of existing services to fully integrated community-based delivery of education and services. Seven studies found improvements in FP-related outcomes, although not all reported the significance of these changes; another reported mixed results and one found no effect. Of the studies that examined providers', clients' or community members' perspectives of integration, all reported overall satisfaction. No studies provided an economic analysis. Conclusions: The evidence supporting the integration of FP with other health services remains weak. Future research should report outcomes for all health areas being integrated and should investigate in more detail the perspectives of providers, clients and community members and assess the cost-effectiveness of integration.

Dudley and Garner (2011) [182]* assessed the effects of strategies to integrate PHC services on healthcare delivery and health status in LMICs (nine papers). Five studies added an additional component, or linked a new component, to an existing service, for example, adding FP or HIV counselling and testing to routine services. Adding on services probably increases service utilisation but probably does not improve health status outcomes, such as incident pregnancies. Four studies compared integrated services to single, special services. Fully integrating STI and FP, and MCH services into routine care as opposed to delivering them as special 'vertical' services may decrease utilisation, client knowledge of and satisfaction with the services and may not result in any difference in health outcomes, such as child survival. Integrating HIV prevention and control at facility and community level improved the effectiveness of certain services (STI treatment in males) but resulted in no difference in health seeking behaviour, STI incidence or HIV incidence in the population. Conclusions: There is some evidence that 'adding on' services may improve the utilisation and outputs of healthcare delivery. However, there is no evidence that a fuller form of integration improves healthcare delivery or health status. Available evidence suggests that full integration probably decreases the knowledge and utilisation of specific services and may not result in any improvements in health status. More rigorous studies of different strategies to promote integration over a wider range of services and settings are needed.

Tudor Car et al. (2011) [112]* assessed the effect of integration of perinatal Prevention of mother to child transmission (PMTCT) measures with other healthcare services on coverage and service uptake (five papers). Results found almost no evidence from reliable, experimental design studies on the effect of integrating PMTCT interventions with other health services on intervention coverage, service uptake, quality of care and health outcomes, despite PMTCT being a crucial component of an international WHO-led strategy to increase coverage to 80% of pregnant women and their children. The one high-quality study that met the inclusion criteria, while successful in achieving a 10% increase in nevirapine coverage fell over 30% short of the 80% target. Following a rapid HIV test and structured nevirapine assessment only 52% of mother-infant pairs received both a maternal and an infant dose of nevirapine. Conclusions: No sufficient evidence was found to make definitive conclusions about the effectiveness of integration of these interventions with other health services rather than providing them as stand-alone services.

Legido-Quigley et al. (2012) [183] reviewed implementation of TB/HIV service integration (63 papers). Results found five models: entry via TB service, with referral for HIV testing and care; entry via TB service, on-site HIV testing, and referral for HIV care; entry via HIV service with referral for TB screening and treatment; entry via HIV service, on-site TB screening, and referral for TB diagnosis and treatment; and TB and HIV services provided at a single facility. Referral-based models are most easily implemented, but referral failure is a key risk. Closer integration requires more staff training

and additional infrastructure (e.g., private space for HIV counselling; integrated records). Infection control is a major concern. More integrated models hold potential efficiencies from both provider and user perspective. Most papers report 'outcomes' (e.g., proportion of TB patients tested for HIV); few report downstream 'impacts' such as outcomes of TB treatment or antiretroviral therapy. Very few studies address the perspectives of service users or staff, or costs or cost-effectiveness. Conclusions: While scaling up integrated services, robust comparisons of the impacts of different models are needed using standardised outcome measures.

Lindegren et al. (2012) [184]* evaluated the impact of integrating maternal neonatal child health and nutrition (MNCHN) and FP with HIV/AIDS services on health, behavioural, and economic outcomes (20 papers). Results found that integrated HIV/AIDS and MNCHN-FP services are feasible to implement and show promise towards improving a variety of health and behavioural outcomes. They may improve the health of mothers and children affected by HIV/AIDS or at risk of HIV infection. Measures of effectiveness included health and behavioural outcomes. Only a few studies reported on change in health outcomes, specifically pregnancy and recovery from malnutrition related to integrated services, and all showed improvements in these outcomes. Conclusions: The impact of integration on the quality of HIV or MNCHN services was generally positive.

Sweeney et al. (2012) [185] reviewed the potential efficiency gains of integrating HIV services with other health services (46 papers). Results found a range of integrated HIV services to be cost-effective compared with 'do-nothing' alternatives, including HIV services integrated into SRH services, integrated tuberculosis/HIV services and HIV services integrated into PHC. The cost of integrated HIV counselling and testing is likely to be lower than that of stand-alone counselling and testing provision; however, evidence is limited on the comparative costs of other services, particularly HIV care and treatment. There is also little known about the most efficient model of integration, the efficiency gain from integration beyond the service level and any economic benefit to HIV service users. Conclusions: In the context of increasing political commitment and previous reviews suggesting a strong public health argument for the integration of HIV services, the authors found the evidence on efficiency broadly supports further efforts to integrate HIV services. However, key evidence gaps remain, and there is an urgent need for further research in this area.

Wallace et al. (2012) [188] provided an update on experiences of integrating health interventions with immunization programs at the point of service delivery (32 papers). Results found 27 integrated activities, including interventions included hearing screening, human immunodeficiency virus services, vitamin A supplementation, deworming tablet administration, malaria treatment, bednet distribution, family planning, growth monitoring, and health education. When reported, linked intervention coverage increased, though not to the level of the corresponding immunization coverage in all cases. Logistical difficulties, time-intensive interventions ill suited for campaign delivery, concern for harming existing services, inadequate overlap of target age groups, and low immunization coverage were identified as challenges. Stakeholder concern that high immunization coverage could be adversely affected may also pose a barrier to linking programs, because campaigns are designed to deliver vaccines quickly and efficiently, any activity that slows delivery may affect overall performance. During campaigns, service integration suffered in situations where substantial time and interaction between provider and patient were required. Conclusions: Results of this review reinforced the 2005 review findings. Ensuring proper planning and awareness of compatibility of service delivery requirements were found to be important. The review revealed gaps in information about costs, comparison to vertical delivery, and impact on all integrated interventions that future studies should aim to address.

du Toit et al. (2013) [192] reviewed available evidence of integration of eye health into PHC in sub-Saharan Africa from a health systems strengthening perspective (173 papers). Results found limited information is available about eye health from a health systems strengthening approach. Particular components of the health systems framework lacking evidence are service delivery, equipment and supplies, financing, leadership and governance. There is some information to support interventions to strengthen human resources at all levels, partnerships and community participation; but little evidence showing their successful application to improve quality of care and access to comprehensive eye health services at the primary health level, and referral to other levels for specialist eye care. Conclusions: Evidence of integration of eye health into primary healthcare is currently weak, particularly when applying a health systems framework. A realignment of eye health in the primary healthcare agenda will require context specific planning and a holistic approach, with careful attention to each of the health system components

Smith Paintain et al. (2014) [190] reviewed the effectiveness of strategies to improve community case management (CCM) of malaria (43 papers). Results found that the capacity of health workers at primary public health facilities in IMCI and management of severe malaria or pneumonia is an important factor to the overall success of CCM because under routine conditions, it is these health workers who have the responsibility for supervising the practice of CHWs and treating referred cases. Sufficient supportive supervision is a recurrent facilitating factor in studies of health worker performance at all levels of the health system, and this review reinforces its importance in maintaining the quality of CCM. Supply chain strengthening, including forecasting and monitoring, is vital in ensuring that CHWs can effectively carry out their task. The studies of integrated CCM suggest that additional tasks do not reduce the quality of malaria CCM provided sufficient training and supervision is maintained. CHWs have the potential to implement quality care of malaria at the community level, even with increasing complexity of their roles and responsibilities. There is still relatively little evidence that CHWs can impact on mortality or morbidity, although there is reasonable evidence they can perform well with adequate supervision and health system support. Conclusions: The studies of integrated CCM suggest that additional tasks do not reduce the quality of malaria CCM provided sufficient training and supervision is maintained.

Zulu et al. (2014) [191] reviewed factors that influenced the integration of national community(-based) health worker (CHW) programmes into health systems in LMICs (36 papers). Results found that different aspects of each of the four retained programmes were integrated in different ways into their respective health systems. Factors that facilitated the integration process included the magnitude of countries' human resources for health problems and the associated discourses about how to address these problems; the perceived relative advantage of national CHWs with regard to delivering health services over training and retaining highly skilled health workers; and the participation of some politicians and community members in programme processes, with the result that they viewed the programmes as legitimate, credible and relevant. Integration of programmes within the existing health systems enhanced programme compatibility with the health systems' governance, financing and training functions. Factors that inhibited the integration process included a rapid scale-up process; resistance from other health workers; discrimination of CHWs based on social, gender and economic status; ineffective incentive structures; inadequate infrastructure and supplies; and hierarchical and parallel communication structures. Conclusions: CHW programmes should design their scale-up strategy differently based on current contextual factors. Adoption of a stepwise approach to the scale-up and integration process may positively shape the integration process of CHW programmes into health systems.

Kikuchi et al. (2015) [178] reviewed the effectiveness of different continuum of care linkages for reducing neonatal, perinatal, and maternal mortality in LMICs (19 papers). Results found that 13

studies used packages of intervention that linked antenatal care, skilled birth attendance, and postnatal care. One study each used packages that linked antenatal care and skilled birth attendance or skilled birth attendance and postnatal care. Four studies used an intervention package that linked antenatal care and postnatal care. Among the packages that linked antenatal care, skilled birth attendance, and postnatal care, a significant reduction was observed in combined neonatal, perinatal, and maternal mortality risks. This linkage reduced combined neonatal, perinatal, and maternal mortality when integrating the continuum of care space dimension. Conclusions: Continuous uptake of antenatal care, skilled birth attendance and postnatal care is necessary to improve MNCH outcomes in LMICs. The review was conclusive for the reduction of neonatal and perinatal deaths. Although maternal deaths were not significantly reduced, composite measures of all mortality were. Thus, the evidence is sufficient to scale up this intervention package for the improvement of MNCH outcomes.

Gera et al. (2016) [186]* evaluated the effects of the IMCI strategy in terms of death, nutritional status, quality of care, coverage with IMCI deliverables and satisfaction of beneficiaries (four papers). The IMCI strategy used very differently across studies. Results showed that use of IMCI may lead to fewer deaths among children from birth to five years of age (low-certainty evidence); may have little or no effect on the number of children suffering from stunting (low-certainty evidence); probably has little or no effect on the number of children suffering from wasting (moderate-certainty evidence); probably has little or no effect on the number of children who receive measles vaccines; and may lead to mixed results on the number of parents seeking care for their child when he or she is ill. It was not known whether IMCI had any effect on the way health workers treat common illnesses, whether IMCI had any effect on the number of mothers who exclusively breast feed their child because certainty of the evidence was very low. None of the included studies assessed the satisfaction of mothers and service users by using an IMCI strategy. Conclusions: The use of the WHO IMCI strategy may have led to fewer deaths among children from birth to five years of age. Effects of IMCI on other issues, such as illness or quality of care, were mixed, and some evidence of this was of very low certainty.

Oyo-Ita et al. (2016) [189]* evaluated the effectiveness of intervention strategies to boost and sustain high childhood immunisation coverage in LMICs (14 papers). Results found low-certainty evidence that regular immunisation outreach, home visits, and integration of immunisation with other primary healthcare services (such as IPTM) may improve immunisation coverage. However, there was currently low-certainty evidence that household monetary incentives (in the form of conditional or un conditional cash transfers) may have little or no effect on immunisation coverage or uptake. The magnitude of effect of these interventions is small and sustainability over long periods is uncertain. Conclusions: Providing parents and other community members with information on immunisation, health education at facilities in combination with redesigned immunisation reminder cards, regular immunisation outreach with and without household incentives, home visits, and integration of immunisation with other services may improve childhood immunisation coverage, but the evidence was uncertain.

Evidence on SAM integration

This section summarizes results from reviewing the published literature on integration of SAM services into health systems. As the evidence on integration interventions or integration processes was thin, papers on interventions or factors that contribute to integration were included. Because the distinction between integration and scale-up is not always clear, scale-up discussions were included. The narrative covers 11 peer-reviewed papers, followed by 39 papers from the grey literature, and all documents are organised by date of publication.

Learning from the peer-reviewed literature on SAM integration

Puett et al. (2012) [194] examined the effect of adding SAM treatment to other tasks provided by CHWs on workload and quality of care in southern Bangladesh. The study found that CHWs managing cases of SAM worked significantly more hours but maintained quality of curative and preventive care. Conclusions: Effectively treating cases of SAM appeared to motivate CHWs.

Palmer et al. (2013) [198] reviewed the evolution of Child Health Days (CHDs), designed as regular events for the delivery of health and nutrition services to children under 5. The review indicated a dramatic rise in CHDs over a decade, from two countries in 1999 to 96 CHDs in 51 countries in 2010. Reliance on CHDs has been particularly marked in sub-Saharan Africa where they are increasingly used to deliver five or more services per event. Whereas early CHDs largely focused on co-delivery of vitamin A supplementation, immunizations and deworming, they have since evolved into diverse packages that may include water purification tablets and screening for SAM. Inclusion of nutrition screening and referral to therapeutic feeding centres has increased sharply, primarily in East and Southern Africa: before 2010, fewer than five annual events included nutrition screening, whereas in 2010, 31% of CHDs (N= 30) included this service. Conclusions: Although CHDs have become increasingly common over the past several years [8], neither their scale-up nor their impact has been consistently monitored or evaluated [198].

Puett et al. (2013) [195] investigated perceptions of barriers to quality of care among CHWs' treating acute respiratory infection (ARI), diarrhoea and SAM. The study found that CHWs were a trusted source of treatment of illnesses in their communities and their services were increasingly in demand, but there were many barriers to quality of care. These included failure of families with limited resources to follow CHWs' advice provide appropriate foods to their children, caring practices constrained by inadequate time for childcare, mothers' failure to attend awareness sessions, the financial and opportunity costs of referrals to hospital and failure of hospital staff to take referrals from CHWs seriously.

Puett et al. (2013) [193] assessed the quality of care provided by CHWs in managing SAM cases according to the CMAM protocols in two sub-districts in Bangladesh. The study found that CHWs managed cases of SAM without complications well and according to the algorithm. The majority of CHWs (>78%) achieved 90% or higher error-free case management. The CHWs also scored high on the quality of care checklist. Provision of RUTF was ranked first among services valued by carers suggesting that carers found the treatment of malnutrition provided by the CHWs appropriate. Carers appreciated CHWs' friendly and inclusive behaviour. They also valued information given by the CHWs in terms of both general counselling and specific feedback on feeding and hygiene practices. Conclusions: CHWs can effectively manage SAM cases, which has implications for the further decentralisation of treatment from current CMAM delivery models.

Somassè et al. (2013) [197] studied challenges to sustainability and scalability of a SAM case management programme in 180 intervention villages in Burkina Faso by analysing conditions for scale-up using ExpandNet recommendations. They found that sustainability and scale-up were constrained by management by external health personnel, lack of financial support for scaling up, insufficient national advocacy and unsustainability of activities (e.g., free care). Conclusions: SAM interventions were effective (good recovery rate, low case-fatality and defaulter rates) but the handover conditions to the district health team and scaling up requirements were unsatisfactory, with poor integration into the health system, lack of resources and insufficient advocacy.

Kouam et al. (2014) [199] used 16 criteria to assess the readiness of the health system in two sub-districts of Bangladesh to implement SAM case management in 44 health centres. Key facilitating factors included government commitment, adapted policy and guidelines and functional user fee waiver for children. Hindering factors included the external source of 74% of funding for short-term interventions, failure to fill half of health worker positions and lack of training of the other half, and lack of operational equipment and supplies. Conclusions: Implementing SAM through the health centres of both sub-districts needs progressive strengthening of the overall health. A short term strategy would consist of strengthening government coordination, exploring additional funding sources, equipping and supplying functional health centres, training health workers and actively involving CHW to cope with health facility staff shortage. A mid-term strategy would consist of securing permanent funding for SAM, rehabilitating non-functional health centres, and attracting and retaining health workers in rural areas.

Puett and Guerrero (2014) [37] aimed to understand and compare the primary barriers households face when accessing treatment for SAM implemented by an NGO or ministry of health in different cultural settings (Sind, Pakistan and Tigray, Ethiopia) with good coverage or integrated into government infrastructure. Common barriers were distance, high opportunity costs, lack of knowledge of services, lack of knowledge of malnutrition, children's refusal of RUTF and poor retention in treatment among remote populations. Conclusions: A number of barriers to accessing SAM treatment persisted in the well-performing programmes. Integrating SAM treatment into other community-based interventions to improve access to life-saving services and ensuring dedicated funding for community activities was recommended.

Rogers et al. (2015) [39] reviewed data from 44 surveys on SAM service coverage and barriers in 22 countries, predominantly implemented by ministries of health with varying support from technical and financial partners. Most of the programmes (33 of 44) failed to meet local or international standards for coverage. The mean level of estimated coverage was 38.3%. The most frequently reported barriers to access were lack of awareness of malnutrition, lack of awareness of the treatment service, high opportunity costs for carers, weak referral systems and linkages between services and previous rejection for admission. Services had a lower contact coverage than in early pilots, therefore had a reduced effectiveness and impact. (But probably geographic coverage had expanded considerably)

[As part of this study] **Deconinck et al. (2016)** [200] assessed the extent of SAM service integration into Niger's national health system over 3 years. Results classified integration of 29 health system functions as full (4), partial (23) or none (3) and evaluated integration progress (23) or stagnation (6) (even in the absence of a defined integration strategy). Governance and health information functions scored highest and financing lowest. In the absence of specific interventions, integration progressed up to a point and then stagnated. Improvements were noted in geographic coverage, access and under-5 mortality risk. Conclusions: The proposed method was useful for assessing the

extent and monitoring the progress of integration of SAM interventions into key health system functions.

[As part of this study] **Deconinck et al. (2016)** [201] explored factors that contribute to the speed of integration of SAM services into Niger's national health system. Factors related to the problem, intervention, adoption system, health system characteristics and broad context were analysed. Key facilitating factors identified were knowledge and recognition of the problem, aided by accurate information; effectiveness of decentralised continuity of care; compatibility with goals; support and involvement of health actors; and leadership for aligning policies and partnerships and mobilising resources in a favourable political context driven by multisectoral development goals. Key hindering factors identified were poor understanding of the severity, causes and consequences of SAM; limited utilisation of and trust in health interventions; high workload and health worker turnover and attrition; and high dependence on short-term emergency funding and technical support in a context of high demographic pressure. Conclusions: The study identified the need for goal-oriented strategies and alignment of health actors to achieve sustainability, as well as systems thinking to understand the complexity of pathways that foster integration.

Amadi et al. (2016) [202] explored the effect of integrating HIV testing and treatment into case management of SAM and MAM. Results found that children with HIV who were able to initiate antiretroviral therapy (ART) had lower mortality than those who did not initiate ART. Conclusions: SAM and MAM case management that incorporates HIV care can achieve low mortality even in a population heavily affected by HIV.

Learning from the grey literature on SAM integration

From the non-peer reviewed literature, we selected publications that reviewed or evaluated overall effectiveness of SAM interventions (N: 20), a specific system function (N: 3), a topic related to integration (N: 7) and conference reports (N: 5) that studied or contributed to integration, complementing the documents selected as part of the policy map reported on in Chapter 3.

Documents reviewing SAM interventions

The Food and Nutrition Technical Assistance III Project (FANTA) (2007) reviewed in 2007 SAM interventions in **Ethiopia** [395], **Niger** [214] and **Malawi** [396] to assess the current state of SAM integration, identify challenges and lessons learned and suggest ways forward for integrating CMAM into national health systems, and synthesised learning in a summary report [208].

