Université Catholique de Louvain
FACULTE DES SCIENCES ECONOMIQUES, SOCIALES, POLITIQUES ET DE LA COMMUNICATION
Center for Demographic Research (DEMO)
And
Université Joseph Ki-Zerbo
ECOLE DOCTORALE LETTRES SCIENCES HUMAINES ET COMMUNICATION
Laboratoire de Recherche Interdisciplinaire en Sciences Sociales (LARISS)

THE PROMISES AND PITFALLS OF MOBILE PHONE SURVEYS FOR MORTALITY MEASUREMENT IN LOW- AND MIDDLE-INCOME COUNTRIES: A CASE STUDY IN BURKINA FASO

Thesis submitted by

DIANOU Kassoum

In partial fulfillment of the requirements for the degree of Doctor of Political and Social Sciences (Demography)

Thesis committee members

Title	*Name.s*	*Surname*	*Role*
Prof.	Bruno	Masquelier	Co-supervisor; University of Louvain (UCLouvain), Louvain-La-Neuve, Belgium
Prof.	Abdramane Bassiahi	Soura	Co-supervisor; Joseph Ki-Zerbo University, Ouagadougou, Burkina Faso
Prof.	Georges	Reniers	Member; London School of Hygiene and Tropical Medicine, London, United Kingdom
Prof.	Philippe	Bocquier	Jury chair ; UCLouvain, Louvain-La-Neuve, Belgium
Dre	Carren	Ginsburg	Member; MRC/Wits-Agincourt Unit, University of the Witwatersrand, Witwatersrand, South Africa
Dr.	Aristide Romaric	Bado	Institut de Recherche en Sciences de la Santé (IRSS), Centre National de la Recherche Scientifique et Technologique (CNRST), Ouagadougou, Burkina Faso

September 2026

Acknowledgements

Je souhaiterais adresser mes sincères et profonds remerciements à toutes les personnes qui, de près ou de loin, ont contribué à l'aboutissement de cette recherche doctorale et m'ont accompagné tout au long de cette aventure.

Tout d'abord, je tiens à exprimer ma profonde gratitude à mon promoteur, **Bruno Masquelier**, pour sa disponibilité, son dynamisme et la confiance qu'il m'a accordée tout au long de ces quatre années de collaboration. Au-delà de son accompagnement scientifique, j'ai particulièrement apprécié sa compréhension, son écoute et son humanisme. J'ai énormément appris à ses côtés, tant sur le plan scientifique que sur le plan humain, et je lui en suis profondément reconnaissant.

Mes sincères remerciements vont également à **Abdramane B. Soura**, pour son accompagnement et ses précieux conseils depuis les débuts de ma jeune carrière scientifique. Merci pour la confiance que vous m'avez accordée et pour avoir cru en mes capacités.

Je souhaite adresser une reconnaissance toute particulière à **Bruno Y. Lankoandé**, qui a joué un rôle majeur dans la réalisation de cette thèse. Il aurait dû être présent parmi les membres du comité de thèse, mais les exigences de qualification de l'Université Joseph Ki-Zerbo ne l'ont malheureusement pas permis. Cela n'a cependant jamais diminué son implication. Merci d'avoir initié cette aventure, de m'avoir encouragé à la poursuivre et de m'avoir accompagné avec constance tout au long de ce parcours doctoral. Votre contribution à cette thèse est considérable et je vous en suis profondément reconnaissant.

J'adresse également mes sincères remerciements à **Philippe Bocquier**, président du jury, pour la lecture attentive de mes travaux et pour la rigueur scientifique avec laquelle il les a examinés tout au long de la thèse. Ses observations et ses exigences ont contribué à améliorer substantiellement ce travail.

Je témoigne également ma profonde gratitude aux autres membres du jury pour le temps consacré à l'évaluation de cette thèse et pour leurs commentaires qui ont permis d'enrichir la réflexion. Mes remerciements vont également à **Carren Ginsburg**, relectrice externe de cette thèse, à **Georges Reniers**, membre de mon comité de thèse, ainsi qu'à **Aristide Romaric Y. Bado**, membre du jury, pour leurs remarques, suggestions et commentaires formulés lors de la défense privée. Je remercie également **Stéphane Helleringer** pour la relecture attentive de mes travaux et pour ses observations qui ont contribué à leur amélioration.

Je remercie particulièrement **Idrissa Ouili, Yacouba Compaoré et Dasmané Dielbeogo**, qui ont contribué à mes premiers pas dans le monde de la recherche au sein de l'équipe de l'Observatoire de Population de Ouagadougou. Je suis reconnaissant pour les conseils, les

encouragements et les apprentissages qui ont accompagné cette période déterminante de mon parcours.

Je tiens à remercier l'**Administration des Relations Internationales de l'UCLouvain** pour l'appui financier dont j'ai bénéficié au cours de cette recherche. Ma gratitude va également à toute l'équipe de coordination du projet **RaMMPS**, qui a contribué à la prise en charge de mes séjours de recherche et de formation en dehors de l'UCLouvain, et qui a mis à ma disposition les données indispensables à la réalisation de cette thèse. Je remercie également l'**Institut Supérieur des Sciences de la Population (ISSP)**, qui m'a accueilli avec beaucoup de convivialité et de bienveillance lors de mes nombreux séjours à Ouagadougou.

Je souhaite exprimer ma gratitude à mes collègues du **Centre de recherche en démographie (DEMO) de l'UCLouvain**, pour la convivialité, les échanges et l'esprit de solidarité qui ont marqué mes différents séjours à Louvain-la-Neuve. Je remercie tout particulièrement **Laetitia Bideau**, **Dénise Musni**, et **Ophélie Goffinet** pour les encouragements et les nombreux moments de partage qui ont rendu ce parcours plus agréable.

J'adresse également mes sincères remerciements à toute l'équipe du **secrétariat de DEMO**, et en particulier à **Isabelle Theys**, pour sa disponibilité, sa bienveillance et son aide au quotidien.

Je remercie également toute l'équipe du **Centre Placet** pour son accueil chaleureux, son accompagnement et la mise à ma disposition d'un logement lors de chacun de mes séjours. Une pensée particulière va à **Sandra Murillo** et **Thomas Rasson** pour leur disponibilité et leur attention.

Je n'oublie pas les camarades de l'**Association des Étudiants Ressortissants Burkinabè à l'UCLouvain**, avec qui j'ai partagé de nombreux moments de convivialité, de solidarité et de fraternité, qui ont contribué à rendre cette expérience loin du Burkina Faso particulièrement enrichissante.

À mes amis et aux membres de ma famille qui m'ont accompagné tout au long de cette aventure, j'adresse toute ma reconnaissance. Merci à **Yacouba Zanné, Dialoga Lankoandé** et à la **famille Nabollé** pour leur soutien, leurs encouragements et leur présence.

Je tiens à adresser une pensée toute particulière à mon épouse, **Fidélia**, pour son soutien, sa patience et sa compréhension tout au long de ces années. Merci d'avoir accepté les longues périodes d'absence, les moments de doute, les contraintes et les exigences de ce parcours doctoral. Ton soutien a été précieux et a largement contribué à me permettre d'aller jusqu'au bout.

À ma fille, **Amira Rabbi**, dont la naissance est intervenue à un moment particulièrement crucial de mon parcours doctoral, je veux également dire merci. Ta présence a été une source de joie et de courage qui m'a donné une force nouvelle pour poursuivre et achever cette aventure.

Enfin, je voudrais exprimer toute ma gratitude à ma famille, et plus particulièrement à mon père, **Karim K. DIANOU**, pour son soutien indéfectible, ses encouragements et sa confiance, ainsi qu'à ma mère pour ses nombreuses bénédictions et ses prières.

À toutes celles et tous ceux que je n'ai pas pu nommer ici, mais qui ont contribué, d'une manière ou d'une autre, à la réalisation de cette thèse, je dis simplement : **merci**.

Cette thèse est aussi, à sa manière, le fruit de votre soutien, de votre confiance et de votre bienveillance.

Table of contents

1 Introduction 10
1.1 Civil Registration and Vital Statistics (CRVS) systems and mortality measurement 11
1.2 From paper to digital: the transformation of demographic and statistical data collection 15
1.3 Challenges of F2F data collection in crisis settings 16
1.4 Emerging opportunities: Mobile Phone Survey (MPS) 17
1.5 Disantangling the different sources of errors 19
1.6 Potential biases and methodological limitations of MPS 21
1.7 Data quality in MPS vs F2F surveys 22
1.8 Research questions 23
1.9 Research objectives and data sources 29
1.10 Outline of the thesis 31
2 The Rapid Mortality Mobile Phone Surveys (RaMMPS) project 32
2.1 The Burkina Faso RaMMPS survey 33
2.1.1 Objectives of the Burkina Faso RaMMPS Project 36
2.1.2 Survey design and target population in Burkina Faso 37
2.1.2.1 First component: Cross-sectional surveys 38
2.1.2.2 Methodological validation study using the Ouagadougou Health and Demographic Surveillance System 42
2.1.3 Fieldwork 44
2.1.3.1 Pre-test phase 45
2.1.3.2 Main data collection 45
2.1.3.3 Validation study 46
2.1.4 Questionnaire content and modules 47
2.1.5 Ethical considerations 48
2.1.6 Difficulties experienced during data collection 49
2.1.6.1 Difficulties encountered during the main RaMMPS survey 49
2.1.6.1.1 Security-related constraints and population displacement 49
2.1.6.1.2 Sampling and coverage challenges related to phone ownership 50
2.1.6.1.3 Difficulties in obtaining informed consent and accessing female respondents 51
2.1.6.1.4 Limitations in the accuracy and completeness of reported information 52
2.1.6.1.5 Sensitivity of mortality-related questions 53
2.1.6.1.6 Household composition and women's reproductive histories 54
2.1.6.2 Other difficulties and comments from the RaMMPS interviewers 54
2.1.6.2.1 Interviewers' experience and comparison between survey modes 54
2.1.6.2.2 Comparison of EHCVM and RDD strategies 55