In **Ethiopia**, the review found that the MOH Nutrition Unit had limited capacity to play a leadership role in SAM services and national health policies and plans did not specifically address SAM case management. Moreover, SAM was not included in MOH health action plans or budgets at any level. Moreover, the country had updated national SAM guidelines, but they were not adhered to by all partners. UNICEF and international NGOs provided major support for SAM capacity building, but high staff turnover and limited funding for capacity development constrained SAM service expansion. While the health system had a well-defined structure at all levels to integrate SAM, there was severe shortage of health staff and limited community outreach of NGO-run programmes with weak referral systems that hindered expansion. In addition, most of the SAM supplies were provided by UNICEF and NGOs, as the government did not budget for them, and there were frequent delays and stock outs of drugs and SAM supplies because of long transportation routes or inadequate

planning. The MOH also lacked capacity to deliver supportive supervision and maintain a reliable nutrition information system.

In **Malawi** the review found that during the 2005 drought emergency, the MOH took the lead role in guiding the gradual expansion of SAM services and further encouraged involvement of district-level MOH managers and staff. Early recognition of the need for a SAM technical support unit seconded to the MOH had been beneficial for SAM scale-up and encouraged sustainability. SAM service sites were important national as well as international learning sites for good practices and integration of services. NGOs had a large variety of experience and strategies in implementing SAM. One NGO with specific skills in strengthening health systems was very successful in integrating SAM into routine primary care during the current emergency phase. Examples of successful MOH-managed SAM services with minimal external support were observed and great variation in effectiveness.

In **Niger** the review found that during the 2005 emergency NGOs overwhelmed the country with externally funded and set-up SAM services implemented in parallel to the MOH health system. These emergency efforts did not engage the MOH, which remained disconnected. In 2007 when the MOH requested integrating SAM, NGOs faced numerous difficulties in adapting their programmes. SAM services in Niger faced two public health dilemmas.

One was managing SAM in emergency contexts treating high caseloads with external resources in parallel systems versus managing SAM in primary care as a routine health service achieving high-quality care, good coverage and sustainability.

The **synthesis report** found similarities and differences. Weak health systems, chronic high levels of SAM outside of emergencies, recurrent spikes of SAM burden to emergency levels and some progress in integrating SAM into the health system were found across the three countries. In Ethiopia weak leadership to integrate SAM and the full reliance on emergency funding jeopardized government ownership, sustainability and integration. In Malawi, NGOs scaled up support of SAM during the emergency phases. In Niger, continued heavy partners support led the scale-up process to address the continued high caseload outside of emergencies.

Concern Worldwide (2007) studied the non-technical challenges in the institutionalisation of SAM case management in **Malawi** [397]. The capacity assessment of the district health offices (DHOs) found progress in institutionalising SAM case management and identified challenges to handing over responsibilities to the DHOs because they depended on logistical and financial support from partners. The cost of RUTF was the main challenge to maintaining the services. Feasible areas for districts to fund were partial funding, transport and distribution of RUTF; supervision; refresher training of health workers and volunteers; and procurement of drugs and stationery. They concluded that until a reliable source of funding for SAM services can be found, Malawi needed external support for SAM training of health workers, provision of equipment and procurement of the bulk of RUTF stock.

FANTA (2008) reviewed SAM interventions in the **Greater Darfur, Sudan** [398] (Mates and Deconinck 2008) to assess the quality, efficacy and effectiveness of selective feeding programmes, and recommend actions for sustainable quality coverage with the involvement of MOH. The review found that outpatient SAM services ran parallel to the State Ministry of Health System and that there was weak leadership, insufficient technical expertise, lack of coordination of services, lack of national guidelines and no links with the national and informal healthcare system. External partners were the main supporters of the SAM case management, and geographical coverage was limited to urban and camps for internally displaced persons. There was a nutrition information system and database for SAM service performance coordinated by UNICEF but no system for documenting best practices and lessons learned from service implementation.

FANTA (2010) reviewed SAM interventions in Mali [399], Mauritania [400], and Niger [215] and synthesised findings [207] on CMAM programme implementation and its integration into national health systems.

In **Mali** the review found that the Nutrition Department of the MOH lacked technical expertise and financial and human resources to play a leadership role in the integration of SAM case management. The integration of SAM into routine health services was patchy with variable service quality. The management of SAM was not well integrated into national health and nutrition policies and information system, and there was no strategic plan or advocacy to improve on it. National guidelines for management of SAM existed but drugs, RUTF were frequently lacking in MOH-run facilities, and there was no collaboration with community based groups or traditional healers.

In **Mauritania**, the review found an aggressive scale-up plan of SAM case management that did not pay attention on integration aspects. There were ongoing initiatives to link SAM with accelerated child survival weeks, IMCI, reproductive health and the Baby-Friendly Hospital Initiative. Traditional healers influenced access to SAM treatment services but were not involved in implementation or support. The integration of SAM into other community services was limited, with the exception of a few NGO initiatives that provided expanded care. The lack of expertise in the MOH, limited involvement of training institutions, imposed implementation and scale-up and lack of a comprehensive strategy for integration were major barriers for integration.

In **Niger**, the review found that SAM was integrated into MOH policies and strategic documents and mainstreamed in national, regional and district operational plans and service but community outreach was mostly led by NGOs. The challenges to integrate SAM into the identified were delays in official endorsement of the nutrition policy and strategy documents, high SAM caseload for understaffed health facilities, a weak cost recovery system to sustain free care of children under 5 with SAM, an unsustainable and parallel referral system established by NGOs relying on monetary incentives, the lack of a formal network of CHWs for case finding and tracing of absentees and defaulters, an unreliable nutrition information system, sale of RUTF to increase household income instead, lack of collaboration with the informal health system and limited integration of SAM with other community services. Some initiatives by local authorities and communities contributed to the success and sustainability of SAM integration, for example, local pay system covering transportation costs for referrals, local hiring of nurses to address the case load, improving adherence to free treatment for children under 5. The review concluded that effective integration of SAM required stronger health systems. Linking SAM to facility and community-based IMCI and growth monitoring could provide a model of integration to be further developed and strengthened.

The **three country synthesis** summarized strong and weak elements across countries. Governments recognised the impact of nutrition on development and created an enabling environment for SAM. Strengths were: national guidelines for SAM and few standardised tools and job aids were available; national technical committees and multisectoral coordination mechanisms were created; partner support for technical and institutionalised learning and capacity strengthening was received; recurrent food crises created opportunities to scale-up SAM; in-service training sessions were provided to strengthen skills of service providers quickly, but this was not part of comprehensive and sustainable capacity strengthening strategy; access to SAM services were improved by decentralising care except in remote areas and areas with mobile populations. Constraints were: training materials were not standardised and adapted, and learning sites were not established; community outreach was weak; there was a shortage of qualified staff and the informal health system was largely ignored; no government supply system for RUTF was in place and UNICEF and partners covered all; the monitoring and reporting (M&R) system had not been harmonised. SAM scale-up and integration received limited national policy support and guidance; limited capacity for advocacy; inadequate technical capacity at all levels; limited effective coordination among nutrition partners; lack of a comprehensive and sustainable capacity strengthening strategy; geographical,

financial and socio-cultural barriers to accessing CMAM; poor quality CMAM services; and inadequate utilisation of routine surveillance systems.

FANTA (2010) explored opportunities to strengthen SAM community outreach by building on or merging with existing community outreach strategies **in Sudan** [401]. Roles and responsibilities of community- and facility-based health staff involved in community participation and outreach were evaluated and lessons drawn to inform the development of a national community outreach strategy. The review found that numerous MOH initiatives involving community volunteers and facility-based staff for community sensitisation and outreach had not been utilised for SAM community outreach to date. For example, SAM sites run by NGOs (emergency sites of Sudan) had a parallel system of community outreach workers set up but their geographical coverage was very limited and was poorly linked with existing community initiatives.

UNICEF (2010) reviewed SAM interventions in ten countries in West and Central Africa (Benin, Burkina Faso, Côte d'Ivoire, Democratic Republic of Congo, Liberia, Mali, Mauritania, Niger, Sierra Leone and Togo) [402]. In all countries national protocols for management of acute malnutrition existed, however they all needed updating; coordination of nutrition programming was weak at the national level compared to the district level where there effective implementation of management of SAM existed. Many of the countries did not integrate management of SAM in the healthcare system and did not allocate any material, human or financial resources for it. There was a lack of adequate and motivated staff and countries did not have SAM reporting systems (no standardized SAM databases). Most SAM sites were funded by emergency funds and the sustainability of those centres was questionable due to depletion of emergency funds.

Concern Worldwide (2010) in Nepal assessed the performance of a Concern-supported SAM pilot in one district and evaluated the level of integration of CMAM services into existing health structures in Bardia District [403]. Results found that an established partnership among the MOH, UNICEF and NGOs contributed to the success of the SAM pilot. To ensure maximum integration, CMAM protocols, the logistics and supply system and monitoring and supervision mechanism were developed and adapted to the existing health systems and services. However, the pilot programme had a high defaulter rate and low recovery and coverage rate. Distance was found the main barrier to access, along with refusal to eat RUTF by SAM children.

FANTA (2011) assessed the integration of SAM services into the health system in Ghana to identify challenges to integration and review recent plans and initiatives to scale up SAM [404]. Results found that nutrition was high on the political agenda, and the Ghana Health Services (GHS) had assumed a strong leadership role in integrating SAM into the national health system. SAM components and supplies were integrated into routine health and nutrition services and there was a referral system. Other strengths were: strategies to improve nutritional status were in place; a technical support unit existed; approved interim national guidelines and job aids for the management of SAM were developed; in-service training on SAM was conducted for managers and service providers, though it had not officially been introduced into the curricula of pre-service education. Weaknesses were: there was lack of commitment because of lack of funds allocated to SAM in the national budget and limited advocacy for mobilisation of resources; there was full reliance on USAID and UNICEF funding for all SAM; no indicators in the health information system captured SAM; and there was no exemption policy for free treatment of children with SAM (however there was a health insurance scheme that had started); geographical accessibility to CMAM services was poor and there was a need for further decentralisation and scale up; there was no formal link between SAM and the informal health system; and there was no linkage between nutrition and other related ministries at national and operational levels.

Save the Children (2011) in Bangladesh examined the effectiveness and feasibility of adding SAM diagnosis and treatment to the community case management (CCM) package delivered by CHWs outside health facilities (Barisal, Bangladesh) [405] (and see the publications by Puett et al above). The prospective cohort study found a high recovery rate (92%), low mortality rate (0.1%) and low defaulter rate (7.5%). CHWs were able to identify and treat SAM very early in the course of the disease and to deliver high-quality care with 100% error-free case identification and management. The cost of treatment in CCM was US\$165 per child treated and US \$26 per DALY (disability-adjusted life year) averted, which is 'highly cost-effective' according to WHO's definition (an intervention is cost effective if it averts one DALY for less than the per capita GDP of a country). The cost-effectiveness ratio was similar to other priority child health interventions such as immunization and treatment of infectious tuberculosis. This study demonstrated that adding SAM to CCM in Bangladesh was feasible and could be an effective and cost-effective strategy to ensure timely and high quality treatment for a condition that is typically associated with high levels of mortality.

UNICEF (2012) reviewed SAM interventions in Ethiopia [406], Kenya [407], Nepal [408] and Pakistan [409], and produced a global synthesis report [410].

In **Ethiopia** the SAM approach was effective and the government commitment, policies and SAM programme strategy achieved good geographic coverage. Moreover, collaboration among government, UNICEF and partners facilitated the decentralisation and scale-up of SAM and its integration into the health system. Health system outreach mechanisms had integrated SAM and were effectively used for screening and active case finding by health extension workers supported by community volunteers. Systematic on-the-job and pre-service training supported by UNICEF and partners had increased the pace of institutionalisation of SAM. On the other hand, the evaluation highlighted the dependence on unpredictable, short-term humanitarian emergency funding, weak adherence to protocols, high turnover of staff and inadequate training in SAM, weak administrative support and lack of food service for carers. SAM referral linkages were inadequate, and demand for SAM services was negatively affected by out-of-pocket charges for routine drugs in some regions. Although country-wide performance was good, there was variation by region that correlated with health system capacity. The SAM programme was well integrated and worked well in urban and agrarian contexts, but mobile health teams did not perform efficiently to address the needs of pastoralist children.

In **Kenya** the evaluation found that the scale-up and integration of SAM into national health services in Kenya was facilitated by partnerships among government and partners. Demand for IMAM, as part of routine health services, had increased because of its inclusion in annual district operational plans. The national guidelines for IMAM contained clear standardised treatment protocols but inadequate guidance on community assessment, sensitisation and integration into the health system and other interventions. Coordinating fora were generally inclusive, and their impact had been significant on nutrition outcomes, particularly in emergencies. Multisectoral coordination required strengthening to implement national development strategies. The evaluation report indicated that government ownership at all levels had improved through policy development, training and coordination, but integration was only partially sustainable. Because government capacity and funding were not adequate to maintain IMAM, it was mainly funded by external donors, increasing risks to continuation without external capacity, technical assistance and funding.

In **Nepal**, key factors in the success of the SAM were the involvement of the government; continuous funding and participation of UNICEF, NGOs and civil society organisations; advocacy efforts resulted in district councils endorsing the SAM approach as part of the district development agenda. UNICEF and the government had promoted stronger nutrition services and emergency planning through the Nutrition Cluster, although coordination among sectors and programmes at central and district levels, and with donors and other stakeholders, was needed to achieve scale up

and impact on the prevalence of malnutrition. Government commitment to promote nutrition was evident in the national nutrition policy and strategy and plans to implement SAM, but in practice, not enough government resources were devoted to strengthening nutrition services. There was no effective framework to guide integration of SAM into the national health system. Government ownership of SAM was partial, but a firm basis had been established through training of national staff and integration SAM in their jobaids. SAM was integrated into IMCI and IYCF protocols, though there were constraints related to weaknesses in the health delivery system, duplicative reporting for individual programmes and distance barriers to access CMAM services. The main sustainability issues were inadequate capacity, poor coordination and lack of plans for mobilisation of resources. Recommendations included joint assessments and planning to prepare districts to integrate and scale up SAM; funding sources to diversify, with more inputs from the government; and opportunities for local production of RUTF to be pursued.

In **Pakistan**, with support from UNICEF, WFP, WHO and partners, SAM performance was good and resulted in a high recovery rates. Progress was made in developing a provincial strategy, aligned to the national nutrition strategy, but the national nutrition strategy did not include costing and funding sources. The national CMAM guidelines focused on treatment protocols and required expansion to include other programmatic processes and procedures. Longer-term resource allocation for SAM was required to retain existing human resources and quality of implementation. The results showed that SAM in Pakistan had been partially integrated into the health system, with shared responsibility between general health workers and SAM staff. The major issues for future scale-up and integration were joint planning to define nutrition policies, standards and indicators for integration; capacity building; coordination among nutrition stakeholders; funding; and mapping and prioritisation of intervention areas

The **global synthesis report** concluded that the SAM approach was appropriate and the demand had increased due to the efficient use of community resources for prevention and identification and referral of children with SAM. The review found that SAM scale-up and integration were facilitated by partnerships among government, UNICEF, WFP, WHO, UNHCR and partners. Technical support resulted in significant gains in process, coverage and outcomes, and capacity development had significantly improved quality of services. National contributions to SAM had grown, but scale-up was challenged by funding constraints for regular programming and reliance on emergency funds and external assistance. Global guidance for SAM treatment had contributed to the development of national guidelines which offered high value in promoting district ownership but lacked planning and monitoring, integration of CMAM, equity and gender, community assessment and mobilisation and case management of MAM. UNICEF provided effective support for fund mobilisation, emergency nutrition response and supporting nutrition protocols. Expansion of regional roles was important to meet national technical assistance needs. Because CMAM was not sustainable as a stand-alone intervention, it should be integrated into health and nutrition packages to strengthen efficiency, effectiveness, sustainability and prevention. There are no global standards for integrating SAM case management into national health systems, which are critical to guide government, UN agencies and partners.

The **Ministry of Health in Ghana (2012)** [411] studied the effectiveness of public health systems to support national rollout strategies of SAM. Ghana had adopted the SAM approach in 2007 and established learning sites for management of SAM which provided training and practical experience for scaling up in the country. In two phases, the national SAM Technical Committee and support teams at regional levels managed the roll out. The MOH/GHS led the integration of SAM into the national health system. Consensus was built between the GHS and partners prior to rolling out SAM, technical support ensured at the planning stage, learning site established, SAM outpatient care integrated into the reproductive health service package, RUTF distributed through the same channels as other health supplies and the volunteers from other health programs used for SAM.

Challenges to implementation of SAM were a lack of funding for phase two of the scale-up plan, failure of involving traditional practitioners, a high defaulter rate, a high workload for volunteers in urban areas and lack of access to free medicine in some facilities for SAM children without health insurance.

The **Ministry of Health in Sierra Leone (2012)** [412] studied the capacity of the national health system to scale up case management of SAM. Rollout of CMAM started in 2007 and linked with other health services. As a result, the number of SAM children treated increased from 2,950 in 2007 to 35,000 in 2010. Key facilitating factors were leadership of the government with the support of UN and partners, SAM integrated into the basic package of essential health services, development of national policy and guidelines for SAM and IYCF, increased health staff with capacities strengthened through regular monitoring and supportive supervision, SAM supplies integrated into the existing health system delivery channel of medical products and SAM services provided as an integrated and comprehensive package. Key challenges identified by the technical review were inadequate numbers of skilled health staff, inadequate community mobilisation and a weak referral system.

UNICEF in Somalia (2012) [413] documented lessons from implementation and scale-up of SAM. Results indicated that nutrition programming in Somalia had achieved rapid scale-up of SAM services in a very difficult context since 2005/6. SAM services were linked with the essential package of health services in the zones where MOH capacity existed and supported by nutrition cluster partners. Success factors were the established partnership between UN agencies and local NGOs, increased commitments from international NGOs for capacity development, adoption of innovative operational modalities such as working through local partners, geographical expansion of services and promotion of mobile rather than static clinics to increase access coverage. Challenges to sustainable SAM scale-up and integration were poor health infrastructure and lack of qualified health staff, shortage of funds, an interrupted supply chain, an incomplete nutrition information system, ineffective coordination systems and inaccessibility of services because of insecurity and displacement.

The **Ministry of Health Niger (2012)** studied government experiences on country-wide scale-up of SAM case management [414]. Two political decisions helped the access to SAM in Niger: the waiver of user fees for healthcare for children under 5 and the integration of SAM in all health facilities. There was substantial capacity for the management of SAM. In 2009, about 127,000 children aged 6–59 months were treated for SAM, in 2010, 330,000 children. SAM implementation success relied on strong government vision and commitment for strategy, coordination and resource mobilisation. Strong government coordination was vital, especially when many partners were involved. Standardisation of treatment was key to ensure equity in treatment and comparable data. Challenges were to sustain quality irrespective of the presence of NGOs and adequate supplies. Niger depends on UNICEF for procurement of therapeutic supplies, which could be solved by allocating a budget line for procurement of therapeutic supplies to the budget and including procurement of therapeutic supplies in the social safety net package. Also, partners preferred to focus on treatment not prevention, and more of the latter was needed. In general, the community component of CMAM in Niger is rather weak and work needs to be done at this level to ensure effective involvement of communities. To overcome the challenges, the government should recruit adequate personnel to staff, set up and implement an inclusive quality assurance system, provide efficient supervision.