2.1.7 Recommendations....56
2.2 RaMMPS surveys in Malawi and DRC....58
3 Phone follow-up versus random digit dialing: comparing mobile phone survey strategies for mortality measurement....60
3.1 Introduction....60
3.2 Methods and analysis....62
3.2.1 Data collection procedures....62
3.2.2 Definition of acceptability and fieldwork efficiency indicators....63
3.2.3 Descriptive analyses....63
3.2.4 Modelling determinants of survey participation....64
3.2.5 Assessment of representativeness and selection bias....64
3.2.6 Weighting and post-stratification adjustment....64
3.3 Results....65
3.3.1 Acceptability of telephone-based surveys....65
3.3.1.1 Profiles and determinants of successful contact and survey participation....65
3.3.1.1.1 Profile of successful contact and survey participation....65
3.3.1.1.2 Determinants of successful contact and survey participation....67
3.3.1.2 Phone call outcomes according to AAPOR norm....71
3.3.1.3 Average interview duration....72
3.3.1.4 Conditions and place of interview....73
3.3.2 Selection biases and poststratification weighting....74
3.3.2.1 Unweighted sample of the general population and women of reproductive age 74
3.3.2.2 Post-stratification weighting....76
3.3.2.3 Weighted sample characteristics....77
3.3.3 Data quality....85
3.3.3.1 Age heaping....85
3.3.3.2 Sex ratio at birth....86
3.3.3.3 Mean number of children by women's age group....87
3.3.3.4 Truncated birth histories and transfer of births outside of the reference period 88
3.3.3.5 Household size by data source....89
3.3.3.6 Mean number and proportions of siblings alive or deceased by women's age group 89
3.3.3.6.1 Mean number of siblings....89
3.3.3.6.2 Proportion of surviving or deceased siblings....90
3.3.3.7 Parental survival histories....92
3.4 Discussion....92

4 Mortality measurements from the mobile phone survey conducted in Burkina Faso.....98
4.1 Introduction.....98
4.2 Methods.....100
4.2.1 Information collected for mortality estimation.....100
4.2.2 Methods for direct estimation.....100
4.2.2.1 Method for estimating under-5 mortality.....100
4.2.2.2 Method for estimating adult mortality.....101
4.2.2.2.1 SSH collected in the Burkina Faso MPS.....101
4.2.2.2.2 Imputation to obtain full SSH.....101
4.2.2.2.3 Obtaining age-specific mortality and the probability $_{35}q_{15}$.....110
4.2.2.3 Method for estimating older adult mortality.....111
4.2.3 Methods for indirect estimation.....115
4.2.3.1 Indirect estimation of under-5 mortality.....115
4.2.3.2 Indirect estimation of adult mortality from reported parental survival: the orphanhood method.....117
4.3 Results.....118
4.3.1 Levels and trends in under-5 mortality.....118
4.3.2 Levels and trends of adult mortality (35q15).....120
4.3.3 Trends and levels of old age mortality ($_{30}q_{50}$).....125
4.4 Discussion.....135
5 Results from the validation study conducted in the Ouagadougou Health and Demographic Surveillance System.....138
5.1 Introduction.....138
5.2 Data and methods.....140
5.2.1 Data.....140
5.2.1.1 Reference data set.....140
5.2.1.2 Sample method and information collected.....142
5.2.2 Data analysis.....143
5.2.2.1 Record linkage.....144
5.2.2.2 Assessment of the accuracy of reported survival histories.....145
5.2.2.3 Assessment of the impact of reporting errors on mortality estimates.....146
5.3 Results.....148
5.3.1 Flow chart of the study enrollment process.....148
5.3.2 Exploring factors linked to variations in answers between the mobile phone study and the reference HDSS data.....151
5.3.3 Selectivity of the study sample and characteristics of participants, according to HDSS data.....151
5.3.4 Results of the record linkage process.....157

5.3.5 Mother's sociodemographic characteristics associated to child omission.....158
5.3.6 Sensitivity and specificity in recording events.....160
5.3.7 Specificity and sensitivity in reporting summary birth histories between MPS and HDSS 162
5.3.8 Specificity and sensitivity in reporting parental survival histories between MPS and HDSS.....165
5.3.9 Accuracy on reporting summary information.....165
5.3.9.1 Accuracy on reporting truncated birth histories in MPS.....165
5.3.9.2 Accuracy on reporting summary sibling survival histories in the MPS.....168
5.3.10 Source of errors in vitals events.....172
5.3.10.1 Inaccuracies in the reporting of detailed ages, birth and death dates for children, siblings and parents.....172
5.3.10.1.1 For children.....172
5.3.10.1.2 Accuracy of data collected on siblings.....184
5.3.11 Effects of reporting errors on mortality estimates.....186
5.3.11.1 Infant, child and under-5 mortality.....186
5.3.11.2 Adult mortality.....187
5.3.11.3 Old age mortality.....188
5.4 Discussion.....190
5.4.1 Limitations.....197
5.5 Conclusion.....199
6 Are mobile MPS useful to capture excess child mortality in countries facing complex humanitarian emergencies?.....201
6.1 Introduction.....201
6.2 The security crisis in Burkina Faso.....203
6.3 Methods.....205
6.4 Results.....206
6.4.1 Sample characteristics.....206
6.4.2 Under-five mortality levels and trends.....208
6.5 Discussion.....216
7 Linking MPS and household data to investigate under-five mortality in Sub-Saharan Africa: the roles of food insecurity and household composition in conflict settings.....220
7.1 Introduction.....220
7.2 Armed conflict, food insecurity, household structure and their impact on child health 223
7.3 Data and methods.....227
7.3.1 Data.....227
7.3.2 Methods.....229
7.3.2.1 Dependent variable: Under-5 Mortality Rate.....229

7.3.2.2 Independent variable: food insecurity 230
7.3.2.3 Independent variable: Household in-migration status 230
7.3.2.4 Independent variable: insecurity level 231
7.3.2.5 Potential Confounders 231
7.3.2.6 Statistical analysis 232
7.4 Results 233
7.4.1 Characteristics of study participants 233
7.4.2 Socio-demographic characteristics 234
7.4.3 Households with short- and long-term exposure to food insecurity 236
7.4.4 Analyzing the characteristics of households hosting migrants 238
7.4.5 Effects of household and mother characteristics on mortality differentials 240
7.5 Discussion 242
8 General discussion 247
8.1 Main findings 247
8.2 Strengths of this thesis 255
8.3 Limitations of this thesis 257
8.4 The policy and practice recommendations 258
8.5 Future research directions 259
9 Conclusion 261
10 References 265
11 Appendix 316
11.1 Appendix-questionnaires 316
11.2 Appendix chapter 4 343
11.3 Estimating sub-national mortality rates for the provinces of Kinshasa and North-Kivu 346
11.4 Appendix-Chapter 5 350
11.5 Appendix chapter 6 362
11.6 Appendix chapter 7 364
12 Lists of abbrevations 368
13 Summary (English) 369
14 Résumé (Français) 371
15 Note related to the use of IA 373

1 Introduction

This thesis examines the potential and limitations of Mobile Phone Surveys (MPS) for mortality measurement in low- and middle-income countries (LMICs), with a particular focus on contexts affected by insecurity and humanitarian crises. It investigates how survey mode influences mortality estimates through selection processes, data quality, and reporting errors, and assesses under which conditions MPS can complement conventional data sources such as censuses and face-to-face (F2F) household surveys. The analyses are primarily based on data collected in Burkina Faso as part of the Rapid Mortality Mobile Phone Surveys (RaMMPS) project, a research initiative designed to assess the feasibility of using mobile phone surveys for rapid mortality measurement in settings where conventional face-to-face data collection is difficult or disrupted. The project was implemented in Burkina Faso against a backdrop of increasing insecurity and the COVID-19 pandemic, which constrained conventional mortality data collection and highlighted the need for alternative data collection approaches. The RaMMPS project constitutes the main empirical foundation of this thesis, providing an opportunity to examine how mobile survey design, survey mode, and reporting processes affect mortality measurement. In some chapters, the analysis is extended through comparative applications using data from Malawi and the Democratic Republic of the Congo (DRC).

Mortality levels and trends are key indicators of a population's health and socio-economic development. In addition to summary measures such as life expectancy, the analysis of mortality by age, sex, and cause helps identify distinct epidemiological profiles and allows the assessment of health progress or deterioration over time. This information is fundamental for national health evaluations, international comparisons, and demographic forecasts (Vos et al., 2020). The elimination of preventable deaths among mothers and newborns, along with the monitoring of maternal and neonatal health progress, is essential for achieving the Sustainable Development Goals (SDGs). By 2030, the global community aims to reduce the maternal mortality ratio to below 70 deaths per 100,000 live births, under-five mortality (U5MR) to at least as low as 25 per 1,000 live births and neonatal mortality to fewer than 12 deaths per 1,000 live births (UNSD, 2024). However, with the limited time remaining and the observed slowdown or even stagnation or reversal in some regions in progress toward reducing maternal, neonatal, and under-five mortality, growing evidence suggests that achieving these targets by 2030 is unlikely (Amouzou et al., 2025). To achieve these targets, various global initiatives have been launched to enhance maternal and neonatal health and to lower deaths associated

with pregnancy, childbirth, and the neonatal period. In Burkina Faso, these initiatives have led to national policies that subsidize care, provide free obstetric services, and increase access to modern contraceptive methods (Ganaba et al., 2016; Ilboudo & Siri, 2023). These policies aim to strengthen health system capacity, improve service delivery, enhance access to maternal and neonatal care, and reduce inequalities in access to health care.

Access to detailed and up-to-date data is essential for the design, implementation, and evaluation of targeted health policies and programmes, as well as for the monitoring of mortality indicators over time. High-quality data enable policymakers to set priorities, allocate resources efficiently, and assess the effects of public health interventions.

Ideally, such data should be highly disaggregated. Disaggregation by sex is particularly important for the identification of gender inequalities and the formulation of appropriate policy responses (WHO, 2025c). At the subnational level, accurate mortality estimates are critical for effective local planning and decision-making, as substantial geographic disparities may remain hidden when relying on national averages. In contexts where civil registration and vital statistics (CRVS) systems are incomplete or inconsistent, the production of reliable subnational mortality estimates constitutes a priority for tracking national and international targets and for assessing local interventions (Adair et al., 2021). Finally, the regular availability of high-quality mortality data, including medically certified causes of death, is essential for the estimation of the burden of disease, the calculation of indicators such as years of life lost (YLL), and the support of research and surveillance activities that contribute to scientific knowledge, professional training, and evidence-based policymaking (Vos et al., 2020).

1.1 Civil Registration and Vital Statistics (CRVS) systems and mortality measurement

Civil registration, defined as the continuous, permanent, compulsory, and universal recording of births and deaths within a national system, constitutes the gold standard data source for mortality estimation (Tabutin, 2006; Mercer et *al*., 2015; Wallis, 2018). A fully functional CRVS system provides detailed and timely information on vital events, including the date of death and the age, sex, and location of the deceased, enabling the direct production of comprehensive demographic indicators, including age- and sex-specific mortality rates and life expectancy (UNSD, 2025). Unlike survey-based methods, CRVS systems do not depend on samples or statistical adjustments, thus avoiding the sampling bias and recall errors common in retrospective data collection (Tabutin, 2006). Consequently, such systems support the

estimation of annual mortality levels and trends with high temporal and spatial resolution, often at a lower long-term cost than surveys and censuses. Furthermore, when linked to accurately completed and coded medical certificates of cause of death, CRVS systems generate cause-of-death data for epidemiological surveillance and health policy evaluation. Beyond their statistical significance, CRVS systems are essential for public policy processes, such as resource allocation and health planning, and provide the legal and administrative foundation for vital statistics used to monitor global development indicators, including the SDGs (Adair et al., 2023; Nations Unies & Division de statistique, 2003; WHO, 2025c).

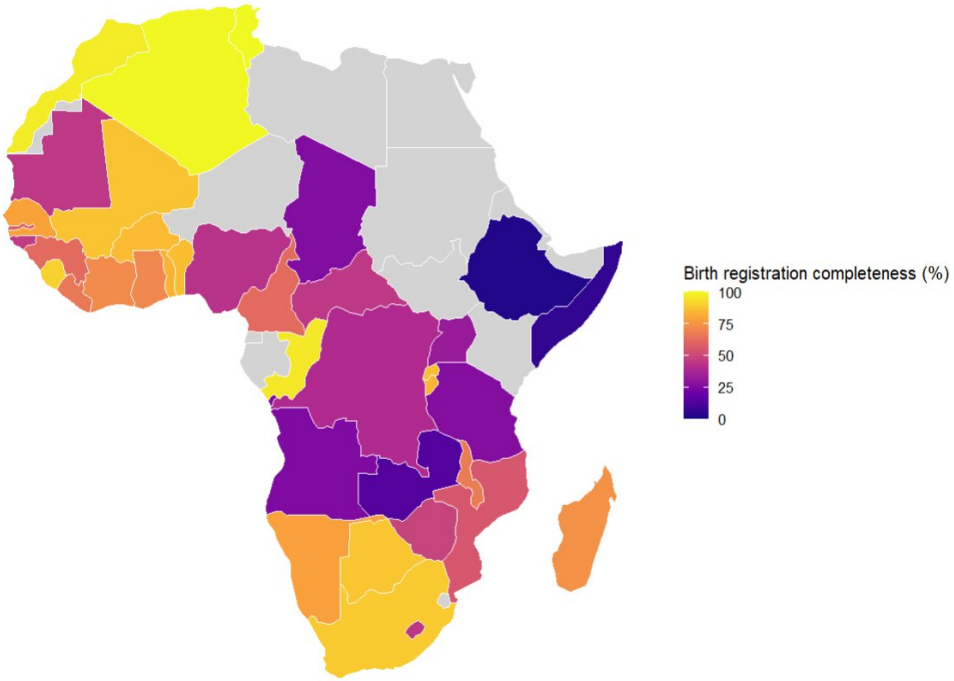
In the past decade, significant efforts have been made at regional and global levels to strengthen CRVS systems, particularly in Africa and other LMICs (WHO, 2025b). Since the early 2010s, multilateral initiatives have aimed to modernize civil registration systems through legal reform, institutional strengthening, and capacity building. In Africa, the Africa Programme on Accelerated Improvement of CRVS (APAI-CRVS), led by the United Nations Economic Commission for Africa (UNECA) in collaboration with the African Union Commission, the African Development Bank, WHO, UNICEF, UNFPA, and other partners, has established a coordinated policy framework for CRVS development. This program promotes harmonized national strategies, legislative reform, capacity-building workshops, and regular monitoring of country progress, while also supporting pilot interventions to enhance the completeness and quality of registration (APAI-CRVS, 2017, 2025). Concurrently, global platforms such as the Global CRVS Group, coordinated by the United Nations Statistics Division and the Centre of Excellence for CRVS Systems (backed by IDRC and Global Affairs Canada) have developed methodological tools, operational guidelines, and training materials for national authorities. These initiatives foster the exchange of best practices, including digitalization, system interoperability, and enhanced medical certification of causes of death (UNICEF, 2022).

At subregional and national levels, strengthening CRVS systems has increasingly been integrated into broader statistical, governance, and health system strategies (WHO, 2017). Regional economic communities like ECOWAS, the East African Community (EAC), and the Southern African Development Community (SADC) have embedded CRVS development into their statistical roadmaps and long-term development visions. Several countries, including Burkina Faso, have initiated legislative reforms to update the legal framework governing civil registration, decentralized registration services to enhance accessibility, digitized registers, and invested in the training of registration officers. Donor-funded pilot projects supported by the World Bank, UNICEF, the Global Financing Facility, and the African Development Bank have

provided information technology equipment, connected local registration offices with national databases, and improved the reliability of mortality indicators (WHO, 2017).

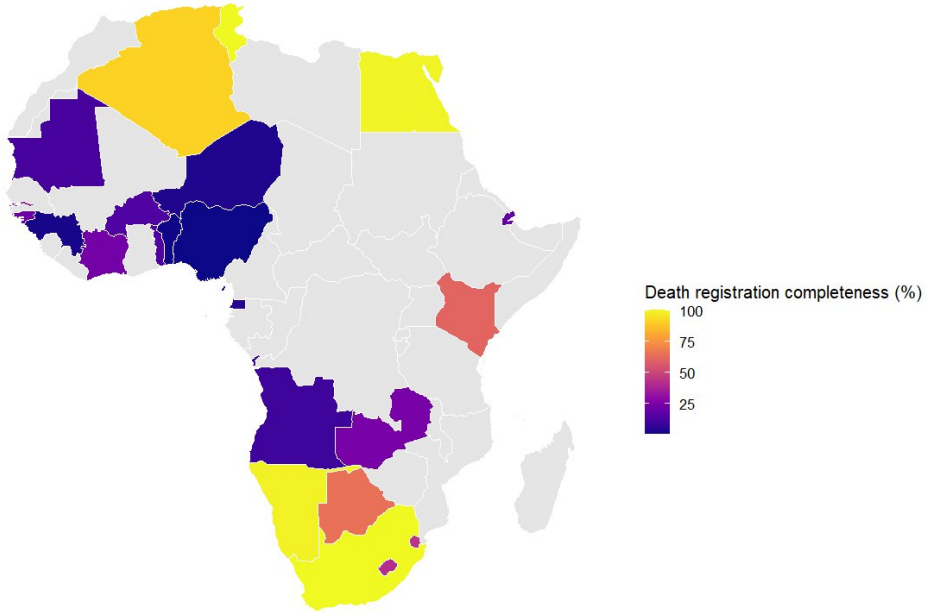
Despite these significant advancements, CRVS systems in most African countries remain incomplete, and the registration of vital events is still far from universal (see Figure 1.1 and Figure 1.2)**.** Recent estimates indicate that, on average, the completeness of birth and death registration in sub-Saharan Africa (SSA) remains low, although there is considerable cross-country variation and recent progress in selected areas (Adair et al., 2023; WHO, 2025c). UNICEF reports for 2024–2025 and syntheses produced by the ECA document improvements, yet the region continues to account for a large share of unregistered children worldwide. According to UNICEF's most recent estimates, while approximately 77% of births are registered globally, the corresponding figure for SSA is only 51% (UNICEF, 2025a). National statistics for Burkina Faso report birth registration coverage of approximately 83% and 85%, as documented by the 2021 Demographic and Health Survey (DHS) and the 2019 census, respectively (INSD, 2019, 2021). The situation is even more critical for death registration (Karlinsky, 2024). In most LMICs, the coverage of death registration remains very limited, and in SSA, fewer than 25% of deaths are officially registered. For example, in Burkina Faso, according to the latest census, only 17.3% of deaths were registered (INSD, 2019). Only a small number of countries, including South Africa and Zimbabwe, have achieved relatively high levels of death registration coverage (Mikkelsen et al., 2015). Some African capitals, such as Dakar, Antananarivo, and Abidjan, report comparatively high proportions of registered deaths but they are not representative of the national trends (Mikkelsen et al., 2015). Outside these limited exceptions, levels and trends of mortality in SSA continue to be derived primarily from population censuses and large-scale household surveys.