Valid International (2013) reviewed operational and practical aspects of SAM interventions in the districts of Balochistan, Punjab and Sindh in **Pakistan** [415]. Results indicated that the SAM programme provided a complete package of services in resource- intensive emergency mode led by

NGOs with support from UNICEF and WFP. The only SAM component that was well integrated into the health system was inpatient care because of lack of leadership and failure to incorporate nutrition programming into district health systems. A successful transition from NGO to government implementation and hence integration required government leadership, effective coordination, human resources and an effective hand-over strategy. In theory, there were national nutrition policies, plans and strategies, but in practice these had little impact on SAM outcomes and its scale and integration into the health system. There was a link between nutrition and food security and livelihood programs in practice. IYCF was included in all SAM programmes, though there was no standard prevention package. The quality of SAM programming as determined by performance indicators was good, but SAM treatment coverage was low because of distance to treatment centres, inadequate follow-up of cases and facility-based treatment of SAM. Although the MOH Nutrition Information System is the main source of data, NGO partners and UN agencies maintain their own systems, making access to SAM data for monitoring difficult. The review found that the pipeline of supplies was stable and reliable and there was little difference in programme quality when supported by international and local NGOs and government. However, local NGOs were more cost-effective in delivering SAM services than international NGOs.

Valid International (2013) assessed the operational aspects of SAM with regard to effectiveness, appropriateness, integration and sustainability for effective integration and scale up in **Sudan** [416]. Results found that the modality of nutrition staff fully running outpatient sites hindered the integration of nutrition into ongoing health programmes and coordination, planning and pooling of resources with other health programmes and maternal and child health in primary care. Although overall programme outcomes were good, analysis of data at local level revealed very high defaulter rates in some areas and low geographic and contact coverage in most areas, attributed to lack of community outreach, limited access, seasonal migration and population movements because of conflict. Innovative practices such as mobile outreach and provision of a 2-weekly ration were recommended to reduce defaulter rates. Inpatient care was managed by nutritionists and adequate though there was little link with medical staff, who did not follow the treatment pathway. This resulted in inadequate clinical care. Outreach activities were weak and that trained volunteers were not active because of lack of incentive payments. Existing community- and facility-based staff (e.g., CHWs, midwives and health educators) were not fully utilised for case finding and prevention using the behaviour change package in the MCH accelerated plan. SAM reports were submitted on time, but recording needed to be streamlined and organised to reduce inaccuracy and to be analysed at site, state and locality levels to address programmatic issues such as high defaulting.

Save the Children (2013) reviewed SAM interventions in **Northern Nigeria** [105] to assess the potential of national, state and local governments to integrate and further scale up SAM. Results found that the SAM programme had made remarkable achievements since its start in 2009, and partners had strengthened government capacity to deliver and scale-up SAM case management. The information system in Northern Nigeria had increased awareness of SAM as a health problem, and this called for continuous use of the information for advocacy and to inform decision-making and planning at different levels. The SAM intervention was successfully introduced based on experience from other countries and support from donors and SAM partners who strengthened aspects of the health system. Integration was based on individual instead of institutionalised capacity, based on the absorptive capacity of various key actors at different levels. The success of the pilot interventions, strengthened capacity of the health system, involvement of government, motivation of key actors and sustainability of funding were factors that had positively influenced the scale-up and sustainability of integrated SAM. The decentralised decision-making and differences across northern states of Nigeria may have influenced SAM integration differently. Overall, SAM had only

partially been integrated. Recommendations included a clear vision of efficiency and sustainability, flexibility and adaptability to changing contexts as key for integration of SAM.

Concern Worldwide (2014) reviewed SAM interventions in two counties of **South Sudan** [106]. The review found that the interventions were adapted to the local contexts and the multisectoral approach resulted in positive long-term effects by addressing the underlying causes of malnutrition. However, the weak health and socio-economic system challenged the sustainability of SAM and nutrition interventions. There was no link between the nutrition activities and curative SAM services in the health facility and local community, resulting in inadequate community screening for SAM and lack of follow-up of referrals, transfers and defaulters. The interventions achieved good geographical coverage and performance outcome. However, challenges included long distances, poor quality of care, frequent stock outs of therapeutic food and antibiotics and inadequate community involvement. Moreover, the emergency nature of the programme and the short-term funding were not conducive for capacity strengthening and integration. Nonetheless, increased presence of more experienced nutrition partners and improved coordination and leadership was needed to improve implementation, integration and scale-up of SAM in South Sudan.

Action contre la faim (2014) conducted a diagnostic of the readiness of the district health system of Fada District in **Burkina Faso** to integrate SAM [417]. Health centres were assessed according to the six WHO health system building blocks (governance, financing, human resources, supplies, service delivery and information). Human resource scored the lowest (1.94), followed by finance (2.00), governance (2.08) and supplies (2.18), while service delivery and the health information system were satisfactory. A workshop was then held to define improvement objectives and activities to strengthen the health system in Fada. Recommendations for district managers to strengthen district capacity for management of SAM were to develop an advocacy strategy and set targets for improvement with the involvement of all participants. Recommendations for UN and partners were to use the results of the diagnostic to guide future programming, work with the Fada Health District to remove bottlenecks to SAM services and strengthen the health system and hold a workshop on internal programming. Recommendations for local authorities were to conduct a comprehensive study of the new management of health services by local authorities and strengthen their support for the human resources, finance and supply health system functions.

Save the Children (2014) reviewed SAM interventions in **Niger** [216] to analyse the potential and necessary steps for improving the integration of SAM into national health services. Niger has a high burden of SAM and the highest annual SAM caseload admitted for treatment in the world. In 2007, the national MOH called for SAM scale-up and integration into routine primary healthcare, providing an opportunity to provide SAM as a routine service in all health facilities. By 2013, all health centres and hospitals in the country provided SAM services. National guidelines and standardised job aids and monitoring and reporting systems were developed. Overall contact coverage was low due to poor access of remote populations, with the exception of few districts that scored above 50% with extensive partner support. Defaulter rates were low. There was continued technical and financial support for SAM implementation from UN and partners, but government involvement in SAM financing and implementation was missing, and as such ownership and sustainability. Health facilities, especially in rural and remote areas, suffered shortages of health workers and high turnover, which was compensated for by partners staff; however, there was no plan to increase staffing or motivation. SAM equipment, supplies and drugs were provided by UNICEF, WFP and partners. The supply system was not well organised, and the MOH did not control the stock movement in the complex supply chain, making forecasting weak and stock outs frequent. Multiple monitoring and reporting systems were being used by MOH and partners, and they were complex and duplicative.

The participation of communities in SAM was weak, although SAM partners actively engaged with them and worked with community-appointed volunteers.

UNICEF (2015) reviewed SAM interventions in **Mauritania** (Deconinck and Diagana 2015) where since 2012 SAM case management had been decentralized in primary care and geographical coverage to health centres and health posts continues to expand. At the national level, nutrition policies and action plans had been developed reflecting commitment of the government and its stakeholders. But gaps in operationalizing the plans persisted. Most funding is external provided by emergency donors, but some government funding is indirect by supporting staff, structures and infrastructure. The health workforce in rural areas was thin on the ground, and supply cuts are common. Community health activities are weak and preventive interventions and community involvement badly managed. Active screening, follow-up of children and health and nutrition education for behaviour change and awareness raising were provided by UN and partners. And these activities do not cover the entire country and are highly dependent on external funding. Among the missed opportunities to stimulate ownership and to better capitalize national resources was the low involvement of schools of medicine, nursing and public health, and professional associations for information sharing and knowledge generation.

ACF (2016) reviewed SAM interventions in **Afghanistan** [418] to highlight the scale of the problem of SAM, the status of SAM management services and factors affecting coverage. The results showed a high burden of SAM. SMART surveys and rapid nutrition assessments conducted by ACF and partners in 2015 and 2016 in 13 provinces found a GAM rate of 17.0% and a SAM rate of 4.8%. SAM admission trends showed changes linked to seasons and agricultural and disease calendars, with high admission rates during the month of September across the 3 years. Since 2013, all provinces had reported implementation of SAM services with good performance indicators, but most of the SAM contact coverage estimations were low. The five most important barriers to access SAM services were distance, lack of awareness of malnutrition, lack of awareness of treatment services, poor community outreach and weak data management and monitoring at clinic and district levels.

Documents reviewing a specific system function or integration intervention

Shoham et al. (2013) [204] [419] explored **financing** for management of acute malnutrition. SAM funding was never part of pooled funding or system-wide approaches (SWAps), which limited flexibility to adapt to local contexts and needs. Usually parallel systems were in place under mostly bilateral agreements between the financial and technical partner, bypassing national and local governments. Challenges to coordination of national and local government financing included funding arrangements from multiple sources through multiple partners with different life cycles and reporting requirements, short-term emergency funding that was often interrupted or ended abruptly, high transaction costs for involvement of multiple UN agencies and NGOs and limited costed plans for SAM integrated into budgeted action plans.

Gray et al. (2014) [420] summarised evidence, good practice and lessons on **community engagement** for case management of SAM and other relevant health interventions and recommended ways to strengthened community engagement in the context of government-led health interventions. The technical brief defined community engagement, its processes and activities and how it increased CMAM coverage and improved health outcomes. Challenges to effective community engagement in CMAM included imbalanced prioritisation, insufficient policies and technical guidance, shortage of funds, weak management of community health workers and volunteers, lack of skilled community actors involved in health, weak monitoring and reporting and

barriers to access and service uptake. Recommended included a set of cations to strengthen the community component of SAM interventions to ensure effective community engagement.

Friedman and Wolfheim (2014) [196] reviewed operational experience **linking nutrition and iCCM** and identified lessons and gaps in knowledge for integrating SAM. The review identified four approaches to integrating or linking iCCM and nutrition ('typologies'). These included 1) advising on 'feeding the sick child' within existing iCCM services, 2) linking to social and behaviour change activities on child nutrition, 3) linking iCCM activities and SAM management through assessment and referral and 4) treatment of uncomplicated SAM at community level. Lessons emerging from the review included the importance of CHW status and skills; division of responsibilities between CHWs that provide treatment and others that do case finding, home visits and/or messaging to increase coverage; the potential for adding nutrition to the Expanded Programme on Immunization and antenatal care; the relevance of community-level treatment in areas with a high prevalence of SAM, low access to treatment and poor health infrastructure; the need to use shared terminology to clearly articulate the advantages of linking 'nutrition' and 'health' sectors; and the need to consider other sectors and concerns such as gender, social protection and food security. Key informants agreed that iCCM by CHWs should assess, refer and counsel SAM children; some agreed that iCCM could be an effective platform for reinforcing IYCF messages, strengthening feeding practices during illness and following up SAM children. Other challenges related to integrating nutrition and health at the national level related to coordination across MOH directorates, funding streams and lack of useful nutrition indicators included in the HMIS.

Documents reviewing a topic related to integration and/or scale-up

Bottleneck analyses

The 2016 UNICEF SAM bottleneck analysis (BNA) guidance note [421] shared experience and learning from introducing the BNA approach as a district-level tool for improving SAM services. BNA findings in Malawi Tanzania and Afghanistan were discussed. The BNA assessed the quality of supplies, health workers, access to services, community activities, use of services, retention in treatment and quality of care, with effectiveness coverage as the overall indicator. Key indicators adapted to the country contexts retained in the analysis were 1) stock out of RUTF supply, 2) number of relevant health workers that provide SAM services, 3) geographic access, or the proportion of health facilities providing SAM case management, 4) outreach, or proportion trained in SAM screening and referral, 5) initial utilisation, or access, 6) continued utilisation, or retention in treatment and 7) effective coverage, or proportion of children with SAM in the population cured. Results showed that the three countries set different thresholds for indicators as good, average and poor. Poor indicators were subjected to a root cause analysis that then led to proposing solutions. In Malawi root causes of the bottlenecks were: weak supply forecasting and lack of buffer stock, partial integration of RUTF into medical supply system, lack of prioritization of SAM training and supportive supervision on SAM for clinician, lack of guideline/protocols for CHWs and build their capacity. In Tanzania the root causes of the bottlenecks were: dysfunctional supply system, lack of training and supervision on SAM, weak referral practices, lack of prioritization for SAM during planning and funding, low government awareness and inadequate availability of data for advocacy. In Afghanistan the root causes for the bottlenecks were: poor planning of RUTF transportation with other essential drugs, lack of costing for SAM training in basic package of health services package, inadequate capacity of the nutrition officer in planning, coordination and monitoring of SAM trainings, lack of clear and detailed plan for expansion of the SAM programme, lack of guideline on community component of SAM for CHW, not prioritizing the community component of IMAM and also lack of

post training follow up & on the job trainings. Root causes of the bottlenecks were similar across the three countries.

Coverage assessments

Since the start of community-based care for the management of severe acute malnutrition, contact coverage (to use Tanahashi's coverage classification [261] was retained as key performance indicator. Contact coverage gives an appreciation of service uptake as a result of availability, accessibility and acceptability of SAM services for service uptake, thus indicating the effectiveness of the scale-up of a service. SAM-specific coverage survey methods have been developed and their application rolled out by financial and technical partners and through the CMN. This review did not retain coverage surveys but included a published summary paper (Rogers et al. 2015).

Cost-effectiveness of SAM

Some cost-effectiveness studies have been conducted to compare the relative cost of outpatient care or community case management (the treatment is considered cost-effective when it averts one DALY for less than the per capita GDP of a country). The cost of a child with SAM treated in outpatient care in 2010 in Zambia was estimated at US\$203 on average of which RUTF was 36%, and US\$53 per DALY averted [44]. The cost of a child with SAM treated in outpatient care in 2012 in Malawi was estimated at US\$42 per DALY averted (and US\$493 per DALY averted in a worst case scenario) [43]. The cost of a child with SAM treated in CCM in 2011 in Bangladesh was US\$165 per child treated and US\$26 per DALY averted, compared with US\$1344 per DALY averted for inpatient treatment [42]. Costing results were context-specific but pointed towards cost effectiveness and were comparable to other priority healthcare interventions in developing countries, such as immunization and treatment of infectious tuberculosis [42].

SAM service implementation experience

Various papers have been published on SAM service performance and capacity development in the *Field Exchange* [173] and *Nutrition Exchange* [173] journals. Three papers met the inclusion criteria and were included in the review. The other papers shared promising practices and provided interesting context-specific learning, but did not discuss SAM integration or evaluate the contribution of interventions to improving integration [up to the search date of January 2015].

SAM in fragile settings building resilience

Hailey and Tewoldeberhan (2010) [422] provided guidance based on a framework approach developed from empirical evidence on building resilience for SAM interventions. The authors proposed a design framework for improved readiness and timely SAM response in emergencies when local capacity is too weak to cover the needs and external support is requested. The framework proposed decision-making based on estimated caseload and capacity of the public health sector instead of emergency thresholds of malnutrition prevalence. The authors suggested that during a declared emergency phase, interventions should address the national capacity gap by substituting resources and increasingly building and strengthening local capacity. The emergency intervention with emergency funding would thereby reduce excess SAM mortality and strengthen the capacity of the health system. This approach would then lead to improved baseline capacity and increased resilience. Steps to increase support and address decreasing capacities or resilience in an emergency (from a recipient perspective) included 1) mentoring 2) mentoring and supplies, 3) mentoring, supplies and extra staff and 4) full implementation.

Conference reports

Conference on the integration of community-based management of SAM report (2008) [108] described the first conference that brought together policy-makers, managers and implementers from governments, UN agencies and NGOs and donors to discuss lessons and ways forward to improve collaboration and scale-up of CMAM. Participants shared emerging evidence and practices on outpatient SAM case management at scale in various settings and discussed pathways for integrating SAM into routine child healthcare, facilitating increased ownership by ministries of health and expanded partnerships.

Coverage assessment reports (2010–2016) from 30 countries accessible on the CMN website [177] provide contact coverage estimates and indications of barriers to service access, uptake and retention. Most assessments were conducted at small-scale district level and were initiated by the supporting partner to evaluate SAM services provided in government-run health facilities. The coverage estimates were the outcomes of the financial and technical support interventions to for improve SAM-specific services. Support packages showed great variation across and within countries in intensity of resources, duration and geographic coverage and included more or less the activities listed in Table 1.2. The general trends were high or improved coverage when support inputs were high or increased, and low or decreased coverage when support inputs were low or decreased. Coverage assessments did not evaluate the extent and characteristics of the support interventions. Most programmes had no goal beyond habitual SAM service performance (based on monitoring and reporting of recovery, death and defaulter rates and the occasional assessment of contact coverage and barriers to access, uptake and retention). Hence, point and period estimates of coverage were indicative of the current situation but could not be interpreted in the absence of standardised reporting and analysis of intervention (resources) inputs, integration progress and financial and institutional sustainability or indication of the impact of increasing support cessation.

Conference on government experiences of scale-up of management of SAM report (2011) [144] brought 22 government, technical and financial partners together to debate SAM scale-up challenges and provide recommendations and guidance on financing, capacity strengthening and governance. The participants exchanged country lessons and experience and identified a issues for scaling up CMAM including 1) financing (funding mechanism; access to and local production of RUTF, information management, emergency/development funds), 2) capacity strengthening (training, decentralisation, use of volunteers, management of MAM) and 3) leadership (political commitment, leadership and governance, coordination, stakeholders' role).

Conference on SAM knowledge update report (2013) [423] brought together key SAM actors (170 academics, practitioners and policy-makers from a range of NGOs, UN agencies, academic institutions and national governments) to share lessons learned, review the state of SAM treatment and identify key areas for future action. The conference sessions discussed CMAM programming in the past 10 years and identified needs, funding mechanisms and challenges for scale-up of SAM treatment, treatment protocols and outcomes, CMAM programme performance and defaulters, integration of CMAM, types of coverage assessments and standardisation of nutrition information systems. The conference identified 17 priority actions to strengthen SAM treatment in the areas of 1) advocacy (develop stronger joint advocacy with the health community; advocate to include wasting in the post-2015 nutrition target and nutrition funding in health funding and for higher funding for community mobilisation in treatment of acute malnutrition, develop a common nutrition stakeholder position/call on needed changes and develop an implement influencing and advocacy strategies, 2) financing (document examples of optimising costs for SAM treatment at scale), 3) government (integrate identification of acute malnutrition into IMCI and integrate malnutrition into

national health curricula, 4) nutrition information and supply chain (Improve nutrition information systems and their use for forecasting RUTF and other supply needs at national/district/facility level, for example, using mobile technology for monitoring and mapping; promoting local RUTF production; and identifying acute malnutrition indicators to integrate into the HMIS), 5) treatment (establish the impact of SAM treatment on stunting and keep MAM on the acute malnutrition agenda) and 6) community access and demand (document lessons learned and good practices in community mobilisation and improving SAM care-seeking behaviour and develop practical guidance and resources to support its application; document success integrating CHWs into community-based SAM treatment programmes and develop practical guidance and resources to support its application; and explore alternative SAM treatment service delivery models beyond health facilities).

Roundtable on integrating SAM into iCCM (2015) [424] gathered key SAM and iCCM actors to explore the linkages between the two domains. This meeting built on two previous ones and discussed the four categories (typologies) identified by Friedman and Wolfheim (2014) [196] to integrate or link iCCM and nutrition (advising on ‘feeding the sick child’ in existing iCCM services, linking with social and behaviour change activities on child nutrition, linking iCCM activities and acute malnutrition treatment through assessment and referral and treatment at community level of uncomplicated SAM). The typologies should be understood as a description of current linkages, and additional or revised typologies may be needed based on evidence and operational researches. Recommendations included considering child survival as the overall goal of linked/integrated iCCM and nutrition and improving the current iCCM package by adding preventive nutrition activities and considering the role of CHWs. Key bottlenecks identified for integration of iCCM and nutrition were poor supply chains for RUTF, vertical funding streams, lack of standardised nutrition indicators, inadequate coordination mechanisms, lack of operational guidelines, lack of an advocacy plan for integration, weak health systems and low utilisation of health services. Recommended next steps were reviewing all relevant experience in iCCM and nutrition and using the findings to identify further areas of research and opportunities for inter-agency collaboration, creating an online repository of relevant documents and scheduling a follow-up meeting to present the review findings to a wider group of stakeholders.