Figure 1.1: Completeness of birth registration in Africa, 2015-2024



Source: World Bank WDI (WHO CRVS data)

Figure 1.2: Completeness of death registration in Africa, 2018



Source: International Completeness of Death Registration (ICDR)

1.2 From paper to digital: the transformation of demographic and statistical data collection

The history of statistical and demographic data collection has undergone several major transformations, driven by technological advances and evolving information needs (Koyuncu, 2021). Until the early 1990s, nearly all surveys worldwide, including those conducted in SSA, relied on paper-based data collection (Kalton & Government of Canada, 2017). Questionnaires were printed, completed manually by interviewers, and processed through lengthy data entry and verification procedures. This approach, commonly referred to as *Paper-and-Pencil Interviewing* (PAPI), long represented the standard for population censuses and large-scale demographic and health surveys. While generally robust, PAPI was associated with important limitations, including transcription errors, long delays in data availability, high logistical costs, and limited capacity for real-time field supervision and quality control (Couper, 2011).

From the early 2000s onward, several organizations began experimenting with electronic data collection using *Personal Digital Assistants* (PDAs) (Shirima et al., 2007). Early applications included pilot surveys conducted under UNICEF's Multiple Indicator Cluster Surveys (MICS) and the first electronic DHS in countries such as Kenya and Tanzania (DHS Program, 2015; ICF International, 2012). PDAs enabled direct data entry and automated consistency checks, reducing data entry errors and accelerating data transmission. However, their widespread adoption was constrained by factors such as high costs, limited storage capacity, technical fragility, and maintenance challenges, particularly in low-resource settings (ICF International, 2012).

A major shift occurred in the mid-2010s with the large-scale adoption of *Computer-Assisted Personal Interviewing* (CAPI). The increasing affordability and availability of tablets and smartphones facilitated the transition to digital survey platforms such as CSPro Android, Survey Solutions (World Bank), and Open Data Kit (ODK). CAPI substantially enhanced fieldwork quality by enabling real-time validation checks, GPS-based household geolocation, and remote monitoring of interviewer performance. As a result, most recent rounds of major survey programs—including DHS, MICS, LSMS, and national population censuses have adopted CAPI as the standard mode of data collection, as illustrated by recent census operations in Burkina Faso (2019) (INSD, 2021).

In SSA, the first large-scale demographic surveys were conducted in the 1950s with support from international partners (Lau et al., 2019). Since then, most countries have implemented multiple rounds of nationally representative surveys, initially under the World Fertility Survey

programme and later through the DHS (DHS, 2019; Ware, 1977). In parallel, several countries have successfully conducted national population censuses. These large-scale data collection operations have relied on F2F interviews.

Despite advances in information and communication technologies and the growing diversity of data collection tools, alternative survey administration modes, such as web-based or MPS have been explored only to a limited extent in LMICs (Dabalen et al., 2016), with the exception of a few phone-based data collection programs initiated by the World Bank (High-Frequency MPS) and UNICEF (MICS Plus) (UNICEF, 2025b; World Bank Group, 2022). Therefore, F2F interviewing remains the dominant approach for national data collection in these settings, even as new modalities increasingly complement traditional methods in specific contexts.

1.3 Challenges of F2F data collection in crisis settings

Household surveys conducted through F2F interviews have long been regarded as the gold standard for producing demographic and health data. However, this approach faces several significant challenges. First, traditional F2F data collection is resource-intensive and time-consuming: mobilizing enumerators, organizing supervision, arranging transport, and ensuring data quality all entail high logistical and financial costs and often lead to long delays in data availability. In addition, in contexts of health crises, insecurity, or natural disasters, in-person interviews can become impractical or even impossible. During the COVID-19 pandemic, for example, a global survey of National Statistical Offices (NSOs) conducted by the United Nations Statistics Division and the World Bank found that 96% of NSOs had partially or fully suspended F2F data collection by May 2020, severely disrupting traditional household survey operations and compromising the continuity of key statistical programmes (World Bank, 2025; World Bank Group, 2022).

These challenges are further amplified in fragile and conflict-affected settings, such as those found in the Sahel and other parts of SSA, where insecurity and mobility restrictions hinder the implementation of large-scale demographic surveys and census operations (Himelein & Kastelic, 2015; INSD, 2021). In such environments, the reliance on traditional fieldwork is affected by safety concerns and logistical barriers that can lead to incomplete coverage and can compromise data quality (INSD, 2021).

Moreover, the postponement or cancellation of major censuses and demographic surveys, often due to funding suspensions or logistical constraints, has exacerbated gaps in data availability (Duthé, 2025; Krugman et al., 2025). For example, recent assessments indicate that fewer than half of LMICs in fragile contexts have conducted recent household surveys since 2020 (Kofi Teteh Baah et al., 2024).

In this context, traditional F2F surveys no longer guarantee the frequency, coverage, or continuity required to track critical demographic and health indicators, including maternal, neonatal, and under-five mortality. These limitations show the need for alternative data collection methods that are faster, less costly, more flexible, and capable of reaching populations and communities in hard-to-access areas, including zones affected by conflict or geographical isolation.

1.4 Emerging opportunities: Mobile Phone Survey (MPS)

With the recent expansion of mobile network coverage, new opportunities for data collection have emerged, particularly in LMICs. Mobile phone use has grown rapidly worldwide, with an estimated eight out of ten individuals now owning a mobile device in LMICs (World Bank, 2022), as also shown in Figure 1.3 and Figure 1.4. In SSA, mobile phone ownership ranges from approximately 61% to 73%, following a steady upward trajectory over the past decade (Gallup, 2016).

Burkina Faso exemplifies this rapid expansion. Mobile cellular subscriptions increased from 46 per 100 inhabitants in 2011 to 112 per 100 inhabitants in 2021, while fixed-line subscriptions continued to decline (World Bank, 2022). National surveys further document the widespread diffusion of mobile phones. The 2010 DHS reported that 59.2% of households owned at least one mobile phone, with substantially higher ownership in urban than in rural areas (INSD, 2012). According to the 2014 Continuous Multisectoral Survey, 64.3% of individuals aged 15 and older owned a mobile phone (Institut national de la statistique et de la démographie, 2014). More recently, the 2021 DHS indicated that mobile phone ownership among adults aged 15–49 reached 75% among women and 90% among men (INSD, 2021). These trends have been accompanied by significant improvements in telecommunications infrastructure, declining call costs, and enhanced network quality, all of which have facilitated remote communication.

Against this backdrop, the literature suggests that telephone-based interviews can be conducted at substantially lower cost and with greater operational flexibility than traditional F2F surveys

(Leo et *al*., 2015 ; Gibson et *al*., 2017; Labrique et *al*., 2017 ; Felderer et *al*., 2019). In Africa, recent years have witnessed a proliferation of MPS, particularly for rapid data collection. However, many of these initiatives remain small-scale or short-term, often focusing on opinion polling or market research rather than on core demographic or health indicators (GeoPoll, 2015).

MPS have been used less frequently for the evaluation of health interventions or the monitoring of demographic events, including mortality, particularly within population surveillance systems (Brinkel et al., 2014; Debrah et al., 2020; Jennings et al., 2015; Pariyo et al., 2019; van Heerden et al., 2010). During the COVID-19 pandemic, however, mobility restrictions and safety concerns accelerated the adoption of MPS to monitor living conditions, health behaviors, and preventive practices (PMA, 2020; Vinceti et al., 2020; World Bank, 2020).

Only a limited number of MPS have explicitly focused on mortality measurement. In Monrovia, Liberia, a mobile phone survey implemented by Médecins Sans Frontières demonstrated that this approach was a feasible and acceptable alternative to F2F data collection, enabling the estimation of excess mortality associated with the Ebola epidemic (Kuehne et al., 2016). In India, Jha and colleagues used an independent national MPS to show that cumulative COVID-19 deaths by September 2021 were six to seven times higher than officially reported figures (Jha et al., 2022). An MPS conducted in Matlab, Bangladesh, also revealed a 28% increase in excess mortality among older adults during the early months of the pandemic (Hanifi et al., 2021). In Cameroon's Far North region, a study conducted jointly by *Médecins Sans Frontières* and the Ministry of Health found that crude mortality rates estimated from telephone interviews exceeded those derived from contemporaneous F2F surveys (Gignoux et al., 2020).

Although telephone interviewing has been used in high-income countries since the 1980s, its application in SSA has been adapted more recently through large-scale initiatives such as the World Bank's High-Frequency MPS (HFPS), MICS Plus surveys and the Rapid Monitoring of Mortality and Population Statistics (RaMMPS) programme, on which this PhD dissertation is based (RaMMPS, 2024; UNICEF, 2025b; World Bank Group, 2022). Computer-assisted telephone interviewing (CATI) approaches enable rapid, secure, and scalable data collection, particularly in crisis settings. Nevertheless, they also raise important methodological challenges, including coverage bias related to phone ownership, representativeness, respondent fatigue, and measurement error, which require careful assessment and mitigation (Dabalen et al., 2016; Lau et al., 2019).

Figure 1.3: Mobile phone subscriptions per 100 people in LMICs (2022)

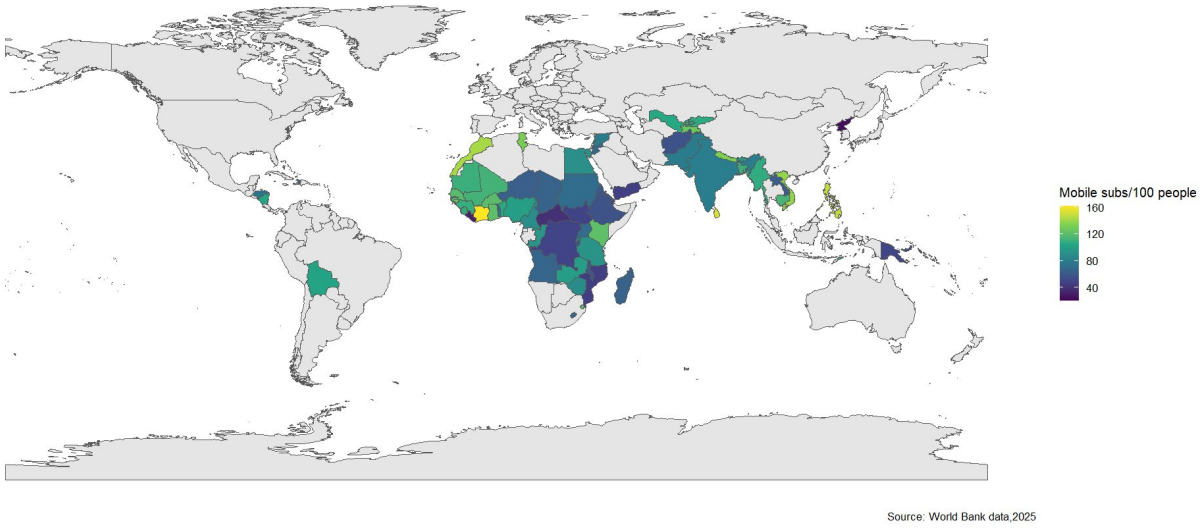
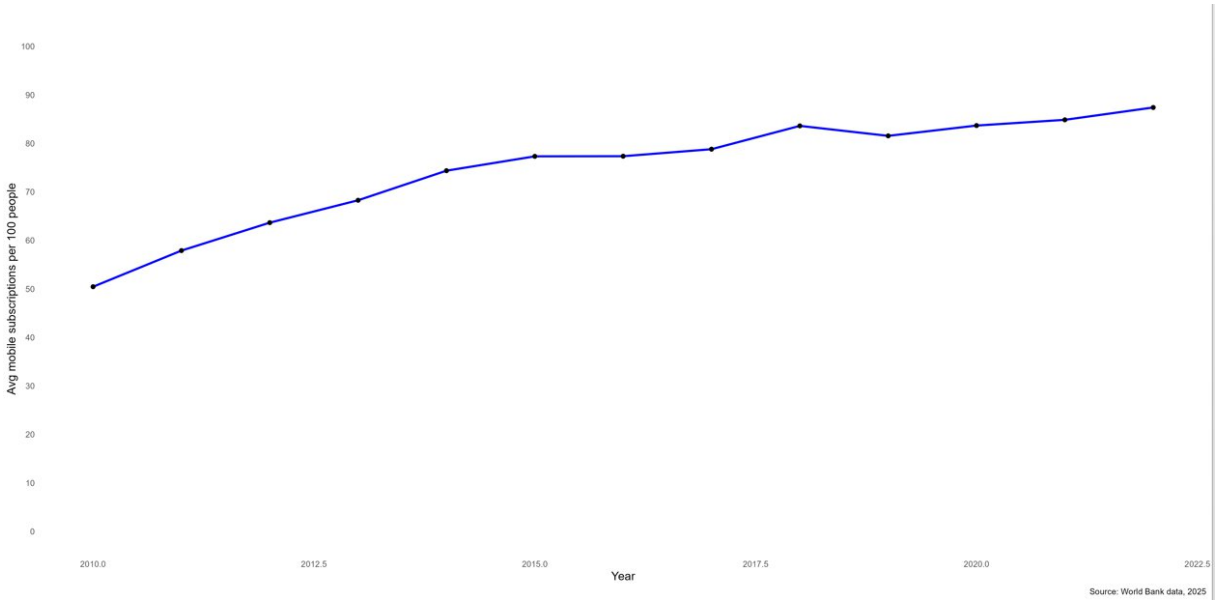


Figure 1.4: Trends in mobile phone penetration in LMICs (2010–2022)



1.5 Disantangling the different sources of errors

The assessment of mortality estimates from different survey modes requires consideration of the multiple sources of error that arise throughout the survey process. A useful framework is the Total Survey Error (TSE) perspective, which distinguishes between errors of representation and errors of measurement (Figure 1.5). Representation errors arise from the processes that determine who can enter the survey and who ultimately participates, including coverage, sampling, and nonresponse. Measurement errors arise during the response process and can affect the validity and reporting of information, as well as subsequent data processing. Post-

survey procedures, such as weighting and calibration, may further modify the final estimates and can reduce some sources of bias, although they cannot necessarily eliminate them.

This distinction is particularly relevant to mortality measurement through MPS. Unequal access to mobile phones primarily creates a coverage problem, while differential participation can generate nonresponse bias. Sampling choices may also affect the composition of the population reached by the survey. These sources of representation error may be compounded by measurement errors related to the reporting of deaths, ages, dates of birth or death, and survival status. The final mortality estimate therefore reflects the combined effect of several stages of the survey process rather than a single source of error.

This framework provides a basis for the empirical strategy of this thesis. The analysis considers both representation and measurement errors and examines how they contribute to differences between mortality estimates from MPS and F2F data. It also provides a structure for assessing whether differences arise from who is reached by the survey, how respondents report mortality events, or the subsequent treatment of the data.

Figure 1.5 : Conceptual framework of total survey error in mortality measurement

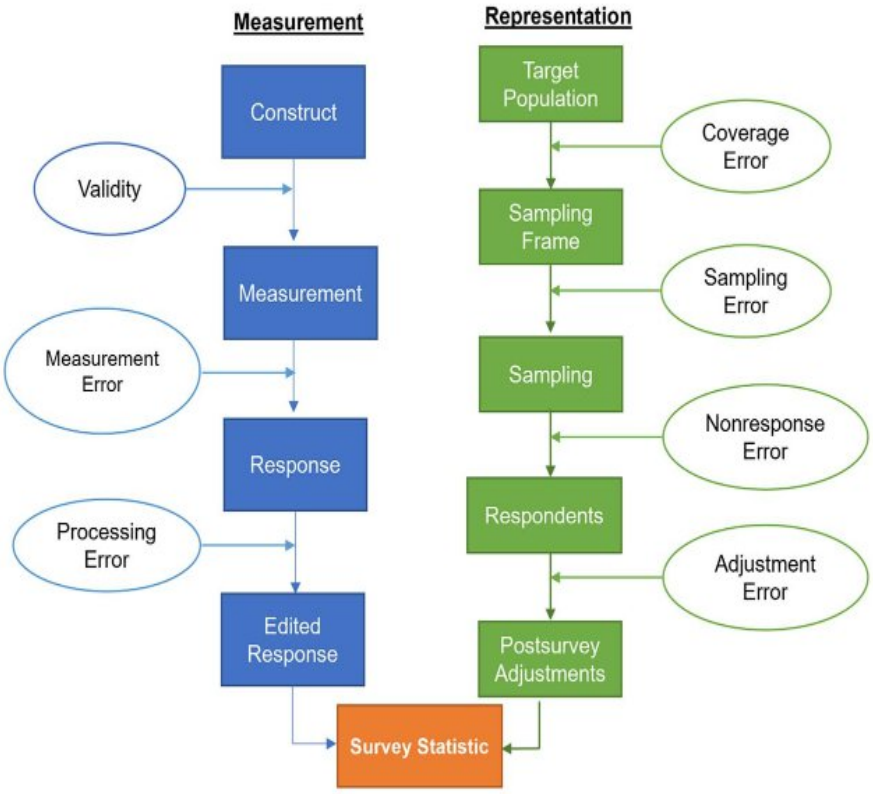


Figure 1. Total survey error. Reference for creation of figure: Groves and Lyberg (2010).

1.6 Potential biases and methodological limitations of MPS

One of the challenges is coverage bias stemming from unequal access to or ownership of mobile phones. In many LMICs, mobile phone ownership is far from universal and is associated with sociodemographic characteristics such as age, gender, education, place of residence, and household wealth (de Leeuw et al., 2008; Kreuter et al., 2010; Lau et al., 2019; Leo et al., 2015). As a result, MPS tend to over-represent younger, urban, wealthier, and more educated individuals, while systematically under-representing disadvantaged population groups that are often exposed to higher mortality risks, as will be illustrated below. This selective coverage can bias mortality estimates downward. For instance, a study conducted in 34 countries as part of the RaMMPS project, showed that MPS underestimated under-five mortality because mobile phone owners disproportionately belonged to more advantaged socioeconomic groups (Sánchez-Páez, et al., 2023). Similarly, an analysis of 25 LMICs found that adult mortality estimates derived from mobile phone owners were lower than those observed in the general population, reflecting selective mobile phone ownership patterns (Sahar et al., 2024).

Beyond coverage, non-response and interview conditions pose additional challenges. Response rates in MPS are often lower than in F2F surveys (Blumenstock & Eagle, 2012; Sinclair et al., 2012), partly due to network instability, lack of privacy, or respondent disengagement (Lynn & Kaminska, 2013). Evidence from Malawi suggests that interviews conducted in public or otherwise unsuitable settings were more likely to be interrupted or yield less reliable responses (Souza et al., 2024). Importantly, non-response is not random: it may be correlated with factors such as socioeconomic status, health, or rural residence, which are themselves associated with mortality, thereby compounding bias if not adequately corrected.

Mode effects further differentiate telephone interviews from F2F data collection. The reduced ability of interviewers to build rapport and ensure privacy, combined with more limited supervision, can affect respondents' willingness to disclose sensitive information and the accuracy of their responses (Lynn & Kaminska, 2013; Maguire, 2009). Responding by phone, particularly in non-private environments, may influence reporting on sensitive topics such as deaths, including maternal or perinatal mortality. As a result, estimates derived from MPS may not be directly comparable to those obtained from F2F surveys without appropriate adjustment.

In addition, MPS typically rely on shorter or simplified questionnaires to limit interview duration, which can compromise the depth and precision of the information collected, especially for complex events such as deaths. Telephone-based reporting may be more prone to recall errors, age or date misreporting, and heaping, all of which can introduce systematic

measurement error (Helleringer et al., 2023). While MPS are particularly valuable in contexts of health crises, conflict, or restricted field access, structural limitations persist even in these settings. Displaced populations, individuals living in areas without network coverage, and residents of highly insecure zones are often inaccessible or systematically under-represented.
These limitations are especially consequential when MPS are used to estimate sensitive indicators such as maternal and child mortality. Such deaths often occur among women and households that are less likely to own mobile phones, in rural or marginalized settings (Anumudu et al., 2025; Majebi et al., 2020). Moreover, recall errors, misclassification of events, and reduced contextual detail in phone interviews can impair the accurate identification and timing of maternal or perinatal deaths. Without robust correction strategies MPS-based estimates may systematically underestimate mortality and compromise data quality.