Annex 5. Global mapping of SAM integration

This annex reports on the global mapping of SAM integration survey.

Since 2007, there has been a steady increase in countries adopting outpatient case management of SAM (Figure 1.2), reaching 80 countries in 2014 [21]. Quality improvement, integration and scale-up of SAM interventions had been on the minds of many researchers, governments and technical and financial partners involved in SAM in high-burden countries. The evidence map (Chapter 3 section v) revealed few studies on SAM integration. However, it also revealed that the package of SAM interventions to improve SAM service quality and scale-up (Table 1.2) had also positive effects on integration and system strengthening. The policy map (Chapter 3 section iv) revealed that to stimulate cross learning, international and national conferences were organised to share practices and experiences on integration, but no specific guidance on integration had been developed.

A global mapping exercise was conducted to provide a snapshot of the extent of integration of SAM interventions into national health systems, and understand the progress of integration across countries and regions.

i. Methods

A study team comprised of UNICEF, ACF and the study investigator developed the e-survey method. Based on tacit knowledge of SAM and its integration, indicators were retained and a questionnaire with 36 questions developed, tested and shared on the internet platform SurveyMonkey® (Annex 9). An introductory note shared the purpose of the survey, contributing to learning on the integration of SAM. For the purpose of this survey, integration was defined from a systems perspective as the extent (pattern and rate) of adoption and assimilation of SAM into key system functions at the national level of the health system. The invitation to participate was shared with regional UNICEF and ACF offices, which subsequently shared it with the country offices in their regions. Participants were health and nutrition managers from the Ministry of Health, UNICEF or ACF. In case of conflict in responses, the team was contacted and asked to review and/or correct the answer.

Data were collected from 14 December to 5 January 2016. Based on the framework of key health system functions for SAM interventions (Table 4.1), we developed a set of questions. We added questions related to the time since introduction in primary care and whether introduced during an emergency or in a development context. Of the 36 questions asked, we retained 20 indicators for the SAM integration score. The number of indicators was reduced to 20 based on the relevance of the questions and study answers. For ease of interpretation, SAM integration indicators were grouped by the six health system domains of governance (five indicators), financing (two indicators), information (three indicators), workforce (four indicators), supplies (two indicators) and service delivery (four indicators). Results were compared to the global nutrition progress data on NutriDash [21].

ii. Results

The response rate of countries was mediocre. Sixty-one responses were received from 39 countries (two entries missed a country specification, four entries were empty and eight countries had multiple entries). Of the 39 countries, 17 (44%) had introduced SAM during emergencies, and 26 out of 36 (72%) had introduced SAM over 2 years earlier. Table A5.1 maps the positive response

frequency of SAM integration into key health system functions across countries. Indicators used in the integration score are marked with an asterisk (*). Results show that the governance integration indicators performed best (11 out of 12 indicators had a positive response in more than 60% of the countries) followed by the financing and information integration indicators. Positive responses were low on government participation in SAM financing (31%), adequate availability of SAM health workers (13%) and community health workers (5%), and RUTF procurement (28%) and distribution (33%). Figures A5.1 and A5.2 rank countries globally and by region based on the SAM integration score of 20 indicators. Results indicated a great variation among countries (scores range from 2 to 18, with a median of 11).

Countries were classified by high or low SAM integration score and by region based on the median score (score 11), marking countries of the upper quintile in bold (score ≥ 15) (Table A5.2). All regions had both low- and high-ranking countries with a similar range. There were more countries plotted in the high integration score group in Eastern and Southern Africa and West and Central Africa than in the other regions. Countries that introduced SAM in an emergency context had a significantly higher integration score (≥ 11) than those that introduced SAM in a development context, but the years since integration (more or less than 2 years) did not matter (Table A5.3).

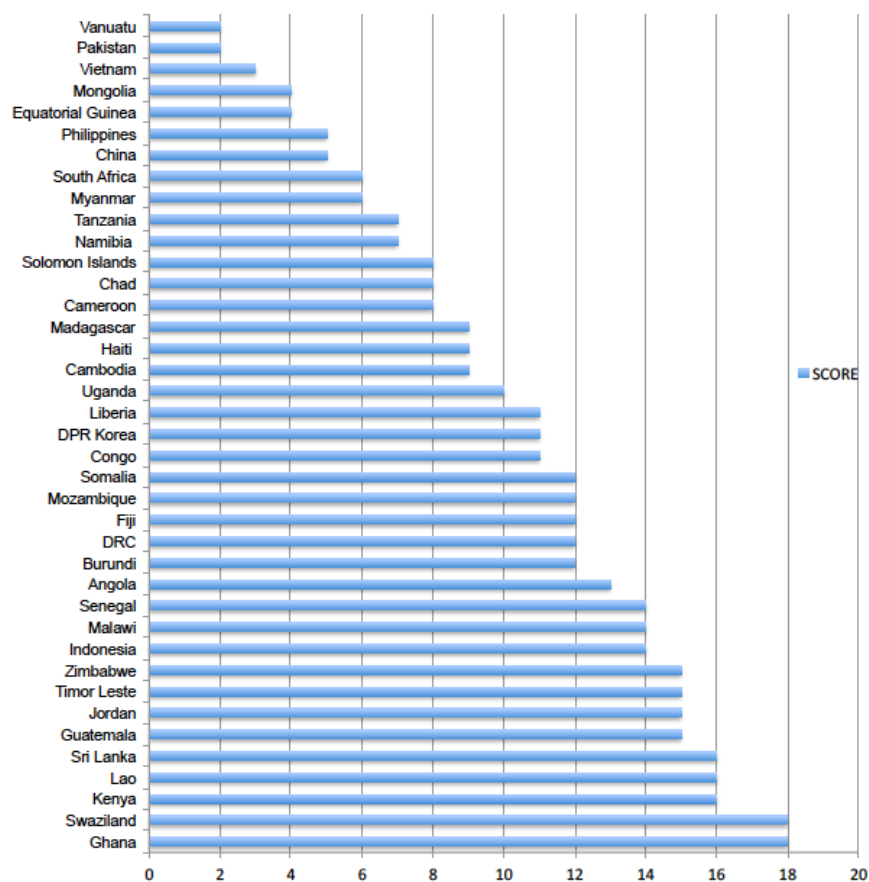


Figure A5.1. Country progress of SAM integration into the national health system (20 SAM integration indicators)

Table A5.1. Frequency of integration of SAM into key health system functions across countries

Variables	Positive responses	Total responses	%
Context			
Emergency (versus development) context of SAM introduction in the country	17	39	44
Time since SAM introduction >2 years	26	36	72
<6 months	2		6
6–11 months	2		6
12–23 months	6		17
24–36 months	3		8
>36 months	23		6
Governance			
SAM in national health policies*	32	36	89
SAM in subnational health policies	23	29	79
SAM in district health policies	22	29	76
SAM in national strategic health plans*	35	38	92
SAM in sub-national strategic health plans	23	31	74
SAM in district strategic health plans	22	30	73
Fee exemption for children under 5	28	39	72
Fee exemption under 5 including SAM*	24	39	62
National child health coordination platform including SAM*	22	33	67
Subnational child health coordination platform including SAM	15	26	58
District child health coordination platform including SAM	13	28	46
SAM guidance in national child health guidelines and protocols*	28	39	72
Financing			
Costed national nutrition plan	27	39	69
SAM in costed national nutrition plan*	25	39	64
Government participation in SAM financing*	12	39	31
Information			
SAM indicators in national health management information system (HMIS)*	22	39	56
Same registration and medical records for SAM and other childhood illnesses*	16	39	41
Same monitoring and reporting (M&R) tools for SAM and other childhood illnesses*	23	39	59
Workforce			
SAM in continuing professional education of MOH staff*	14	39	36
Adequate availability of SAM trained health workers*	5	39	13
Adequate availability of SAM trained CHWs*	2	39	5
SAM in routine health supervision*	25	38	66
Supplies			
RUTF in national procurement system-essential drug and medical supplies*	11	39	28
RUTF in national distribution/delivery system - essential drug and medical supplies*	13	39	33
RUTF on essential drug and medical supplies list	-	-	-
Service delivery			
SAM as routine healthcare in MOH facilities*	25	38	66
Systematic detection of SAM in MOH facilities*	20	38	53
SAM daily admission frequency*	28	36	78
SAM daily follow up frequency	13	33	39
SAM detection in health outreach*	22	38	58
SAM services in private-for-profit facilities	6	38	16

* Indicators of system functions that participate in the SAM integration score (N:20)

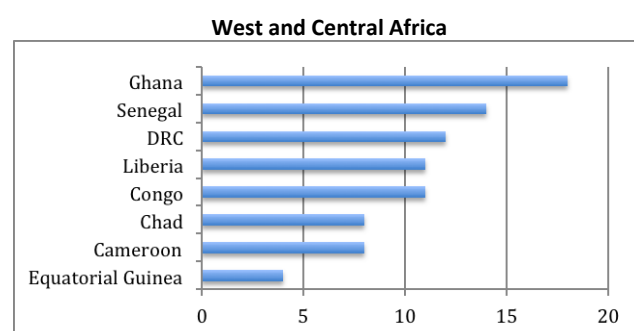
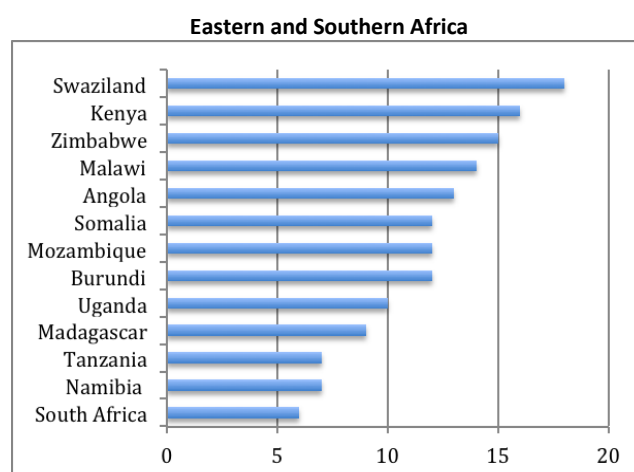
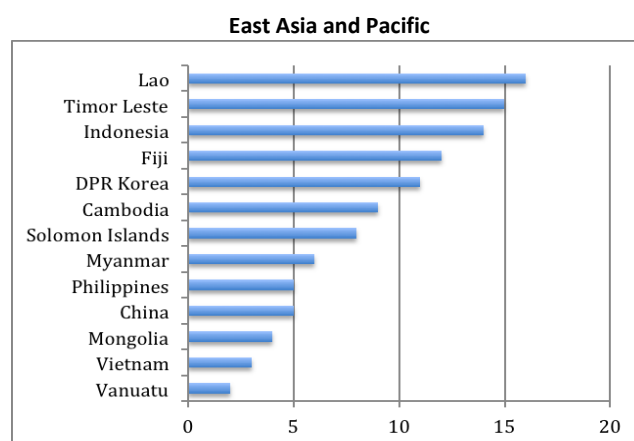


Figure A5.2. Country progress of SAM integration in three regions (20 SAM integration indicators)

Table A5.2. Countries with a high or low SAM integration score by region (based on median score 11) (based on upper quintile score ≥ 15 for countries in bold)

Regions	High integration score (≥ 11)	Low integration score (< 11)
East Asia and Pacific	Lao, Timor Leste , Indonesia, Fiji, DPR Korea	Cambodia, Solomon islands, Myanmar, China, Philippines, Mongolia, Vietnam, Vanuatu
East and Southern Africa	Swaziland, Kenya, Zimbabwe , Malawi, Angola, Burundi, Mozambique, Somalia	Uganda, Madagascar, Namibia, Tanzania, South Africa
Latin and Central America	Guatemala	Haiti
Middle East and Northern Africa	Jordan	
South Asia	Sri Lanka	Pakistan
West and Central Africa	Ghana , Senegal, DRC, Congo, Liberia	Cameroon, Chad, Equatorial Guinea

Table A5.3. Association between introduction of SAM in an emergency context and years since integration and a higher score (Fisher exact test) (N: 39)

	High integration score (≥ 11)	Low integration score (< 11)	P
Emergency	16	1	< 0.001
> 2 y	17	9	0.087

iii. Discussion and conclusions

The quick assessment representing about one-half of all countries with SAM interventions showed a wide range in variation of the extent of SAM integration into health system functions. Because of the limited method and low response rate, results have to be interpreted with caution. The great variation in the integration progress was difficult to explain based on this method (which was also not the purpose of the e-survey). Some of the results came as a surprise to UNICEF advisors. For example, Guatemala was not expected to score high because of the country's limited coverage and involvement with SAM. However, the result might indicate that it was easier for a country with a well-developed primary healthcare system and well-established preventive nutrition interventions to assimilate a new intervention. Moreover, integration of SAM services into emergency settings had progressed further, possibly because of the increased financial and technical resources made available in emergencies.

The global mapping e-survey encountered limitations. First, the response rate was low and country representation by region was limited. Seventy countries were invited to participate [21], thus information from one-third of the countries was missing. Second, the responses were the perspective of the responder, and not a group consensus. Some questions had induced confusion (noted when multiple entries were received), indicating that the targeted questions and/or the concepts of integration were not well understood. Third, the integration score was based on 20 indicators identified as key for systems integration at the national level and most feasible to answer with a questionnaire, and therefore sensitive to non-response. For example, Vietnam did not respond to four questions, and maybe therefore had a low score. Therefore, the score provided a snapshot of SAM integration progress and not a diagnostic.

Overall, SAM integration in many countries had started and progressed well, indicating that governments had a desire or willingness to take on the services. However, strategic plans for effective integration interventions based on an analysis of needs and capacities were missing.

Annex 6. Promising strategies for accelerating change: two cases

The core of our study was to understand pathways of integrating SAM interventions for improving quality, scale-up and sustainability as one pathway among others of improving effectiveness coverage of SAM. Various other pathways to increase treatment capacities may be explored in different contexts and with different resource gaps. An inadequate health budget to cover SAM needs has frequently been identified as a major key health system weakness [204]. But there may be ways to improve performance within current health budget constraints. For example, improving rational use of resources, preventing fragmentation and duplication of efforts, using health information and local knowledge to adapt strategies to needs (instead of ambitious donors or development partners pushing smart global initiatives) and unlocking community capacities, may help accelerate growth and transformative change.

Based on learning from the scoping study, the following strategies have surfaced as contributing to accelerating change and expanding effectiveness coverage of SAM:

- Improving leadership by
 - Information, knowledge and accountability for sustainable capacities and resource mobilisation;
 - System strengthening approaches; and
 - Unlocked local capacities for involvement and demand generation.
- Accelerating prevention
 - Multisectoral nutrition interventions to increase effectiveness;
 - Champions to promote healthy behaviours; and
 - Opportunities for dietary diverse complementary feeding.
- Simplifying care to accelerate integration and scale
 - Effectiveness of diagnosis for improving coverage; and
 - Simplified treatment protocols without antibiotics for uncomplicated SAM, and/or fewer or shorter regimens of RUTF for simplicity and cost-effectiveness without loss of safety and quality.
- Improving information and knowledge management
 - Knowledge and information sharing for improving learning;
 - Continuous quality improvement methods with peer-support, barrier analysis and systems thinking; and
 - Innovative research methods, e.g., implementation research, dynamic modelling—to increase learning in real-world settings.

The identified pathways could each be a topic for future research. As part of the scoping review, we analysed two strategies as possible contributing factors to accelerating change for SAM intervention scale-up: simplified anthropometry for diagnosis and treatment, and improved information sharing, summarized in two publications.

Effectiveness of diagnosis for improved coverage

We reviewed the literature on evidence for simplifying the diagnostic protocol of SAM based on anthropometry would be one option to improve effectiveness coverage of SAM services. It was not by chance that this subject was selected. Since long, experts debated on the reliability and validity of anthropometry in the detection of SAM and confused policy makers, which was not helpful for high-burden countries with a huge unmet need. We took therefore the opportunity to summarize latest evidence and practices in a mini review, which allowed highlighting critical elements in learning that may encourage policy makers and researchers to be innovatively looking for solutions [205].

Knowledge and information sharing for improved learning

A small group of interested people, under my personal lead, started the CMAM Forum as a one-stop website where existing technical guidance, evidence, and learning was collected and could be freely accessed to support scale-up of quality services. After the first years of voluntary work, donor interest formalised the initiative. In the first year of existence, about 1000 documents were made available, four summary of evidence papers on frequently asked questions reflecting recurrent problems were developed and a membership from over 60 countries was secured. To evaluate the use and usefulness of the website, we analysed routine website monitoring, conducted an e-survey to all members, and conducted country case studies in India, Kenya, Niger, and Yemen. We assessed the profiles of the CMAM Forum users and the reach and use of information for improved health outcomes, to further improve the information-sharing platform and support countries to develop national SAM information-sharing platforms [206].

Mini Review: Detecting Severe Acute Malnutrition in Children under Five at Scale: The Challenges of Anthropometry to Reach the Missed Millions

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Abbreviations: Mid-upper arm circumference (MUAC); Severe acute malnutrition (SAM); United Nations Children's Fund (UNICEF); Weight-for-height z-score (WHZ); World Health Organization (WHO)

Abstract

Objective: Severe acute malnutrition (SAM) interventions aim to detect and treat children at highest risk of death who benefit most from treatment. SAM services reach less than 20% of affected children worldwide, and innovative policy changes are needed to scale up services. This paper discusses anthropometry to diagnose SAM as one pathway to improve the effectiveness coverage of SAM services.

Results: WHO defines SAM by either MUAC <115 mm or WHZ <-3 or the presence of nutritional oedema. Both MUAC and WHZ are proxy indicators of a clinical condition, and neither is a gold standard. Because they measure different characteristics of the same illness, MUAC and WHZ identify different SAM populations that overlap differently in different contexts across and within countries. MUAC is a better predictor of mortality and has the practical advantages of simplicity, reliability and accuracy. Using both indicators independently identifies more children and loses sensitivity to risk of death.

Discussion and conclusions: Based on current evidence and operational and policy considerations, using MUAC only for diagnosing SAM with a country-adapted cut-off could feasibly scale up SAM services and improve coverage to reach the millions of missed children. Meanwhile, continued research on the biomedical consequences and policy implications of this approach, as well as innovations such as system dynamics modeling, may contribute to the evidence.

Keywords: Anthropometry; Mid-upper arm circumference; Severe acute malnutrition; Weight-for-height z-score; Child malnutrition; Nutrition disorders, child

Introduction

Worldwide, severe acute malnutrition (SAM) affects about 16 million children under 5 at any time [11] and kills over half a million annually [4]. SAM is a serious illness caused by inadequate food intake or absorption or by infection. SAM alters metabolism, weakening the immune system and making children more susceptible to illness and nine times more likely to die than well-nourished children [425]. Until 2000, few children with SAM were treated, in routine hospital care or temporary emergency centers often far from their homes. The advent of ready-to-use therapeutic food in the 1990s allowed treatment of uncomplicated SAM in decentralized primary care and made scale-up possible [18]. The global annual SAM treatment caseload grew from a few thousand in 2000 to over 3 million in 2014 in about 80 countries [426], but less than 20% of SAM children received care [426]. Scale-up has slowed, and accelerated change is required. One way to reach the millions of missed children with SAM more efficiently is to improve early detection of children at highest risk of death. This paper discusses the challenges of anthropometry in diagnosing SAM as one pathway to improve the effectiveness coverage of SAM services. The authors examined published literature, policies and practices on the use of mid-upper arm circumference (MUAC) and/or weight-for-height z-score (WHZ) to detect SAM for treatment.

Detecting SAM for treatment

The World Health Organization (WHO) defines SAM as MUAC less than ($<$) 115 mm or WHZ $<$ minus 3 standard deviations of the median value of the 2006 WHO Child Growth Standards or the presence of bilateral pitting (nutritional) oedema [3]. Both MUAC and WHZ are proxy indicators of the clinical condition of SAM and are more practical in resource-poor environments than biomarkers such as hormonal and metabolic changes, but neither is a gold standard. Late detection of SAM or presentation for treatment increases the risk of medical complications requiring intensive inpatient care [16]. Early detection prevents development of complications and allows early start of treatment in primary healthcare, making treatment cheaper [16] and easier to scale up and integrate [201]. This improves health outcomes and maximizes effectiveness coverage (the proportion of children with SAM who recovered after treatment, the key outcome indicator of effective care) [261].

MUAC detects loss of subcutaneous fat and muscle mass in wasted children [427, 428]. MUAC tapes are inexpensive, portable and easy to use with training and supervision [3]. Measurement requires placing the tape correctly and reading and recording measurements accurately. MUAC is influenced by age, sex and body composition of lean mass. MUAC $<$ 115 mm in children 6–59 months detects younger children (with smaller arms than older children) and more girls (with smaller arms than boys) [428]. Child populations with more central fat, e.g., thin-fat phenotypes in South Asia, have lower MUAC readings than those with more peripheral fat [429] indicating MUAC's sensitivity to fat distribution. Though using a single MUAC cut-off for all children 6–59 months has been questioned, as MUAC is age and gender dependent [430, 431], using MUAC-for-age or MUAC-for-height did not improve predictive value of mortality [428, 432].

WHZ is a composite indicator of weight relative to length (for children under 2) or height (for children over 2). Expressed in standard deviations, it describes how far and in what direction a child's weight deviates from the median weight of a child of the same length or height in the WHO Child Growth Standards. WHZ requires good training and regular supervision and involves weighing and measuring length or height using scales and length/height boards that are not easily available and must be functional and calibrated for accuracy. In practice, children are rarely weighed naked,

and measurements are often imprecise because the moving piece of the measuring board is incorrectly placed. WHZ also involves finding the intersection of height and weight on separate reference tables for boys and girls with either upper limits or ranges of cutoffs [433] and classifying nutritional status by z-scores. Because WHZ is more likely to identify boys than girls with SAM (the WHO SAM cutoff for girls at any given height is at a lower weight than for boys [434], so girls must have lower weight to be eligible for treatment) some researchers and policy makers recommended a unisex table based on the tables for boys to avoid discriminating against girls [402]. As WHZ compares ponderal growth with linear growth, child populations with larger heads, chests and abdomens and greater central body fat distribution [435], stunted growth or shorter legs generally have higher WHZ (or lower prevalence of wasting) [8, 436]. Longer legs typically translate into lower WHZ (or higher prevalence of wasting), though linear growth reflects good health [437].

Since the first publications on MUAC [438] and WHZ [439] to diagnose malnutrition in pre-school children, their use has expanded and their popularity fluctuated. A first comparative study (1975) of anthropometric methods to diagnose 'protein calorie malnutrition' showed close agreement between the two indicators in the same population [439]. A major review of untreated SAM in the community found MUAC better at identifying children at risk of mortality [440]. Further comparative studies found MUAC less prone to error than WHZ [441], better able to detect children with nutritional oedema and as effective as WHZ in identifying SAM children with medical complications [441]. No difference was found in clinical and laboratory characteristics and treatment outcomes in children with SAM identified by either indicator [442]. A 2011 Kenya study recommended routine MUAC measurement as part of child hospital admissions in sub-Saharan Africa [443]. A 2013 Bangladesh study found that community health workers achieved 90% error-free case management of children identified with uncomplicated SAM by MUAC [193]. A 2015 Niger study found that mothers detected SAM in children using MUAC with good sensitivity and specificity [255]. A 2014 Kenya study found weight, length and height measurements reliable under controlled conditions but less so when combined into WHZ, risking failure to detect SAM [444]. A 2015 Bangladesh study found that WHZ misdiagnosed 12–14% of children with SAM, compared with only 1%–2% misdiagnosed by MUAC [445]. MUAC's validity has been challenged [446] by comparing its sensitivity and positive predictive value to that of WHZ instead of mortality, mistakenly assuming that WHZ is the definitive standard for identifying SAM.

Different body shapes (which influences WHZ), stunting level and fat distribution (which influences MUAC) mean that MUAC and WHZ identify different children with SAM [428, 435, 441, 447]. A 2016 study of anthropometric surveys from 47 countries found that on average, 52.7% of children were classified as SAM based on MUAC and 63.7% based on WHZ, with an overlap of 16.5% [448]. SAM prevalence based on either MUAC or WHZ and overlap of SAM child populations varied within and across countries, showing that the relationship between MUAC and WHZ was more complex than previously thought.

Improving effectiveness coverage of SAM services

Policy changes and innovative strategies are needed to break the deadlock of sustained low coverage and improve health outcomes when they are less severe and less costly to treat. Self-referral, active and routine detection of SAM by informed communities and health workers and better access to care are key to expanding coverage. Persistent barriers to treatment access, initiation, adherence and retention are understanding of the illness and treatment pathway, availability of services, transport costs, out-of-pocket expenditures and opportunity costs for carers [308], [39]. Improving SAM treatment access and uptake will increase coverage and reduce health

costs and financial risk for carers. A 2015 Sierra Leone study found that using MUAC only for admission of SAM children significantly increased coverage (71%) over using WHZ (55%) and resulted in similar recovery rates (83% for MUAC and 71% for WHZ) [449].

Using MUAC only to detect SAM may improve coverage because of its ease of use, reliability and ability to identify children at risk of mortality. Its effectiveness has been studied in several contexts [450], and some countries have adopted it fully (Ghana, Somalia) or partially (Sierra Leone, South Sudan, Sudan). SAM detection and care based on MUAC enabled adding SAM to integrated community case management (iCCM) of diarrhoea, malaria and pneumonia in Bangladesh [193], Mali, Pakistan and South Sudan [196]. Moreover, MUAC only may reduce workload and improve planning and resource allocation [451], thus health outcomes. While MUAC only may detect SAM children at highest risk of death, arguments against such a policy underlined the risk of missing SAM children identified by WHZ who also have increased risk of death, although lower than by MUAC [443]. A counter-argument suggested increasing the MUAC cut-off to include more children with SAM identified by WHZ [452] who might otherwise be left out and would benefit from treatment. If SAM treatment capacity increases so that all cases of SAM identified by MUAC access treatment, then cases of SAM identified by WHZ that were not yet identified by MUAC should be targeted.

The challenge of scaling up SAM services, the case of Sudan

The complexity of decision-making is illustrated by Sudan, which has a high burden of SAM and a weak health system. The government received support for SAM services in war-affected zones (about 20% of the country) [21] in 2015 expanded services to another 35% of health facilities with its own resources [453] but struggled to scale up further or integrate SAM case management into routine primary healthcare. The 2015–2017 national health plan proposed using MUAC only for SAM diagnosis and treatment [454] to accelerate scale-up [455] but faced resistance because of the lack of international guidance or clear evidence.

With 5.2 million children under 5 in 2010 and a SAM prevalence defined by WHZ of 5.3%, Sudan had an average of 275,600 children with SAM [456] and an annual caseload of 716,560 children (applying the global 1.6 incidence conversion factor) [38]. The real caseload was probably higher because the prevalence did not include SAM cases defined by MUAC or oedema and the incidence conversion factor was probably higher [457]. When applying the SAM treatment capacity in 2010 of 52,064 children [458], only one out of 14 children were admitted for treatment (coverage was probably lower because the caseload did not count children with SAM identified by either MUAC or oedema). Sudan has diverse ethnic groups with different body shapes (e.g., pastoralist populations tend to have longer legs and hence higher sitting to standing height ratio than agrarian populations). A 2016 study suggested that on average, the SAM population identified by either MUAC or WHZ overlaps by 20.4% and twice as many SAM children are identified by WHZ as by MUAC [448]. However, in 2013, North Darfur State had a SAM prevalence of 5.8% based on MUAC and 7.8% based on WHZ, while Kassala State had a SAM prevalence of 4.3% based on MUAC and 2.6% based on WHZ [459] (Figure A6.1), suggesting a different overlap of the two populations.

The estimated SAM caseload based on population estimates in 2014 [460] and the prevalence rate from a 2013 survey, was 394,234 children identified by MUAC and 531,362 identified by WHZ [459]. The survey results did not indicate how much the SAM populations overlapped, but assuming 20.4% [448], 768,767 children would have been identified by either MUAC or WHZ (Figure A6.2). Thus, 51.3% of SAM children (394,234 with low MUAC/768,767) were at higher risk of death. In 2014, Sudan's SAM treatment capacity was 140,000 children. With the current policy and treatment

capacity, one child in five (18.2% or 140,000/768,767) identified by either MUAC or WHZ (or oedema) accessed treatment. There was no guarantee that the one child who accessed treatment was identified with SAM by MUAC and thus was at higher risk of death. With a MUAC only policy and the 2014 treatment capacity, one child in three (35.5% or 140,000/394,234) with a high risk of death would have accessed treatment.

Increasing SAM service coverage would require major increase in capacities and resources. A MUAC only policy would double coverage and save more lives by targeting children at highest risk of death. This example raises the question whether saving the lives of more serious SAM cases and treating less serious cases with less costly interventions (75% to 90% of SAM children may recover spontaneously [461]) may be more effective for overall health outcome.

Conclusions

This paper discussed the challenges of anthropometry in diagnosing SAM and ways to improve the effectiveness coverage of SAM. Innovative practices have been piloted to increase early detection and treatment of SAM children, but the clinical unknowns of the missed children resisted policy change. Simple and reliable anthropometry for early diagnosis could increase the number of children accessing treatment. But because of incomplete biomedical evidence, researchers are unlikely to agree soon on using MUAC only. This uncertainty is a serious barrier to decision-making for policy change to accelerate coverage of more effective, feasible and sustainable quality services at scale.

Based on current evidence and policy considerations, using MUAC only for diagnosis shows promise for closing the capacity gap to scale up services to reach missed children with SAM. Meanwhile, with so many children's lives at risk, more and innovative research is needed on the biomedical consequences and policy implications of this approach. Effectiveness studies of SAM-specific health outcomes from implementation of various policies will fill in part of the picture. Systems thinking can help explain why and how SAM policies work in complex and rapidly changing settings [85]. For example, mathematical modeling [462] and dynamic systems modeling over time [82] could compare the (cost-)effectiveness of different SAM policies in specific contexts. This paper calls for better understanding of the impacts of policy changes and for real-world decisions without making SAM children wait for treatment.

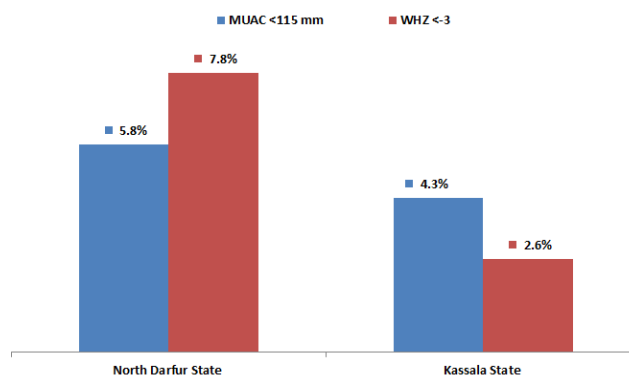


Figure A6.1. Diagnosis of severe acute malnutrition (SAM) in children under 5 by mid-upper arm circumference (MUAC) and weight-for-height z-score (WHZ) in Sudan, 2013 [459].

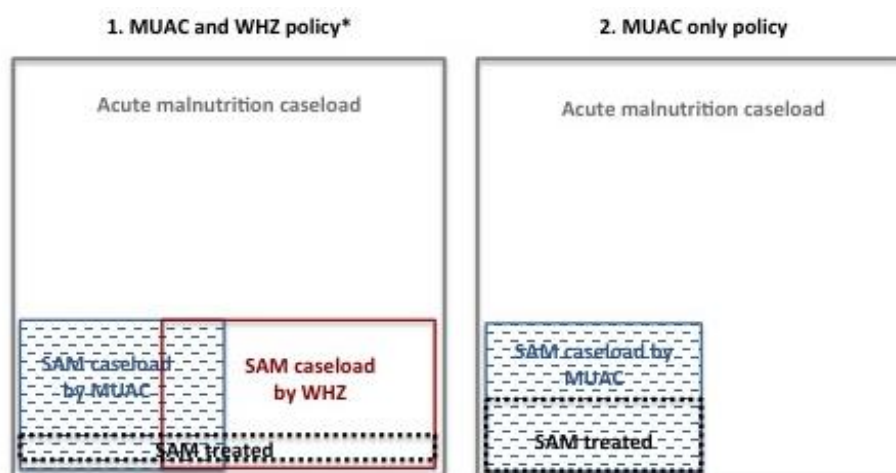


Figure A6.2. Annual caseloads of treated and untreated children with severe acute malnutrition (SAM) in Sudan, by diagnosis policy and treatment capacity, 2014 [47][52].

* The 2013 national survey identified 394,234 children with SAM by mid-upper arm circumference (MUAC) <115 mm and 531,362 by weight-for-height z-score (WHZ) <-3. If we assume a 20.4% overlap of the two populations, then 768,767 children were identified with SAM by either MUAC or WHZ. SAM treatment capacity in 2014 was 140,000 children. Calculation: $(394,234 + 531,362) - (20.4/100 * X) = X$, or $768,767 = X$

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Annex 7. Indicators and questions

This annex provides the lists of indicators and questions used to 1) assess the situation analysis in which integration of SAM occurs, 2) assess the extent of integration, 3) identify factors that influence the integration process at the various tiers of the health system, and 4) scenarios for improving integration.

1. Situation analysis		
Objective	Key questions	Assessment
Describe the SAM burden and SAM interventions in the context of the health system	What is the current SAM burden, SAM interventions and their performance in the given health and policy context?	SAM burden and overall health status of population SAM service delivery package at various platforms Performance and bottlenecks of SAM service delivery Capacities of the health system (government, communities, technical and financial partners) Health actors' involvement National policies and initiatives fostering SAM Implementation strategy of SAM interventions
Population health measure	Indicator	Specification, benchmark and source
National context	Population Population children under 5 Fertility rate Adult literacy rate Gross national income per capita (PPP) Population living under the poverty line World Bank income group Human Development Index	Source: World Health statistics, World Bank Country groups, UNDP HDI.
Health context	Life expectancy at birth: Total expenditure on health per capita: Total expenditure on health as a percentage of GDP	WHO World health statistics, MICS 2014, other?
Public health service delivery system	National and regional hospitals, district hospitals primary healthcare centres, outreach clinics	
Community health system	Village development committees, female community health volunteers	
Prevalence of acute malnutrition	Proportion of children under 5 diagnosed with SAM in the population (%; confidence interval) Proportion of children under 5 diagnosed with overall acute malnutrition (GAM) in the population (%; confidence interval)	Doubling of baseline prevalence is considered a severe situation [31] Source: Nutrition surveys [34], DHS (wasting) Note: specify anthropometric indicator WHZ or MUAC GAM below 5% is acceptable, 5-9% poor, 10-14% serious and <15% critical in the absence of aggravating factors (WHO 1998) Source: DHS (wasting), nutrition surveys Note: specify anthropometric indicator WHZ or MUAC
Under-5 mortality	Probability of dying before 5 years of age per 1000 live births	In 2015, the under-five mortality rate in low-income countries was 76 deaths per 1000 live births – about 11 times the average rate in high-income countries (7 deaths per 1000 live births). WHO African Region (81 per 1000 live births) [463].

		Proportion of deaths of children under 5 per 10000 children under 5 per day	Source: DHS In emergencies, the rate should not double the baseline rate, or when the baseline rate is unknown or of doubtful validity, the under 5 mortality rate should remain at least below 2/10000/day [31]). Source: Nutrition surveys
Disability-Adjusted Life Year (DALY) for SAM		DALY is the sum of the Years of Life Lost (YLL) due to premature mortality in the population and the Years Lost due to Disability (YLD) for people living with the health condition or its consequences	The sum of SAM DALYs across the population measures the burden of SAM, or the gap between current health status and an ideal health situation where the entire population lives to an advanced age, free of disease and disability [267] Source: Research studies
SAM service performance		Indicator	Specification, benchmark and source
Geographic coverage	service	Availability coverage	Number and proportion (%) of secondary and primary health facilities offering SAM treatment Number of mobile sites with SAM treatment Number of community case management sites with SAM treatment Proportion of SAM treatment sites receiving partner support Source: Various
Access to treatment		Accessibility coverage	Proportion of household total out-of-pocket expenditure for health being paid for SAM access and treatment Source: NA
		Barriers to access and service uptake	Physical, financial, socio-cultural barriers to access Source: Coverage surveys
Contact coverage		Proportion of children under 5 with SAM in the population taking up/receiving treatment	Low (<30%), medium (30-50%), or high (≥50%) SAM contact coverage [31].
Caseload		Annual number of children under 5 receiving treatment for SAM	Number of children under 5 with SAM receiving treatment in a given period Source: SAM service monitoring
Quality of care		Annual overall SAM recovery, case-fatality and defaulting rates	Low (recovery rate ≤75%, case-fatality rate in treatment ≥10% and defaulting rate ≥15%), medium (one or two low scores for cure, case-fatality in treatment or defaulting rate), or high (recovery rate >75%, case-fatality rate in treatment <10% and defaulting rate <15%) quality of care [31]. [Instead of defaulting use retention in treatment?] Source: SAM service monitoring
Cost of a treatment		Cost of an individual SAM treatment	Comprehensive cost of a child SAM treatment, expressed in USD Source: Research studies
Bottlenecks in SAM service implementation		Availability of commodities	Proportion (%) of health facilities with SAM outpatient care that did not have stockouts of RUTF in a given time period (1y) Source: BNA for SAM or SAM service monitoring?
		Human resources involvement Or Qualified human resources?	Proportion (%) of health workers providing SAM treatment Or Proportion (%) of health workers trained on SAM treatment in a time period (1 y) Source: BNA for SAM or SAM service

Equity	Geographic access outpatient care	monitoring? Proportion (%) of functional primary health facilities providing SAM outpatient treatment Source: BNA for SAM or SAM service monitoring?	
	Geographic access outreach	Proportion (%) of community health workers trained on acute malnutrition case detection Source: BNA for SAM or SAM service monitoring?	
	Initial utilization	Proportion (%) of children under 5 with SAM in the population who receive treatment Source: BNA for SAM or SAM service monitoring?	
	Use and retention in treatment	Proportion (%) of children under 5 with SAM in the population who completed treatment (cured + died + non-recovered minus defaulters?) Source: BNA for SAM or SAM service monitoring?	
	Effectiveness coverage	Proportion (%) of children under 5 with SAM in the population who successfully recovered after treatment Source: BNA for SAM or	
	Analysis of root causes of indicators identified as bottlenecks and prioritization of solutions based on score	Score (1, 2, 3): time required, feasibility, affordability, equity, security, level of response	
	Absence of unfair and avoidable or remediable differences in child health interventions and outcomes among groups of people	Contact coverage by household wealth rank and/or urban/rural or remote populations? Prevalence of SAM by household wealth rank and/or urban/rural or remote populations? [CORE 2015 equity tool; WHO 2015 monitoring equity for AIDS]	
	Sustainability	Financial dependence of SAM interventions	Number of financial partners, plus map (who does what where) Amount of annual donor funding for SAM (extra-budget) Source: Government and partner reports
		Technical dependence of SAM interventions	Number of technical partners involved in SAM, plus map (who does what where) Proportion (%) of SAM sites receiving technical partner support Source: Government and partner reports
		Estimate of financial and technical dependence	Low (high financial and technical partner dependence), medium (partial financial or technical partner dependence), high (no financial and no technical partner dependence) sustainability. Source: Government and partner reports
Policy and implementation framework			
Policies	Indicator	Specification, benchmark and source	
	Description of policies that cover SAM	What national and/or local policies, strategies, initiatives promote or foster SAM interventions - Policy mapping	
Technical guidance	SAM national guidelines	Do they exist, are they updated to latest evidence, have job aids and training materials been developed	
Implementation strategy	Mapping of SAM interventions	What SAM interventions are provided where with who and how	

Health actors	Mapping of health actors	Who is involved doing what and where, and how are they regulated and coordinated - Health actors (Stakeholder) mapping
M&E	National repository	Does a national repository of SAM information exist (surveys and service monitoring) exist with open access, information sharing and feedback system
Challenges	Topic	
	Health outcome improved SAM implementation improved	What challenges need attention (to overcome) and what changes or adaptations are needed for improved service delivery?