1.7 Data quality in MPS vs F2F surveys

As indicated earlier, MPS have expanded rapidly in LMICs. This increasing use raises questions regarding data quality and comparability with traditional F2F surveys.
Some studies suggest that telephone interviews may be better suited for collecting information on sensitive topics, as they can provide respondents with a greater sense of anonymity and psychological distance from the interviewer (Azad et al., 2021). It has been argued that the absence of F2F interaction may reduce social desirability bias by allowing individuals to express themselves more freely (Azad et al., 2021; Dabalen et al., 2016). A recent study on data collection among rural women in India found that telephone interviews constituted a useful alternative even for sensitive topics, although structural barriers related to phone access and gender norms remained significant (Hersh et al., 2021).
This debate is constrained by the limited number of studies directly comparing data quality and the reliability of indicators derived from telephone versus F2F surveys, particularly in LMICs, and by the near absence of such comparative evidence in countries affected by armed conflict or severe security crises. This limitation is especially pronounced for highly sensitive and complex outcomes such as child mortality or the death of close relatives. A 2017 review of MPS in LMICs identified only 11 published articles covering 19 MPS and reported that “the majority of MPS relied on phone numbers collected during prior F2F surveys,” thereby restricting the generalizability of their findings beyond already-surveyed populations (Gibson et al., 2017).

1.8 Research questions

Following methodological studies comparing survey modes (for example, web-based versus F2F surveys), the evaluation of MPS for generating mortality data and estimates should consider the following:

- the effects of coverage and selection biases associated with mobile phone ownership;
- differences in reported mortality levels and trends by mode of data collection;
- the specific role of reporting errors (age misreporting, event dating, and death omissions) in generating these differences;
- the ability of MPS to capture excess child mortality in conflict-affected areas that may be missed by F2F surveys, and to identify the household-level mechanisms that contribute to these differences.

Accordingly, the research question guiding this project can be formulated as follows:

What are the strengths and weaknesses of using MPS for estimating levels and trends in mortality, compared with traditional F2F surveys, in LMICs, particularly in conflict-affected settings?

This question is divided into four specific research questions, each focusing on a particular mechanism likely to explain the observed differences between the two data collection approaches. For each question, the analytical relevance is specified and theoretical expectations are formulated, drawing on the existing literature and the specific characteristics of the data used.

Table 1.1 provides an overview of the research questions.

RQ 1: What are the implications of inequalities in mobile phone ownership on mortality estimates derived from MPS?

Despite the rapid expansion of mobile phone coverage in LMICs, access to mobile telephony remains uneven across population subgroups (Dabalen et al., 2016; INSD, 2019; World Bank, 2022). As a result, phone-based surveys are subject to coverage and selection biases, which may compromise the validity of mortality estimates derived from these data (Berry et al., 2021; Dabalen et al., 2016; Lambrecht et al., 2023). In SSA, including in Burkina Faso, mobile phone ownership has increased rapidly over the past decade, reaching high and increasing levels

among both households and individuals, with higher coverage among men and urban populations (INSD, 2021; World Bank, 2022).

These patterns are particularly concerning for mortality measurement, as phone ownership is correlated with determinants of survival such as household wealth, education, place of residence, and gender. As indicated earlier, populations without access to mobile phones are more likely to be poorer, reside in rural areas, and experience higher mortality risks (Dabalen et al., 2016; C. Q. Lau et al., 2019). Therefore, mortality indicators derived from MPS may systematically underrepresent high-risk groups, leading to biased estimates of mortality levels and differentials.

Empirical evidence from SSA supports these concerns. Studies conducted in Nigeria and Ghana show that MPS tend to underrepresent women, older individuals, rural populations, and individuals with lower socioeconomic status, making it difficult to obtain samples that are fully representative of the general population (Lau et al., 2019; L'Engle et al., 2018). These selection patterns are likely to affect mortality estimates differently across age groups, given the strong age gradient in both phone ownership and mortality risks.

Against this background, this research question aims to assess the extent to which biases related to mobile phone ownership contribute to observed differences in mortality estimates between phone-based and F2F data collection approaches, with a particular focus on Burkina Faso.

RQ 1.1: To what extent does mobile phone ownership bias affect mortality differentials observed between MPS and F2F surveys?

Hypothesis 1.1:

Mortality estimates derived from MPS differ significantly from those obtained through F2F surveys due to selective exclusion of individuals without access to mobile phones.

RQ 1.2: Do the effects of inequalities in mobile phone ownership on mortality estimates vary across age groups?

Hypothesis 1.2:

The impact of inequalities in mobile phone ownership on mortality estimates is more pronounced for adult and older-age mortality than for child mortality. This difference may arise from the way mortality information is collected: child deaths are typically reported by household members and can therefore be captured through household-level phone access, whereas adult and older-age mortality measured through parental survival histories concerns parents who may live outside the respondent's household and locality. Mobile phone coverage inequalities may consequently lead to greater selection and underrepresentation in the reporting of parental mortality than in the reporting of child mortality.

RQ 1.3: Can weighting and adjustment strategies adequately reduce selection bias in mortality estimation associated with mobile phone ownership?

Hypothesis 1.3:

Standard weighting and adjustment procedures reduce, but do not fully eliminate, selection bias in mortality estimation arising from mobile phone ownership.

RQ 2: What are the differences in mortality levels and trends estimated from F2F surveys compared with MPS?

Beyond coverage bias related to mobile phone ownership, differences in the data collection process itself between F2F and phone-based surveys may contribute to discrepancies in mortality estimates. In LMICs, mortality indicators derived from traditional F2F surveys such as censuses and household surveys are well known to be affected by a range of reporting errors. These include omissions of deaths, age misreporting, and errors in the timing of events, particularly for deaths occurring in the periods distant from data collection (Masquelier et al., 2021; Tabutin, 2006). DHS, which remain the main source of child mortality estimates in most LMICs, are also subject to reporting errors related to age heaping, misdating of births and deaths, and displacement of events across reference periods (Pullum & Staveteig, 2017; Romero Prieto et al., 2021; Tabutin, 2006). Although important methodological work has been devoted to adjusting these data to produce plausible mortality levels, such corrections are not always sufficient to eliminate bias.

MPS may exacerbate some of these known sources of error due to shorter interview duration, greater cognitive burden on respondents, limited probing by interviewers, and the absence of visual aids or household rosters (Helleringer et al., 2023; Lau et al., 2025). ***RQ 2.1: Do MPS and F2F surveys yield comparable estimates of mortality levels?***

Hypothesis 2.1:

Compared with F2F surveys, MPS generate mortality estimates that are more prone to measurement errors, leading to systematic and age-specific differences in both the direction and magnitude of estimated child, adult, and older-age mortality.

RQ 3: Can the effects of age misreporting, date misreporting, and death omissions be isolated as drivers of mortality differences between MPS and F2F surveys?

Comparisons of mortality estimates at the national and local levels can identify overall discrepancies between survey modes, but they do not allow for the isolation of specific sources of error. Reporting errors may compound or offset one another. For example, omissions of deaths tend to bias mortality estimates downward, while age misreporting and errors in event dating can distort age-specific mortality patterns and aggregate indicators. In the Niakhar Health and Demographic Surveillance System (HDSS) in Senegal, respondents were found to underestimate the ages of living siblings and the time since the death of deceased siblings, leading to biased estimates of adult mortality (Masquelier et al., 2021). By contrast, research conducted in the Nouna HDSS in Burkina Faso suggests that age misreporting in reports of household deaths plays a relatively modest role, while underreporting of deaths is the primary driver of mortality underestimation in the 2006 census (Lankoandé et al., 2022). In Manicaland in Zimbabwe, longitudinal census data reveal misreporting of parental survival status, particularly for mothers, with foster mothers often reported as biological mothers, which contributes to the underestimation of female mortality estimates based on maternal orphanhood (Robertson et al., 2008).

The third research question aims to determine how much age misreporting, date misreporting, and underreporting of deaths contribute to the difference in mortality estimation observed between MPS and F2F surveys.

RQ 3.1: To what extent do age misreporting and date misreporting differ between MPS and F2F surveys?

Hypothesis 3.1:

Age and date misreporting are more frequent in MPS than in F2F surveys and contribute to distortions in age-specific mortality patterns.

RQ 3.2: Are omissions of deaths more prevalent in MPS than in F2F surveys?

Hypothesis 3.2:

Compared with F2F surveys, MPS are associated with higher levels of death omission and systematic underestimation of mortality.

Hypothesis 3.3:

The relative contribution of reporting errors differs by type of mortality indicator (child, adult, household mortality).

RQ 4: Do MPS capture excess child mortality in conflict-affected areas that is missed by F2F surveys, and which household-level mechanisms explain this excess mortality?

Comparisons of national child mortality trends derived from F2F surveys (such as DHS and censuses) and MPS indicate similar declines in under-five mortality in Burkina Faso over recent decades (Dianou et al., 2025; INSD, 2021; UN IGME, 2025). However, these aggregate trends may mask subnational heterogeneity, particularly in conflict-affected areas that are partially or entirely excluded from F2F survey sampling frames due to insecurity.

This research question seeks to assess whether MPS are better suited than F2F surveys to detect excess child mortality in conflict-affected areas, and to identify the household-level pathways through which insecurity translates into elevated mortality risks.

RQ 4.1: Do child mortality estimates derived from MPS differ systematically from F2F survey estimates in conflict-affected areas?