2. Why integration

Objective	Key questions	Assessment
Identify why and how integration is considered	Has integration of SAM into the national health system been defined? Has it been translated into a strategic plan? What are its objectives and expected results?	Need and desire for integration What is understood by integration What is expected What is planned Who is involved
Change for integration	Indicator	Source: Questions to discuss (interview or focus groups) with key health actors
Interest in integration	Expressed interest for integration of SAM interventions	Has an interest for integrating SAM been expressed? Is a strategy (plan) in place?
Defining integration	Definition of integration of SAM into the national health system been exist	How is integration of SAM being defined?
Expected outcome	Expected outcome of integration defined	Has an expected outcome of integrating SAM been defined?
Strategic plan	Implementation strategy for integration in place	What key activities are planned and ongoing? Timeline? Budget? Is progress monitored?
Health actors	Expanded key stakeholder involvement	Who are key stakeholders (health actors)? Has somebody been missed out? Capacities?
Challenges	Topic	
	Changes for initiating or improving integration	What challenges need attention and what changes or adaptations are needed?

3. Extent of integration

Objective	Key questions	Assessment
Conduct a diagnostic of extent of integration of SAM interventions	What is the extent (level) (and trend if information of more than 1 year is available) of SAM integration into the national health system?	What is the level of systemic integration (macro/meso level) What is the level of organizational integration (meso level) What is the level of professional integration (meso level) What is the level of clinical integration (micro level) What is the level of functional integration (crosscutting) What is the level of normative integration (crosscutting) What is the level of horizontal and vertical integration (crosscutting)

3.1 Systemic integration at the national level (macro level)

	Indicator	Examples
	Source: Questions to discuss (interview or focus groups) with key health actors at national level	
	Level: Range of no, partial or full integration occurs along a continuum: no interactions or segregation when no integration exists; linkage or coordination when partial integration exists; and full integration when health system functions and structures have assimilated or merged	
Governance		
Policy setting	National health and nutrition policies with SAM as part of child healthcare (i.e. integrated management of childhood illness (IMCI) and child hospital care with SAM covered)	Full: National health and nutrition policies cover SAM as part of IMCI and child hospital care. Partial: National health and nutrition policies cover some but not all aspects of SAM as part of IMCI and child hospital care. No: National health and nutrition policies do not cover SAM.
National guidelines	National guidelines for IMCI and child hospital care supporting comprehensive child healthcare, with SAM as part of IMCI and child hospital care	Full: National guidelines for IMCI and child hospital care support comprehensive child healthcare, with SAM as part of IMCI and child hospital care Partial: National guidelines for SAM exist but are ill adapted or incomplete for comprehensive child healthcare (linking or coordinating with IMCI and child hospital care) No: National guidelines for SAM do not exist, or generic guidelines are used but are not adapted to the country context.
Technical leadership	A technical advisory group for comprehensive child healthcare, with SAM as part of IMCI and child hospital care	Full: The Ministry of Health (MOH) leads a technical advisory group for comprehensive child healthcare, with SAM as part of IMCI and child hospital care, generating national technical and operational management expertise. Partial: The MOH leads a technical advisory group for SAM that is not part of an overarching child healthcare group. No: A technical advisory group for SAM does not exist, or exists but is not lead by the MOH.
Regulation and coordination	Regulation and coordination of health actors (including financial and technical partners, education and training institutions, professional associations, private and informal health sector, communities, and champions) aligning with the national health and nutrition policy and implementation strategy	Full: The MOH regulates and coordinates health actors to align with the national health and nutrition policy and implementation strategy with a common goal, with SAM as part of IMCI and child hospital care. Partial: Not all health actors involved in SAM are regulated and coordinated by the MOH or aligned with the national health and nutrition policy and implementation strategy. No: Health actors involved in SAM are neither regulated nor coordinated by the MOH nor aligned with the national health and nutrition policy and implementation strategy.
Evidence-based decision making	Generation and interpretation of intelligence and research on policy and strategy options	Full: The MOH generates and interprets intelligence and research on policy and strategy options for comprehensive child healthcare, including SAM Partial: Inadequate intelligence and research on policy and strategy options for child healthcare and SAM is been generated and interpreted. No: The MOH does not generate and interpret intelligence and research on policy and strategy options for SAM
Social participation	Social participation of local and community actors in planning, building coalitions, and implementing and monitoring of comprehensive child healthcare with a people-centred approach	Full: The MOH involves local and community actors in planning, implementing and monitoring comprehensive child healthcare with a people-centred approach. Partial: The MOH involves local and community actors in some but not all aspects of planning, implementing and monitoring of child healthcare, and may receive partner support for SAM. No: The MOH does not, but partners may involve local and community actors in planning, implementing and monitoring of SAM.
Contingency planning	Plans and regulations for addressing contingencies	Full: The MOH has plans and regulations for contingencies that affect child healthcare, including for SAM. Partial: The MOH plans for some contingencies that affect child healthcare, and/or some for SAM. No: The MOH does not plan for contingencies for SAM, but partners may do.

Financing

Regular budget-pooled funding	Regular budget from pooled funds with a sector-wide approach covering financing for SAM	Full: Financing for SAM interventions is covered by the regular health budget from pooled funds with a sector-wide approach. Partial: Financing for SAM interventions is predominantly from extra-budgetary funds (short term or emergency funding). No: Financing for SAM interventions is from extra-budgetary funds (short term or emergency funding).
Annual costed action plans	Annual costed action plans of MOH covering SAM interventions	Full: SAM interventions are fully incorporated in annual costed action plans of MOH. Partial: Some but not all SAM interventions are incorporated in annual costed action plans of MOH. No: SAM interventions are not incorporated in annual action plans of MOH and thus have no health budget allocation.
Health workers payroll	Staff in national health facilities involved in SAM on MOH payroll	Full: SAM staff in national health facilities is on the MOH payroll. Partial: Some but not all SAM staff in national health facilities is on the MOH payroll, and some may have temporary local government or partner contracts. No: No SAM staff is on the MOH payroll.
Financial risk protection	Fee waiver system for children under 5 (or health insurance) covering comprehensive child healthcare	Full: The MOH has a functional fee waiver system for children under 5 (or health insurance) covering comprehensive child healthcare omitting all out-of-pocket payments. Partial: The MOH has a fee waiver system for children under 5 (or health insurance) that covers some but not all costs of SAM, or does not omit all out-of-pocket payments. No: No MOH fee waiver system for children under 5 (or health insurance) exists, but partners may cover SAM costs.

Information

Health information system (HIS)	National HIS, including acute malnutrition indicators	Full: The national HIS includes key acute malnutrition indicators. Partial: The MOH manages a SAM information system apart from the national HIS, and may receive partner support. No: The MOH does not manage a SAM information system.
Performance monitoring system	Performance monitoring of comprehensive child healthcare	Full: The MOH monitors performance of comprehensive child healthcare services including SAM. Partial: The MOH monitors some but not all aspects of child healthcare services including SAM or of SAM services only, and may receive partner support for SAM. No: The MOH does not, but partners may monitor SAM-specific service performance.
Contact coverage monitoring	SAM coverage monitoring as part of comprehensive child healthcare coverage monitoring	Full: The MOH monitors SAM coverage as part of comprehensive child healthcare coverage monitoring. Partial: The MOH monitors SAM-specific coverage, and may receive partner support. No: The MOH does not, but partners may monitor SAM-specific coverage.

Workforce

Adequate coverage of health workers	Adequate number of qualified health workers with geographic coverage for comprehensive child healthcare	Full: The MOH manages shortage of qualified health workers for comprehensive child healthcare by hiring or re-allocating, training and retaining health workers and/or adjusting job descriptions for task sharing or shifting. Partial: The MOH has shortage of qualified health workers for child healthcare that may be complemented by partner staff and/or by partner support for hiring for SAM. No: Shortage of health workers for SAM is compensated for by partner staff.
Competences of health managers and health workers	Adequate technical and organizational management skills for comprehensive child healthcare	Full: The MOH staff has adequate technical and organizational management skills for comprehensive child healthcare. Partial: The MOH staff has insufficient technical and organizational management skills for child healthcare, and may receive partner support for SAM. No: Partners are in charge of clinical and organizational management of SAM.
Performance appraisal and motivation	Performance appraisal and career development opportunities as part of the	Full: The MOH provides performance appraisal and career development opportunities as part of its human resources management system.

system	human resources management system	Partial: The MOH provides some but not all aspects of performance appraisal or career development opportunities, and may receive partner support for SAM. No: The MOH does not, but partners may provide performance appraisal and career development opportunities for SAM.
Pre-service education	Modules of pre-service education curriculum on comprehensive child health and nutrition	Full: The pre-service education curriculum is adapted to include comprehensive child health and nutrition, including the latest evidence on the management of SAM. Partial: Some but not all aspects of the pre-service education curriculum of child health and nutrition are adapted and updated for SAM. No: The pre-service education curriculum does not cover SAM.
Continuing professional development	Continuing professional development on comprehensive child health and nutrition	Full: The MOH provides continuing professional development on comprehensive child health and nutrition. Partial: The MOH provides continuing professional development on some but not all aspects of child health and nutrition, and may receive partner support for SAM. No: The MOH does not, but partners may provide continuing professional development for SAM.
Supplies		
Essential medicines and medical supplies list	National essential drugs and medical supplies list including for SAM	Full: SAM equipment, drugs and supplies are included in the national essential drugs and medical supplies list. Partial: Some but not all SAM equipment, drugs and supplies are included in the national essential drugs and medical supplies list. No: None of the SAM equipment and supplies are included in the national essential drugs and medical supplies list.
Procurement system	National drugs and medical supplies needs (forecasting and) procurement, including for SAM	Full: The MOH (forecasts and) procures drugs and medical supplies that include all SAM equipment, drugs and supplies. Partial: The MOH (forecasts and) procures some but not all drugs and medical supplies needs for SAM, and may receive partner support. No: Partners (forecast and) procure all SAM equipment, drugs and supplies.
Logistic management system	National logistic management system for drugs and medical supplies, including for SAM	Full: The MOH has logistic management capacities for drugs and medical supplies that include SAM equipment, drugs and supplies. Partial: The MOH has insufficient logistic management capacities for SAM equipment, drugs and supplies, and may receive partner support. No: Partners provide all logistic management for SAM equipment, drugs and supplies.
Service delivery		
Demand generation	Demand generation by activating and informing communities for improved child health and nutrition	Full: The MOH manages demand generation activities for improved child health and nutrition including acute malnutrition (to improve service access, use and retention in treatment, and promote social and behaviour change for improved care practices). Partial: The MOH manages some but not all aspects of demand generation activities for improved child health and nutrition including acute malnutrition, and may receive partner support. No: The MOH does not, but partners manage demand generation activities for improved child health and nutrition including acute malnutrition.
Early case finding	Early active (by volunteers in the community), systematic (by health workers at the health facility) and enhanced (by carer) case finding for selected child illnesses	Full: The MOH provides and supports early active, systematic and enhanced case finding for selected child illnesses including acute malnutrition. Partial: The MOH supports some but not all aspects of early case finding for selected child illnesses including acute malnutrition, and may receive partner support. No: The MOH does not, but partners may provide and support early case finding for acute malnutrition.
Community-based primary care	Promotive and preventive community health and nutrition and community case	Full: The MOH manages comprehensive community-based primary care (national policy). Partial: The MOH manages some but not all aspects of

	management (CCM)		community-based primary care (national policy) including acute malnutrition, and may receive partner support. No: The MOH does not, but partners may manage some aspects of community-based primary care for acute malnutrition. Full: SAM without complications is systematically diagnosed and treated with continuity of comprehensive child health as part of IMCI. Partial: SAM without complications is diagnosed and treated as part of or in isolation from IMCI, and may receive partner support. No: SAM without complications is diagnosed and treated in isolation from IMCI organised by partners.
Outpatient care (Facility-based primary care)	Outpatient management of SAM without complications as part of IMCI OR Comprehensive IMCI		Full: SAM with complications is systematically diagnosed and treated in hospitalised care until stabilisation with the SAM ward (or SAM beds) being part of the paediatric unit with rotating staff. Partial: SAM with complications is diagnosed and treated in hospitalised care until stabilisation with the SAM ward separate from the paediatric unit with assigned SAM staff, and may receive partner support. No: SAM with complications is treated until stabilisation or full recovery in a SAM ward separate from the paediatric ward organised by partners.
Inpatient care (Child hospital care)	Inpatient management of SAM with complications until stabilisation as part of child hospital care OR Comprehensive child hospital care		Full: MOH manages comprehensive health outreach activities for selected child illnesses (national policy) including acute malnutrition. Partial: MOH manage some but not all aspects of health outreach activities for selected child illnesses (national policy) including acute malnutrition, and may receive partner support (e.g. for early case finding and referral for treatment). No: MOH does not, but partners may provide health outreach activities for selected child illnesses (national policy) including acute malnutrition (or not).
Health outreach	Health outreach activities for selected child illnesses including acute malnutrition		Full: The MOH manages a referral and tracing system for the detection and retention in treatment of selected child illnesses including SAM. Partial: The MOH manages some but not all aspects of a referral and tracing system for the detection and retention in treatment of SAM, and may receive partner support. No: The MOH does not, but partners may organise a referral and tracing system for the detection and retention in treatment of SAM.
Referral and tracing between services	Referral and tracing system for the detection and retention in treatment of selected child illnesses, including SAM		Full: Comprehensive care for the ill child is provided, tracked over time and place, and responds to the individual preferences, needs and values. Partial: Care for the child with SAM is provided in isolation, and may receive partner support for tracking over time and place. No: Care for the child with SAM is provided in isolation, and is not tracked over time and place.
Patient-centred continuity of care	Comprehensive child healthcare tracked over time and place responding to individual preferences, needs and values		Full: The MOH manages a continuous quality improvement system of comprehensive child healthcare by assessing and addressing barriers. Partial: The MOH manages some but not all aspects of quality improvement of child healthcare including SAM by assessing and addressing barriers, and may receive partner support. No: The MOH does not, but partners may manage a SAM-specific quality improvement system.
Continuous quality improvement	Continuous improvement of comprehensive child healthcare		
Crosscutting integration			Source: Verify in the above
Functional integration	Key support functions and activities to coordinate and support accountability and decision making of child healthcare between stakeholders		Have key support functions and activities (i.e. financial, management and information systems) that are structured around child healthcare service delivery, to coordinate and support accountability and decision making between organisations and professionals to add value to the system been (and therefore covered in the above assessment)?

Normative integration	Common frame of reference for child healthcare between stakeholders	Has the development or maintenance of a common frame of reference (i.e. shared mission, vision, values and culture) between organisations, professional groups and individuals regarding child healthcare been considered (and therefore covered in above assessment)?
Horizontal integration	System functions at the same level linked	How are system functions at the same level linked?
Vertical integration	System functions at the various levels linked	How are system functions at the various levels linked?
Challenges	Topic	Source: Questions to discuss (interview or focus groups) with key health actors
	- Governance and policy leadership for change to improved integration enhanced - Alignment of rules and policies to improved health outcome enhanced	What challenges need attention and what changes or adaptations are needed?

3.2 Systemic integration at the district level (meso level)

SAM activities to integrate in routine management and operational activities	Source: Questions to discuss (interview or focus groups) with key health actors at district level Level: Range of no, partial or full integration occurs along a continuum: no interactions or segregation when no integration exists; linkage or coordination when partial integration exists; and full integration when health system functions and structures have assimilated or merged Action plans include SAM National SAM guidelines, and regular updates developed/disseminated and job aids adapted, and application supervised Collaboration with many technical and financial partners with high-level involvement of SAM Community engagement for active SAM case detection and involvement Seasonal variation often coinciding with other vulnerabilities and shocks (e.g. malaria, drought)	
Translating policies into strategic action plans	Promoting and regulating (controlling) adherence to guidelines	
Coordinating technical and financial partners	Promoting stakeholder involvement in planning and monitoring	
	Planning for contingencies (e.g. buffer stocks in case of surge or stock delays)	
Financing	Allocating and managing the health budget	Health budget rarely covers SAM, as coverage by external funding streams is common. No control of funds may jeopardize plans, budgets and flexibility to address needs
	Mobilising additional resources	Funding from local partners to include in budget
	Paying local staff and contractors	Financial and in-kind contribution from local partners
Information	Managing the HMIS (and other vertical monitoring and reporting systems)	Elaborated M&R system for SAM
	Sharing information for use and providing feedback to stakeholders incl local government and communities	Reliance on partner support for sharing information
	Managing/overseeing population surveys (e.g. DHS, nutrition surveys and coverage assessments)	Many SAM-related surveys organised by partners requesting collaboration
Workforce	Engaging additional health workers/Promoting equitable distribution of health workers	SAM increases workload considerably and affects quality of care and motivation
	Training health workers in clinical care and health facility management and use of tools	Expansion of knowledge and skills are needed for a relative complex intervention (many facets) thus increasing training needs that require specific skills in clinical care but also of management at health facility and district levels
	Conducting supportive supervision	Increased supportive supervision for a relative complex intervention for strengthening skills, problem solving and motivation thus quality
	Providing training materials and/or job aids	Because of complexity, SAM-specific training materials and job aids

Providing job description and appraisal system	Because of complexity, clear indication of roles and responsibilities for SAM activities needed
Supplies	
Providing logistical support for equipment and supplies: calculate need, order, store, transport, distribute, control quality, regulate misuse, manage buffer stocks	RUTF is a costly and bulky and heavy product, needed in big quantities that demands special handling Precise calculation of estimated supply needs and use Managing buffer stocks and preventing supply stockouts
Transportation means for supply distribution, supervision and patient movement	SAM add a serious burden on transportation needs
Service delivery	
Providing operational support to facility-based services	Adaptation of site and re-organisation of work for easy provision and reception of care may be needed
Organising health outreach	Improved access and use of decentralised care for SAM is crucial for improved health outcome
Organising community-based primary care activities	SAM-specific community-based activities to improve demand and use of services and active case finding
Organising referral systems	Movement of children with SAM between services and levels of care is common
Crosscutting integration	
Functional integration	Key support functions and activities to coordinate and support accountability and decision making of child healthcare
Normative integration	Common frame of reference for child healthcare
Horizontal integration	System functions at the same level linked
Vertical integration	System functions at the various levels linked
Challenges	
	• Management and operational leadership for change to improve integration enhanced • Management and operational leadership for change to improve health outcome enhanced

3.3 Extent of organisational integration (meso level)

Topic		Questions Source: national and district level discussions
	Coordination of child healthcare interventions between different organisations	How do organisations coordinate child healthcare interventions? (Give examples of inter-organisational relationships (e.g. contracting, strategic alliances, knowledge networks, mergers), including common governance mechanisms, to deliver)
Crosscutting integration		
Functional integration	Key support functions and activities to coordinate and support accountability and decision making of child healthcare	How do organisations coordinate and support accountability and decision making of child healthcare?
Normative integration	Common frame of reference for child healthcare	How organisations have a common frame of reference for child healthcare?
Horizontal integration	Organisations working on the same discipline of child care linked	How are organisations working on the same discipline of child healthcare linked?
Vertical integration	Organisations working across disciplines of child care linked	How are organisations working across disciplines of child healthcare linked?
Challenges		
	Difficulties in organisation collaboration identified and overcome	What are the perceptions of stakeholders on organisational integration for child healthcare?

3.4 Extent of professional integration (meso level)

Topic		Questions Source: national and district level discussions
Crosscutting integration		
Functional integration	Key support functions and activities to coordinate and support accountability and decision making of child healthcare	How do professionals coordinate and support accountability and decision making of child healthcare?
Normative integration	Common frame of reference for child healthcare	How do professionals have a common frame of reference for child healthcare?

Horizontal integration	Professionals of the same speciality of child care linked	How are professionals of the same speciality of child healthcare linked?
Vertical integration	Professionals working across specialities of child care linked	How are professionals working across specialities of child healthcare linked?
Challenges		
	Difficulties in professional collaboration identified and overcome	What are the perceptions of stakeholders on professional integration for child healthcare?
3.5 Extent of clinical integration		
Topic		Visit health facility for discussion with health workers and observation of services
Clinical integrated care across platforms		
	Comprehensive integrated child care defined	How has integrated child healthcare been defined?
	Comprehensive integrated child care understood and meaningful	What does integrated care mean for health workers? Is it useful?
	New knowledge and skills adopted and assimilated	Perception of health workers whether their knowledge and treatment and organisational skills are sufficient to adopted and assimilated SAM and provide integrated care?
	Timely and early detection	Perception of health workers on how to achieve timely and early detection of SAM as part of child healthcare?
	Management of multiple care activities	Perception of health workers on how to manage the multiple care activities for SAM, what is different or same with other child healthcare?
	Collaboration between health workers managed	Perception of health workers on how to manage the multiple care activities for SAM as part of child healthcare, what is different for SAM, and how do they overcome
Clinical integrated care platform specific		
	Comprehensive integrated child care implemented	Observe how is comprehensive integrated and person-centred child healthcare in a single process across time, place and discipline coordinated and implemented across delivery platforms?
	Community-based primary health	Observation of services
	Facility-based primary health	Observation of services
	Child hospital care	Observation of services
Crosscutting integration issues		
Functional integration	Key support functions and activities to coordinate and support accountability and decision making of child healthcare between stakeholders	Are registration, medical records, monitoring, supervision comprehensive for all child healthcare services?
Normative integration	Common frame of reference for child healthcare between stakeholders	Has the development or maintenance of a common frame of reference (i.e. shared mission, vision, values and culture) between organisations, professional groups and individuals regarding child healthcare been considered (and therefore covered in above assessment)?
Horizontal integration	Clinical services and professionals within the same delivery platform linked	How are clinical services and professionals within the same delivery platform collaborating to provide comprehensive child healthcare?
Vertical integration	Clinical services and professionals between different delivery platforms linked	How are clinical services and professionals between different delivery platform collaborating to provide comprehensive child healthcare? Is there a functional referral system and exchange of information and problem solving?
Challenges		
	Difficulties identified and overcome	What challenges have been identified and what changes or adaptations are needed to improve

integrated care?

4. Factors influencing integration		
Objective	Key questions	Assessment
Identify how the integration process worked (or not)	What critical elements facilitate or hinder the integration process of SAM into the national health system?	- Factors influence the gradual adoption and assimilation of SAM per the five components: SAM problem, SAM interventions, adopters, health system, and broader context - Adoption is cumulative and nonlinear or not always a predictable translation / transformation process: what can we learn from the interaction of these factors?
Components	Indicator [107, 120, 124]	Positive (boosting) or negative (hindering) influence
SAM problem		
Perceived necessity of a robust response	Knowledge on causes and consequences of SAM, and treatment pathways realisation	+: good communication for awareness raising -: weak or absent communication for awareness raising
	Severity and trend	+: high -: low
	Urgency	+: high urgency -: low
	Scale of economic burden	+: high economic burden -: low
	Communication channels and communication behaviour	+: good communication and communication behaviour, with high political and population visibility -: weak
SAM intervention		
Perceived attributes of innovation for rapid realisation	Relative advantage	+: positive perceived advantage -: perceived adverse effects
	Compatibility with existing health interventions	+: high compatibility with existing health interventions -: low
	Trialability	+: (pilot) sites with SAM services show good results with satisfied providers and users -: no sites with SAM services exist
	Observability	+: (pilot) sites with SAM services can be visited (real-time observation) -: no sites with SAM services exist
	Complexity [107]	-: intervention protocol is complex Multiple episodes of care Multiple elements and facets of service activities Multiple levels of care (platforms) Time delay in cause-effect and in treatment outcome Multiple care providers and health actors High user involvement High level of behaviour change rather than technology
Health actors as adopters of SAM		
Receptivity to adopt and assimilate the SAM intervention	Extent of promotion efforts for adoption and assimilation by the knowledge purveyors (those who disseminate the new knowledge)	+: strong communication; good credibility; evidence-based; efforts to help the assimilation -: absent or weak communication
	Extent of promotion efforts by the change agents (those who foster the adoption and assimilation and scale-up)	+: strong communication; good credibility; evidence-based; involvement of national champions -: absent or weak communication
	Conformity of the intervention with norms, beliefs and values of MOH	+: alignment -: no alignment

	of partner agencies of service providers of service users		
Coherence of the intervention			+: perceived benefits -: perceived risks
	for MOH for partner agencies for service providers for service users		
Participation in the intervention			+: curiosity, openness, motivation, skills, learning style, social networks, seeking additional information -: not known or understood, insecurity, lack of confidence
	for MOH for partner agencies for service providers for service users		
Motivation to continue involvement and use			+: continuing involvement and use of the innovation -: not involved or in use, or involved but lacking capacity, support or other
Conformity with expectations			+: satisfactory results, promotion to others -: non satisfactory results
Authority decision for the adoption			+: present, high -: absent, low
Health system characteristics			
Regulatory, organisational, financial, relational, functional and clinical changes at various levels to adopt and assimilate the SAM intervention	National governance and policy leadership for integrated care		+: favourable system (political will; strategy for planned and regulated integration; competences; capacities) -: weak; un-programmed; uncertain
	District management and leadership for integrated care	operational	+: favourable system (ownership; competences; flexible and adaptable to changes) -: weak system and competences
	Collaborative partnerships		+: favourable system (inclusive, participatory, supportive, interested, contributing) -: weak system and interest
	Social participation		+: favourable system (participatory; ownership) -: weak
	Health financing		+: favourable system (well managed and regular budget; pooled funding; long-term development funding; child fee waiver or health insurance) -: weak (donor dependence; centralised fiscal dependency; emergency funding; out-of-pocket payment)
	Human resources management		+: favourable system (skilled and motivated staff in adequate numbers; support system; career development opportunities) -: weak (high workload; high turnover and attrition; weak skills; weak supervision)
	Health information management		+: favourable system (quality; timely available; sharing) -: weak, complex and/or complicated monitoring and reporting system
	Medical products management		+: favourable system (capacity) -: weak
	Service delivery		+: favourable system (comprehensive decentralised quality care) -: weak
Broad context			
Broad context in which the adoption and assimilation	Political, legal, socio-economic environmental, demographic stability		+: favourable -: unfavourable
	Donor mandated financing		+: long-term and flexibility of funding -: 'ring fence' funding, short-term results

process of SAM intervention occurs	Interactions with national initiatives	oriented +: opportunities of demonstrable synergies and benefits -: competing priorities, disease/initiative-specific champions
	Advocacy mechanisms	+: present -: absent

5. Intervention scenarios

Objective	Key question	Assessment
Test solutions for identified problems	What intervention scenarios are plausible and may provide lessons?	Identifying interactions of factors influencing integration of SAM into national health systems: Causal loop analysis (CLA), plausible intervention scenarios for informing strategic changes
(To test by CLD or simulation modelling)		

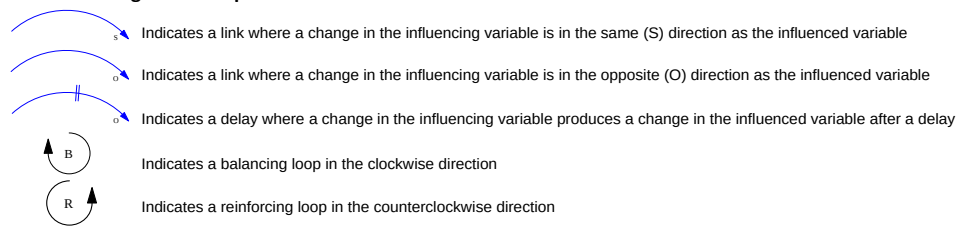
Abbreviations

BNA: Bottleneck analysis
 CLA: Causal loop analysis
 GAM: Global Acute Malnutrition
 HIS: Health Information System

IMCI: Integrated Management of Childhood Illness
 MOH: Ministry of Health
 SAM: Severe Acute Malnutrition

Annex 8. Causal loop diagram for severe acute malnutrition integration: generic diagram and validation tool

Code for reading causal loops:



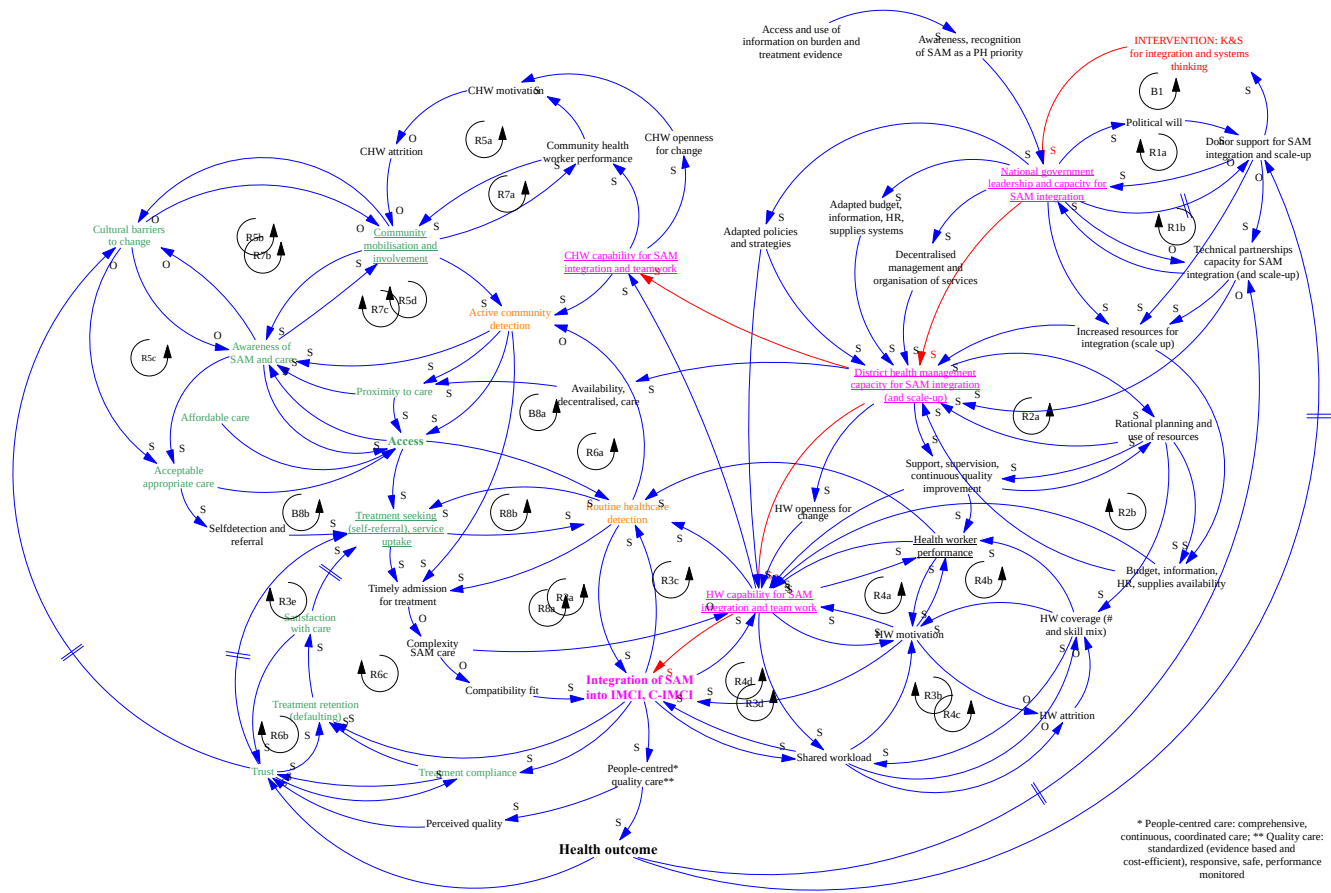


Figure A8.1: Comprehensive generic causal loop diagram to study system dynamics of integration of SAM

Table A8.1. Validation tool of the causal loop diagram

Causal loop (CL)	Description of dynamics	Questions/Response
CL1 Systems integration B1: Integration intervention loop (This loop can be drawn at the various levels of the health system) R1a: Political will loop R1b: Integration capacity loop	An action that increases knowledge and skills for integrating a health intervention (with systems thinking) results in an improve in national leadership and capacities for SAM integration (and scale-up) thereby encouraging - the adaptation of 1. policies and strategies for equitable comprehensive care (IMCI and C-IMCI) to include SAM 2. budget allocation, information, human resources and supply systems to include SAM - decentralising management and organisation of SAM service delivery Directly and indirectly these factors result in an improve in district leadership and capacities for SAM integration (and scale-up). On the other hand the increase in government leadership and capacity for SAM integration increases political will that results in an increase in donor support for SAM that results in an increase in partnerships for SAM (partner attraction). These factors together contribute to an increase in resources for SAM integration that also implies SAM scale-up (to target areas or entire country as outlined in the strategy). Driving factors of access and use of information on SAM burden and evidence of the intervention and public health impact result in creating awareness of and need for SAM integration. Political will stimulates an increase in financial and	a. Do variables provided in this diagram exist? b. Do relationships between these variables exist? c. Are there any significant causal factors missing? If so, list them. d. Are the directions of the links right (variable 1 impacts on variable 2) or do they need to be reversed (implying that the effect is the cause)? Are there missed delays? e. What other effects could be observed as a result of these causes?

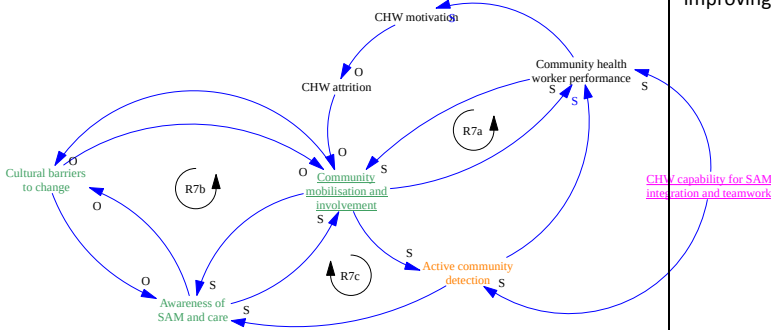
	technical support for SAM integration and scale up (pull and push) (R1a and R1b). With a time delay the increase in governance capacity for integration (as well as the improved health outcome, see link in overall diagram) will eventually decrease the financial and technical support for SAM integration and liberate funds for other needs.	
CL2 Organisational and managerial integration R2a and R2b: Resources boost loops	An improve in national leadership and capacities for SAM integration (and scale-up) (CL1) result in an increase in resources and an improve in district capacity. Both factors improve - health worker (HW) capacity, and - community health worker (CHW) capacity to integrate SAM and promoting teamwork. The improve in district capacity because of national and financial and partner support (see CL1) results also in an increase in - availability of care that is provided in decentralised primary and secondary care - supportive supervision and problem solving that creates an improve in more rational planning and use of resources that further boost the availability of resources. The improve in district capacity reinforces rational use of resources, that further strengthens district capacity (R2a and R2b) and resource availability.	a. Do variables provided in this diagram exist? b. Do relationships between these variables exist? c. Are there any significant causal factors missing? If so, list them. d. Are the directions of the links right (variable 1 impacts on variable 2) or do they need to be reversed (implying that the effect is the cause)? Are there missed delays? e. What other effects could be observed as a result of these causes?
CL3 Clinical health facility integration	Organisational and managerial integration (CL2) and health worker capacity (CL4) result in an increase in resources that facilitate the (C-)IMCI approach, hence comprehensive care that includes SAM.	a. Do variables provided in this diagram exist? b. Do relationships between these variables exist?