Hypothesis 4.1:

Child mortality estimates derived from MPS are higher than those from F2F surveys in conflict-affected areas, while estimates are comparable in secure areas.

RQ 4.2: Are observed differences in child mortality between conflict and non-conflict areas primarily driven by indirect mechanisms rather than direct exposure to violence?

Hypothesis 4.2:

Higher child mortality in conflict-affected areas is primarily associated with indirect household-level vulnerabilities such as food insecurity and hosting internally displaced persons rather than with direct exposure to armed violence.

RQ 4.3: Does forced displacement and hosting of internally displaced persons exacerbate child mortality risks among host households?

Hypothesis 4.3:

Children living in households hosting internally displaced persons face higher risks of infant and under-five mortality compared to children in non-hosting households, even after controlling for socio-economic characteristics.

RQ 4.4: Can integrating multiple MPS data sources improve the identification of mortality gradients and their determinants in conflict settings?

Hypothesis 4.4:

The integration of multiple MPS datasets strengthens the ability to identify mortality differentials and their determinants in conflict-affected areas, revealing patterns that are not observable using F2F surveys alone.

Table 1.1 : Research questions and hypotheses

Research questions and hypotheses
RQ1: ***To what extent does mobile phone ownership bias affect mortality differentials observed between MPS and F2F surveys?*** *(chapter 4)*
H1.1: Mortality estimates derived from MPS differ significantly from those obtained through F2F surveys due to the selective exclusion of individuals without access to mobile phones

H1.2: The impact of inequalities in mobile phone ownership on mortality estimates is more pronounced for adult and older-age mortality than for child mortality.
H1.3: Standard weighting and adjustment procedures reduce, but do not fully eliminate, selection bias in mortality estimation arising from mobile phone ownership.
RQ2: ***What are the differences in mortality levels and trends estimated from F2F surveys compared with MPS?*** *(chapter 4)*
H2.1: Compared with F2F surveys, MPS generate mortality estimates that are more prone to measurement errors, leading to systematic and age-specific differences in both the direction and magnitude of estimated child, adult, and older-age mortality.
RQ3: ***Can the effects of age misreporting, date misreporting, and death omissions be isolated as drivers of mortality differences between MPS and F2F surveys?*** *(chapter 5)*
H3.1: Age and date misreporting are more frequent in MPS than in F2F surveys and contribute to distortions in age-specific mortality patterns.
H3.2: Compared with F2F surveys, MPS are associated with higher levels of death omission and systematic underestimation of mortality.
H3.3: The relative contribution of reporting errors differs by type of mortality indicator (child, adult, household mortality).
RQ 4: Do MPS capture excess child mortality in conflict-affected areas that is missed by F2F surveys, and through which household-level mechanisms? *(chapter 6 and 7)*
H4.1: Child mortality estimates derived from MPS are higher than those from F2F surveys in conflict-affected areas, while estimates are comparable in secure areas.
H4.2: Higher child mortality in conflict-affected areas is primarily associated with indirect household-level vulnerabilities such as food insecurity and hosting internally displaced persons rather than with direct exposure to armed violence
H4.3: Children living in households hosting internally displaced persons face higher risks of infant and under-five mortality compared to children in non-hosting households, even after controlling for socio-economic characteristics.
H4.4: The integration of multiple mobile phone survey datasets strengthens the ability to identify mortality differentials and their determinants in conflict-affected areas, revealing patterns that are not observable using F2F surveys alone.

1.9 Research objectives and data sources

The main objective of this doctoral project is to contribute to filling critical knowledge gaps regarding measurement biases in mortality indicators derived from different data collection modes in LMICs, using Burkina Faso as a case study. The thesis aims to assess and compare the biases associated with mortality estimates produced from MPS and traditional F2F data collection methods. This research is embedded within a multi-country initiative designed to

measure excess mortality associated with the COVID-19 pandemic in five LMICs, including Bangladesh, Burkina Faso, Malawi, Mozambique, and the DRC. The project was coordinated by a multidisciplinary team of demographers and public health researchers across several institutions under the RaMMPS programme (https://www.lshtm.ac.uk/research/centres-projects-groups/rapid-mortality-mobile-phone-survey).

The doctoral research draws on multiple nationally representative and longitudinal data sources in Burkina Faso. These include the last population census, successive DHS, longitudinal data from the Ouagadougou HDSS, data from the World Bank HFPS (HFPS-LSMS, 2020–2024), and data from the RaMMPS surveys implemented during the COVID-19 period.

A key data source for this research is the OPO (Observatoire de Population de Ouagadougou), also referred to as the Ouagadougou Health and Demographic Surveillance System (OHDSS). HDSS systems involve the continuous and prospective registration of vital events births, deaths, and migrations within a geographically defined population following an initial census (Pison, 2005). Owing to their high data quality and temporal precision, HDSS platforms are widely used as reference standards for evaluating the validity of mortality indicators derived from surveys and censuses (Helleringer, Pison, Kanté, et al., 2014; Rerimoi et al., 2019). Currently, 32 HDSS sites in SSA are affiliated with the INDEPTH Network (Ye et al., 2012). In this thesis, we will specifically utilise data from the Ouagadougou HDSS, established in 2008 by the Institut Supérieur des Sciences de la Population (ISSP, Université Joseph Ki-Zerbo). The OHDSS operates in five neighborhoods in the northern periphery of Ouagadougou and collects annual data on major vital events, including births, deaths, unions, and in- and out-migration (Rossier et al., 2012).

The study will also use data from national population censuses, which provide demographic, social, and economic information for the entire population. Burkina Faso has conducted regular censuses approximately every ten years, in 1975, 1985, 1996, 2006, and most recently in 2019. For this thesis, only the 2019 census will be used for national-level analyses and comparisons. This census includes information on child survival, parental survival, and household deaths occurring in the 12 months preceding the census enumeration.

In addition, the thesis will draw on data from multiple rounds of the DHS conducted in Burkina Faso in 1993, 1998, 2003, 2010, and 2021. These surveys provide the core data required to estimate child, adult, and maternal mortality using standardized demographic methods.

The analysis will also incorporate data from the High-Frequency Phone Survey on COVID-19, implemented by the National Institute of Statistics and Demography (INSD: Institut National de la Statistique et de la Démographie in french) using phone numbers collected during the

2018–2019 Harmonized Survey on Household Living Conditions (EHCVM: Enquête Harmonisée sur les Conditions de vie des Ménages in french). This survey aimed to monitor, in near real time, the socioeconomic impacts of the COVID-19 pandemic through repeated telephone interviews covering employment, access to basic services, income sources, and household welfare. Data were collected monthly between June 2020 and July 2021 (11 waves), and subsequently on a bimonthly basis from April 2022 to July 2024, with rotating thematic modules across survey waves (World Bank Group, 2022).

Finally, the research will employ data from the RaMMPS surveys (RaMMPS, 2024), which are described in the next chapter.

1.10 Outline of the thesis

This thesis is organized into eight chapters, including the introduction, structured as follows. The first chapter (Chapter 2), after the introduction (Chapter 1), provides an overview of the RaMMPS project, whose data are used for mortality estimation and for comparison with other F2F data sources. The subsequent chapters have been written to be published as separate manuscripts in peer-reviewed journals, with some editing for this thesis. Some are already published, others are under review or currently under preparation. Each of these chapters includes a summary of its content, followed by a brief introduction, a description of the methods used, the presentation of results, and finally a discussion and conclusion.

In Chapter 3, we examine the feasibility, operational efficiency, representativeness, and data quality of MPS for mortality measurement in Burkina Faso. This chapter compares two survey strategies: a MPS follow-up of respondents previously interviewed F2F and a random digit dialing (RDD) approach using data from the RaMMPS project (2021–2022). The chapter assesses response and cooperation rates, sample selectivity relative to census and DHS benchmarks, and multiple indicators of data quality, including age heaping and reporting of vital events.

Chapter 4 focuses on the use of a national MPS for rapid mortality monitoring in Burkina Faso. Mortality estimates derived from truncated birth histories, sibling survival histories, and parental survival histories collected via MPS are compared with estimates from censuses, DHS surveys, and United Nations model-based estimates. The chapter evaluates the strengths and limitations of MPS for estimating child, adult, and older-age mortality and discusses sources of bias related to reporting errors.

Chapter 5 assesses the validity of MPS for mortality data collection through a validation study conducted within the OHDSS. By matching MPS responses to high-quality longitudinal HDSS records on the survival of children, siblings, and parents, the chapter quantifies errors related to age reporting, dating of deaths, and omissions. It evaluates the sensitivity and specificity of MPS and examines how respondent characteristics influence reporting accuracy, as well as the implications of these errors for age-specific mortality estimates.

Chapter 6 evaluates the usefulness of MPS for capturing excess child mortality in countries facing complex humanitarian emergencies, using Burkina Faso as a case study. Regional under-five mortality estimates derived from MPS are compared with those from the 2021 DHS, which could not cover parts of the country due to insecurity.

Chapter 7 links data from multiple MPS to investigate the determinants of under-five mortality in conflict settings in Burkina Faso. Using record linkage between RaMMPS data and HFPS (LSMS-HFPS), the chapter examines the roles of food insecurity, household composition, and migrant hosting, particularly internally displaced persons, in shaping child survival.

Finally, Chapter 8 provides the general discussion of the thesis. It synthesizes the main findings across chapters, discusses methodological and substantive contributions, outlines the strengths and limitations of MPS for mortality measurement, and considers implications for future research, humanitarian response, and population health monitoring in crisis-affected LMICs.

2 The Rapid Mortality Mobile Phone Surveys (RaMMPS) project

This chapter describes the design and implementation of the RaMMPS project in Burkina Faso and discusses the main methodological challenges encountered during its implementation, with particular attention to representativeness, data quality, and the social acceptability of MPS. The analyses presented throughout this thesis rely primarily on data collected through the RaMMPS surveys conducted in Burkina Faso. Comparative analyses also draw on RaMMPS data from the Democratic Republic of the Congo (DRC) and Malawi.