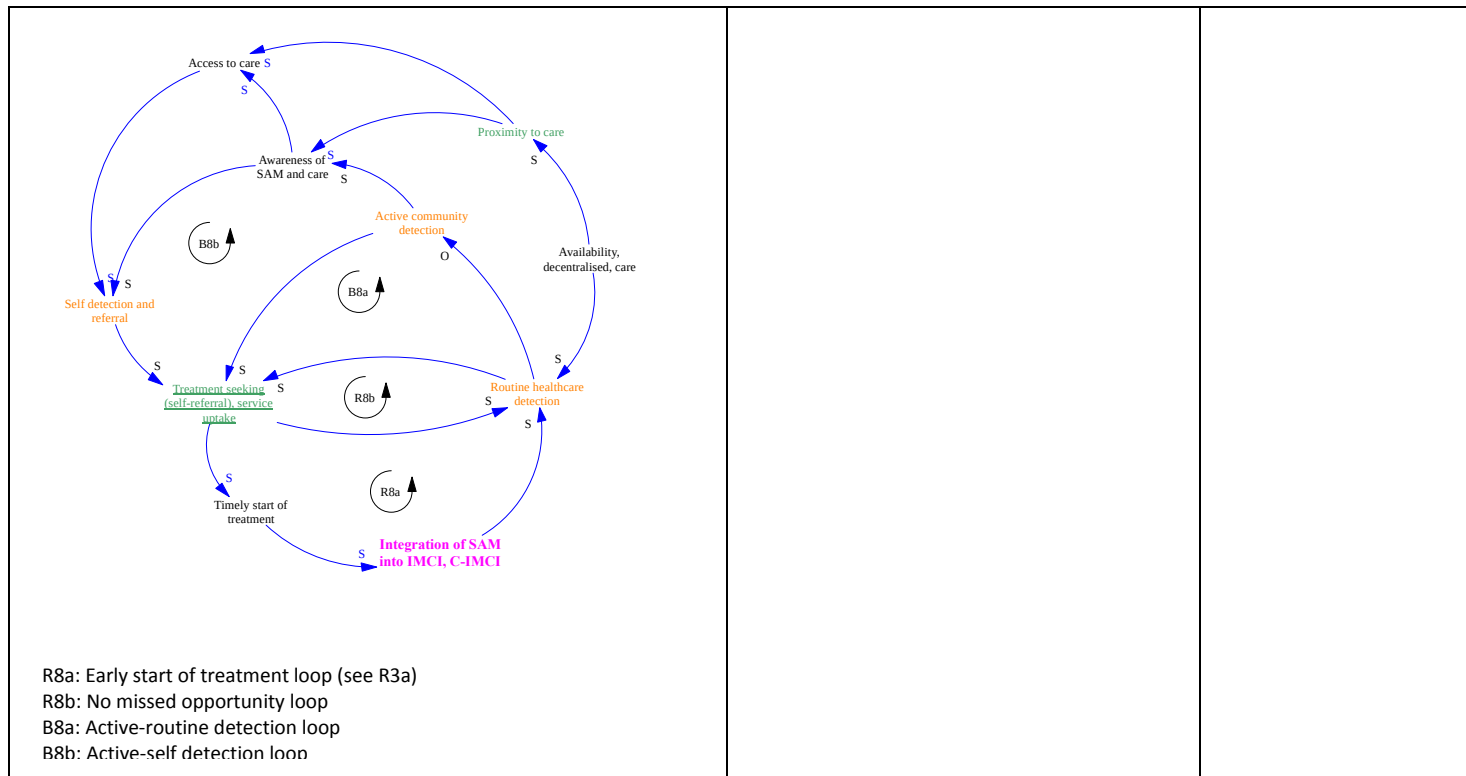
R3a: Early start of treatment loop R3b: Skill mix loop (R4c) R3c: No missed opportunity loop R3d: Task sharing loop (R4d) R3e: Trust/Quality loop	Early treatment seeking, due to improved access, results in an increase in opportunities to integrate care (R3a), which on its turn, contributes to improving quality care that results in improved trust in the health services and further reinforces health service seeking behaviour (R3e). Integrated care results in an increase in task and workload sharing (R3d) that improves skill mix and contributes to increase the capacity if the health workforce (R3b). It also contributes to HW capacity to not miss opportunities of detecting cases during routine healthcare exposure (R3c).	c. Are there any significant causal factors missing? If so, list them. d. Are the directions of the links right (variable 1 impacts on variable 2) or do they need to be reversed (implying that the effect is the cause)? Are there missed delays? e. What other effects could be observed as a result of these causes?
CL4 Professional integration	District health management capacity, including leadership and organisational skills for integrated SAM creates an enabling environment for the health workforce to optimise resources. Improved capability and teamwork results in an increase in collaboration across disciplines to share tasks and decrease workload and improve skill mix and availability (R4c). It results also in an increase	a. Do variables provided in this diagram exist? b. Do relationships between these variables exist?

R4a: Motivation loop R4b: Performance loop R4c: Teamwork loop (R3b) R4d: Task sharing loop (R3d)	in motivation hence performance (R4a and R4b) as people collaborate and coordinate work, that results in an improve of teamwork that further strengthens the integration of SAM into (C-)IMCI to provide comprehensive care (R4d).	c. Are there any significant causal factors missing? If so, list them. d. Are the directions of the links right (variable 1 impacts on variable 2) or do they need to be reversed (implying that the effect is the cause)? Are there missed delays? e. What other effects could be observed as a result of these causes?
CL5 Community access	Community health worker capacity results in an improved performance thus community involvement that has a feedback loop on CHW performance and further strengthens it (R5a). Involvement of communities in SAM care through the work of the CHW results in an increase in awareness and behaviour change for health	a. Do variables provided in this diagram exist? b. Do relationships between these variables exist?

R5a: Health worker community loop R5b: Community awareness loop (R7b) R5c: Appropriate care loop R5d: Active community detection loop (R7c)	seeking that could have been hampered by cultural barriers (R5b), and may make healthcare more acceptable or perceived as appropriate (R5c). Active community screening increases awareness that results in improved community involvement (R5d), and may reach deprived or remote population groups or individuals if targeted well.	c. Are there any significant causal factors missing? If so, list them. d. Are the directions of the links right (variable 1 impacts on variable 2) or do they need to be reversed (implying that the effect is the cause)? Are there missed delays? e. What other effects could be observed as a result of these causes?
CL6 Community use	Capabilities of (community) health workers ((C)HW) to collaborate with colleagues to provide integrated care results in an increase in availability of care, which stimulates awareness, thus resulting in an increase in access and early service uptake that further strengthens integration (R6a). Integrated care improves quality of care and health outcome that result in an increase in trust (R6b) thus further strengthening service use and	a. Do variables provided in this diagram exist? b. Do relationships between these variables exist? c. Are there any significant causal factors missing? If so, list them. d. Are the directions of the links right (variable 1 impacts on variable 2) or do they

R6a: Early health seeking/use loop R6b: Trust/satisfaction loop R6c: Compliance and retention loop	compliance to and retention in treatment, preventing dropouts (R6c) (and behaviour change, CL7).	need to be reversed (implying that the effect is the cause)? Are there missed delays? e. What other effects could be observed as a result of these causes?
CL7 Community health workers' (CHW) performance	CHW's capability for integrated care and teamwork results in an increase in performance that improves motivation, preventing attrition and increasing involvement with the community (R7a). Engaged communities can also boost CHW performance that then impacts on behaviour change and community awareness, further stimulating community engagement (R7b). From another angle, active community detection, can be targeted to vulnerable population groups	a. Do variables provided in this diagram exist? b. Do relationships between these variables exist? c. Are there any significant causal factors missing? If so, list them. d. Are the directions of the links right (variable 1 impacts on variable 2) or do they need to be reversed

 R7a: Community mobilisation loop R7b: Community awareness loop (R5b) R7c: Active community detection loop (R5)	thus resulting in an increase in awareness further improving community engagement (R7c).	(implying that the effect is the cause)? Are there missed delays? e. What other effects could be observed as a result of these causes?
CL8 Detection and start of treatment	Early admission is key to quality and integration of care. If routine detection (by eg, availability of services and HW performance) and self-detection (by proximity of care and community awareness) are well established, active community detection is redundant (B8a and B8b). Interventions to promote both routine and self-detection may be more sustainable, however equity may be a caveat. Routine detection creates opportunities to detect cases (R8a) that may be asymptomatic/in early stage of illness (R8b) thus not needing complicated care, which is easier to integrate.	a. Do variables provided in this diagram exist? b. Do relationships between these variables exist? c. Are there any significant causal factors missing? If so, list them. d. Are the directions of the links right (variable 1 impacts on variable 2) or do they need to be reversed (implying that the effect is the cause)? Are there missed delays? e. What other effects could be observed as a result of these causes?



Annex 9. Repository of raw data and data tools

Organisation of folders

1. Niger; 2. Nepal; 3. Burkina Faso

- Primary data
 - Data collection tools
 - Raw data
 - Spreadsheet and summary tables
 - Photo
 - Voice recording
 - Causal loop diagrams and Vensim files
- Secondary data
 - Policy documents
 - Programme and survey reports
 - Databases
 - Spreadsheet and summary tables

4. Health system strengthening (HSS); 5. Integration; 6. SAM

- Policy documents
- Programme and survey reports
 - Evidence documents
 - Spreadsheet and summary tables

7. SAM integration progress

- Primary data
 - Data collection tools
 - Raw data

8. ABM

- Micro model; Meso model
 - Netlogo model
- Evidence documents
 - Results tables and figures
 - Sensitivity analysis

Access: Upon request

Annex 10. Study proposal outline

Improving effectiveness in severe acute malnutrition case management in Burkina Faso: system dynamics studies

Introduction

In 2015, Burkina Faso had about 3 million children under 5, of which one in ten had acute malnutrition and one in three was stunted [464]. The management of severe acute malnutrition (SAM) in Burkina Faso—as in many other countries in the Sahel—is facing a deadlock, with a high burden of cases, high cost of treatment and low coverage (a maximum of 30% coverage in areas with community interventions by financial and technical partners). SAM services integrated into a weak health system, characterized by insufficient health budgets and health workforce constraints, draw limited interest from national governments and development donors to invest. Because health system weaknesses are a recognized problem in almost all countries with a high burden of SAM, health actors are seeking to unlock opportunities to improve coverage without compromising the effectiveness of care. Strategic opportunities include simplifying diagnostic and treatment protocols, reducing the costs of therapeutic food formulations, integrating services and strengthening health systems with a systems approach to maximize the outcomes of sustainable and equitable quality interventions of SAM at scale within an overall child healthcare perspective.

The 2015 nutrition survey showed persistently high levels of acute malnutrition. Overall malnutrition rates were 10.4% [95% Confidence Interval (CI) 9.8–11.0%] identified by either weight-for-height standard deviation less than ($<$) -2 z-score (WHZ) of the median of the WHO 2006 standard child population or 4.5% [95% CI 4.0–4.9%] identified by mid-upper arm circumference (MUAC) $<$ 125mm. Severe malnutrition rates were 2.2% [95% CI 1.9–2.4%] identified by WHZ $<$ -3 or 0.7% [95% CI 0.5–0.9%] identified by MUAC $<$ 115mm. The survey revealed major discrepancies between the child SAM prevalence detected by WHZ and MUAC. Investigation of child populations of several countries identified by the two anthropometric indicators has shown that roughly 30% of the SAM child populations in Burkina Faso overlapped and that overlap varied considerably within and between countries [448].

Problem statement

Evidence confirmed that children with SAM detected with low MUAC are at higher risk of death than those detected with low WHZ [465]. If healthcare aims to prevent death, then treatment should be offered to those that benefit most from treatment, thus children with low MUAC should be prioritized for treatment. If we consider the latest survey indicator results, MUAC identified three times fewer children with SAM (0.7%) than WHZ (2.2%) and two times fewer children with MAM (3.7%) than WHZ (8.2%). If the two SAM populations overlap by 30% and only those with low MUAC at highest risk of death are selected for treatment, then the caseload of SAM for treatment will be reduced by

3¹¹ (Figure A10.1). Hence, a policy change that prioritizes children at highest risk of death for SAM treatment—based on MUAC and oedema—would reduce not only case-fatality considerably but also the caseload for treatment. Children with MUAC >115mm and <125mm and WHZ <-2 have also a higher risk of death but less so, and could be targeted with less expensive and more sustainable curative and preventive interventions. Thus, the policy change would decrease mortality from severe acute malnutrition by targeting children that benefit most from it and simultaneously create fiscal and resource space that could be used for preventing acute malnutrition. Moreover, this policy simplifies the diagnostic protocol that will reduce workload (thus potentially improves quality and responsiveness of care) and improve the reliability of individual and service monitoring data, and reduces the cost of effective care. We also may assume to reduce unintended negative effects on other health services by the creation of extra resources space (e.g., time, supplies, workload). A combination of these factors promotes integration and sustainability for improved overall health outcomes.

The aim of this study is to investigate the effectiveness of a policy change that improves targeting for SAM treatment (identifying children with SAM <115mm and oedema for treatment; thus treating less false positive SAM cases). We assume that the policy change creates financial and organisational space that when re-invested in preventive care (e.g., infant and young child nutrition (IYCN) interventions) would improve overall health outcome by reducing SAM incidence and SAM case-fatality in the population in comparison to the current policy.

Adjusting the MUAC cut off for SAM to <120mm that identifies more children as true positives would be another possibility to test effectiveness that includes more children at an increased risk of death for treatment and free (less) funds for IYCN. The new models could be compared with the current model that shows low contact coverage of SAM and very low for MAM case management crowding out resources for preventive IYCN.

Methodological approach

Various methods will be applied that are interlinked:

1. Conduct system dynamics modelling to test whether treating false positive SAM cases has an opportunity cost that crowds out prevention;
2. Implement the policy change intervention (small scale, 6 months) to test whether we can replicate similar positive results as identified through simulation modelling, and thus validate the model; and
3. Conduct a realist evaluation to study effectiveness (and missed opportunities) of both policies and improve our understanding on why either policy works for whom in what circumstances.

The study will be developed in two phases.

¹¹ If 0.7% children 6-59 months of age have MUAC <115mm, and 2.2% have WHZ <-3, and if overlap is 30%, then about 1.5% of children have WHZ <-3 and MUAC >115mm [$2.2 - (2.2 \times 0.3) = 1.54$]. Thus, the group of children with MUAC <115mm only (0.7%) is three times smaller than the group with either MUAC <115mm or WHZ <-3 ($0.7 + 1.54 = 2.24\%$).

Phase 1. Simulate a policy change

The first phase will develop a model (causal loop diagram) to simulate a policy change and test the system dynamics by agent-based modelling (and/or by stock and flow analysis). The simulation will compare the outcome of treatment of SAM in children 6–59 months old who are identified by MUAC <115mm and/or WHZ <-3 and oedema (as per the national guidelines) versus the outcome of treatment of children identified by 1) MUAC <115mm PLUS re-investment of funds in IYCN, and 2) MUAC <120mm PLUS lower re-investment of funds in IYCN. The study outcomes will be SAM incidence and SAM case-fatality in the population (Figure A9.2). Development and testing of the models are done in participation with experts. Rules and parameters are based on evidence and assumptions on expert elicitation.

Phase 2. Implement and evaluate

The second phase consists of two parts. First, if the outcome of Phase 1 is favourable, the policy change will be introduced in one district for 6 months and evaluated for its effectiveness by comparing outcomes in two control districts of the same region: one district receiving NGO support, one district not receiving NGO support. by a quality comparative analysis using the realist approach (a). Second, regardless the outcome of Phase 1, a realist evaluation will be conducted in one intervention district and two control districts of the same region: one district receiving NGO support, one district not receiving NGO support (in case (a) is in place). As such, three (or two) implementation strategies will be evaluated with a systems approach through accumulating causal mechanisms for theory building and testing of what works how for whom in what circumstances and why. Results will shed light on the complex causality and abstract elements that are transferable and help policy makers to find acceptable solutions to complex problems.

Study data collection, analysis and reporting

For phase 1, secondary data from the 2015 SMART survey and SAM service performance data (MOH database) will be used, also for random selection of children realistic individual data in the simulation model. Secondary data results from peer-reviewed studies on the subject will be consulted and expert elicitation sought in case of absent data to develop the model. For phase 2, primary data will be collected with various methods, including surveys. Appropriate data collection tools will be developed and data analysis methods will be applied. Logistical tools such as NetLogo® for agent-based modelling, Vensim PLE® for stock and flow diagrams, ENA for SMART surveys, SPSS for quantitative analysis and NVivo® for qualitative analysis will be used.

Study summary

Population	Children under 5 living in Burkina Faso
Intervention	1) SAM treatment for children 6-59 months detected with SAM by MUAC <115mm and oedema, plus improved IYCN for all children under 5 with same total budget as the control intervention 2) SAM treatment for children 6-59 months detected with SAM by MUAC <120mm and oedema, plus improved IYCN for all children under 5 with same total budget as the control intervention (Improved IYCN uses various social and behaviour change methods and includes improved early detection and referral)
Control	1) SAM treatment for cases detected by MUAC <115mm and WHZ <-3 z-score, district supported by NGO 2) SAM treatment for cases detected by MUAC <115mm and WHZ <-3 z-score, district supported by NGO
Primary outcomes	Incidence of SAM in phase 1- Prevalence of SAM in phase 2 SAM case-fatality in the population

Secondary outcomes	SAM case-fatality in treatment Causal mechanisms (assessing context-mechanism-outcome to assess which element was most important or which intervening factor was most critical for improved outcomes) in control and intervention districts
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Activities with tentative time line

Activities	M1	M2	M3	M4	M5	M6	M8	M9	M10	M11	M12
Phase 1											
Build model	X	X	X								
Test model	X	X	X								
Analyse & report		X	X								
Share results			X								
Publish....				X	X	X					
Phase 2											
Assess baseline			X	X	X						
Plan & prepare interventions			X	X							
Develop monitoring plan			X	X							
Implement interventions (supporting the district health office & NGO)				X	X	X	X	X	X		
Monitoring				X	X	X	X	X	X		
Evaluate (baseline survey, service performance, realist evaluation & end survey)				X	X	X	X	X	X		
Analyse data & report				X	X	X	X	X	X	X	X
Share results					X						X
Publish....											

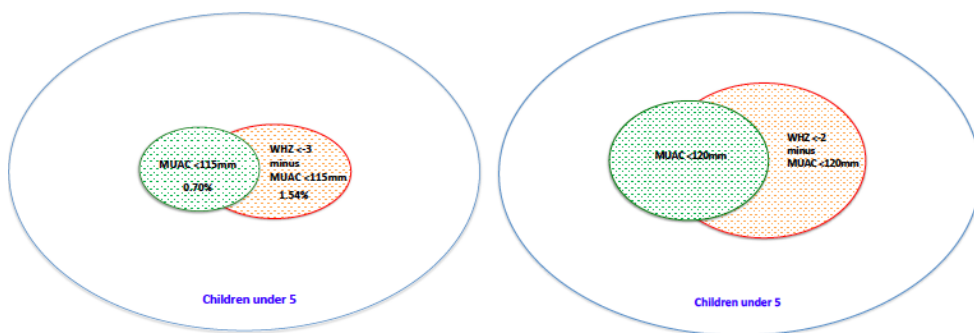
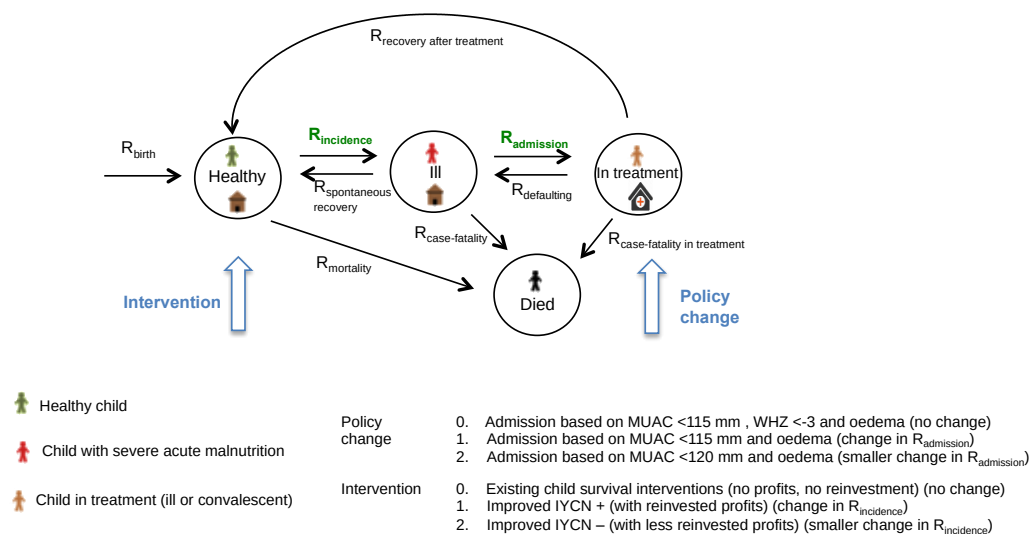


Figure A10.1. Under-5 child populations in Burkina Faso with severe acute malnutrition identified by various cut-offs of mid-upper arm circumference (MUAC) and weight-for height z-score (WHZ)



IYCN: infant and young child nutrition; MUAC: mid-upper arm circumference; R: probability rate to transition; WHZ: weight-for-height z-score

Figure A10.2. Proposed simulation model showing children in the various states with transition rates

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