To put this chapter in context, I will briefly highlight my involvement in the RaMMPS project. As a research assistant and subsequently as a doctoral researcher within the RaMMPS project, I contributed to all major stages of the research process. My responsibilities included the

development of the study protocol and survey questionnaires; the preparation of the ethics application submitted to the National Ethics Committee in Burkina Faso; the design of sampling frames and sampling strategies across different survey phases; the recruitment and training of interviewers; the supervision of quantitative data collection and quality assurance; the design, collection, and analysis of qualitative data; and the quantitative analysis of survey data. I also contributed to the dissemination of the project by preparing presentations and reporting findings at national and international meetings and scientific conferences. Beyond Burkina Faso, I participated in the analysis of RaMMPS data from Malawi and the DRC, in comparative analyses across study settings, although this thesis is focused on Burkina Faso.

2.1 The Burkina Faso RaMMPS survey

Burkina Faso, like many countries in SSA, lacks a national system capable of continuously monitoring mortality. Conventional data sources, including population censuses, DHS, and the CRVS system, have long constituted the backbone of mortality measurement in the country. However, these sources often suffer from important limitations in terms of coverage, periodicity, timeliness, and data quality (Helleringer et al., 2014; Mikkelsen et al., 2015). As a result, substantial gaps persist in the availability of recent, reliable, and disaggregated mortality data, particularly in contexts of rapid change or crises. The COVID-19 pandemic amplified these challenges, as mobility restrictions and physical distancing measures severely constrained F2F data collection and revealed the structural limitations of conventional survey systems (World Bank Group, 2022).

It was within this context that the RaMMPS project was implemented in Burkina Faso. The primary objective of RaMMPS was to assess the feasibility, validity, and operational performance of MPS as an alternative or complementary approach for measuring mortality in the general population, especially in settings where F2F data collection is constrained (RaMMPS, 2024). The project was developed as part of an international research initiative coordinated by the London School of Hygiene & Tropical Medicine (LSHTM) and aimed at strengthening national capacities for mortality measurement during periods of crisis and system disruption. RaMMPS was designed and rolled out against the backdrop of the COVID-19 pandemic, a period during which traditional household surveys and census operations were severely disrupted across many LMICs (DESA, 2021; Hasanov & Hasanova, 2020).

The RaMMPS project was a collaborative effort involving universities, governmental organizations, and non-governmental organizations (NGOs) from the USA, the UK, Belgium, Abu Dhabi, and each of the five participating countries: the DRC, Malawi, Mozambique, Bangladesh, and Burkina Faso. Figure 2.1 shows the geographic distribution of the RaMMPS case studies.

Burkina Faso is a landlocked country in West Africa, bordered by Mali to the north and west, Niger to the east, and Benin, Togo, Ghana, and Côte d'Ivoire to the south. It spans approximately 272,000 square kilometers and features a predominantly Sudano-Sahelian climate, characterized by a long dry season and a short rainy season. The landscape consists mainly of savannahs and plateaus, with limited water resources, increasing susceptibility to desertification and climate variability. The capital city, Ouagadougou, is situated in the central plateau and serves as the political, economic, and cultural center of the nation.

Burkina Faso's economy is primarily agriculture-based, employing over 70% of the labor force (World Bank Group, 2024). Subsistence farming and livestock production are the dominant activities, and the sector is heavily reliant on rainfall. In recent decades, gold mining has emerged as the country's main export and a significant driver of growth, contributing nearly 80% of export revenues (World Bank Group, 2024). Despite these advancements, the economy remains fragile and susceptible to external shocks, such as fluctuations in commodity prices, climate-related crises, and political instability. According to World Bank data (2024), Burkina Faso's GDP per capita is approximately USD 950, categorizing it among the world's low-income countries (World Bank Group, 2024). Ongoing insecurity linked to armed conflict since 2016 has further strained economic activity and displaced over two million people internally (CONASUR, 2022).

As of 2025, Burkina Faso has an estimated population of about 23 million, growing at nearly 3% per year (WPP, 2023). The population is predominantly young, with nearly 45% under the age of 15, in a context of high fertility estimated at about five children per woman. Urbanization is rapidly increasing, especially in Ouagadougou and Bobo-Dioulasso; however, over 70% of the population still lives in rural areas. This demographic structure presents both opportunities for economic growth and challenges in employment, education, and healthcare systems.

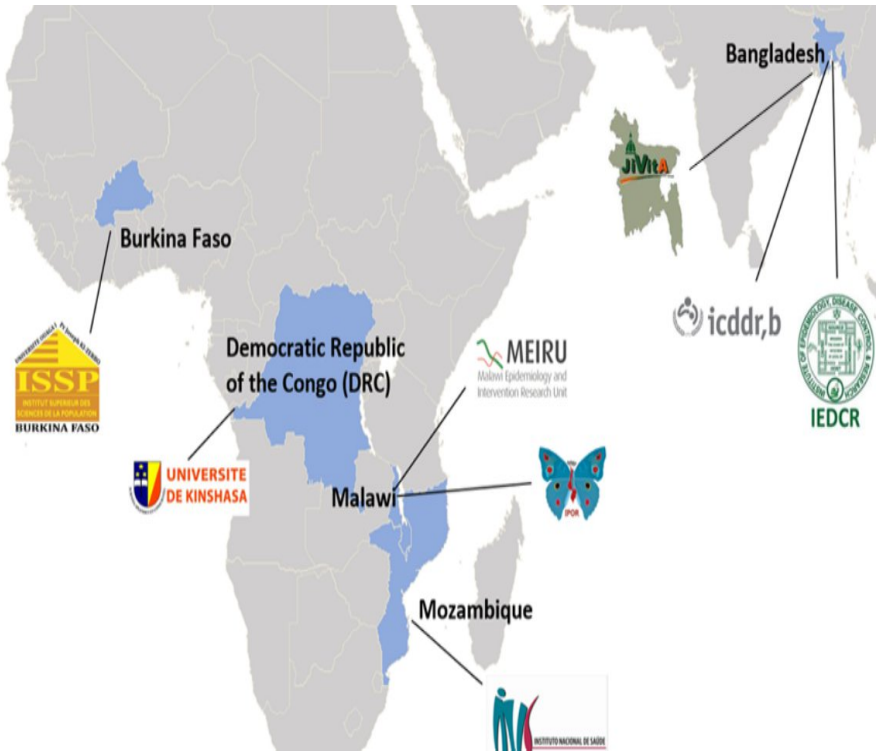
Burkina Faso faces significant public health challenges but has achieved progress in recent decades. Life expectancy at birth has risen from 52 years in 2000 to about 62 years in 2023 (World Bank Group, 2024). The under-five mortality rate has decreased significantly, from over 200 deaths per 1,000 live births in the early 1990s to around 74 per 1,000 in 2023 (UN IGME, 2024). Nonetheless, mortality rates remain high compared to global averages,

particularly in rural and conflict-affected regions. Major causes of death among children include malaria, respiratory infections, and neonatal complications (Millogo et al., 2019; WHO, 2025a). While maternal mortality has also declined, it remains high, estimated at about 320 deaths per 100,000 live births (UN IGME, 2024).

Burkina Faso has been facing a security crisis since 2015, initially marked by sporadic attacks in the northern and Sahel regions. Over time, this crisis has progressively spread to other areas bordering Niger, Togo, and Benin, particularly affecting the East, Center-East, Boucle du Mouhoun, and Center-North regions (Cedoca, 2022). The increasing frequency of incidents recorded across the country in 2021 and 2022 reflects the growing instability (ACSS, 2023). While the first attacks by armed groups primarily targeted security forces, their focus has gradually shifted towards civilians, including healthcare workers, teachers, and other professionals in critical public services. This escalation has led to widespread fear and disruption of essential services.

As a result, nearly 2 million people, approximately 10% of Burkina Faso's total population, were forcibly displaced within the country in 2022 (CONASUR, 2022). Beyond displacement, the crisis has severely affected livelihoods and access to basic services such as healthcare, education, and nutrition (WFP, 2023). Attacks by terrorist and armed groups have led to the destruction of health facilities, road infrastructure, and agricultural lands, depriving many rural populations of their primary source of income and deepening economic and social vulnerabilities.

Figure 2.1 : RaMMPS country case studies



2.1.1 Objectives of the Burkina Faso RaMMPS Project

The RaMMPS project aims to develop and validate innovative approaches for estimating mortality through MPS in LMICs. Implemented in the context of the COVID-19 pandemic, RaMMPS seeks to assess whether mobile phone–based data collection can provide timely, reliable, and cost-efficient mortality estimates in crisis-affected and resource-constrained settings (RaMMPS, 2024).

The project in Burkina Faso is structured around three specific objectives:

1. Methodological validation of mortality estimation by phone

RaMMPS tested some modifications of standard demographic tools, like truncated birth histories and survival reports for parents, siblings, and household members, for remote data collection. The primary goal was to assess the validity and reliability of mortality indicators obtained through phone interviews. This validation process included both ex-ante methods (e.g., comparing abridged and full questionnaires, evaluating bias related to mobile phone ownership) and ex-post comparisons of RaMMPS estimates against reference sources, such as DHS and Health and Demographic Surveillance Systems (HDSS).

2. **Application to excess mortality estimation during the COVID-19 pandemic**

The second objective was to estimate mortality rates by age, sex, and location, comparing pre-pandemic (baseline) and pandemic periods. This comparison was initially designed to allow for the estimation of excess mortality, capturing both the direct and indirect impacts of COVID-19.

3. **Assessment of cost-effectiveness and sustainability**

The third objective was to assess RaMMPS's potential as a cost-effective and scalable complement to traditional mortality surveillance systems, extending its use beyond COVID-19. To inform future large-scale implementation and improve the efficiency of mortality data collection, the project systematically gathered metadata on interview duration, resource utilization, and operational costs.

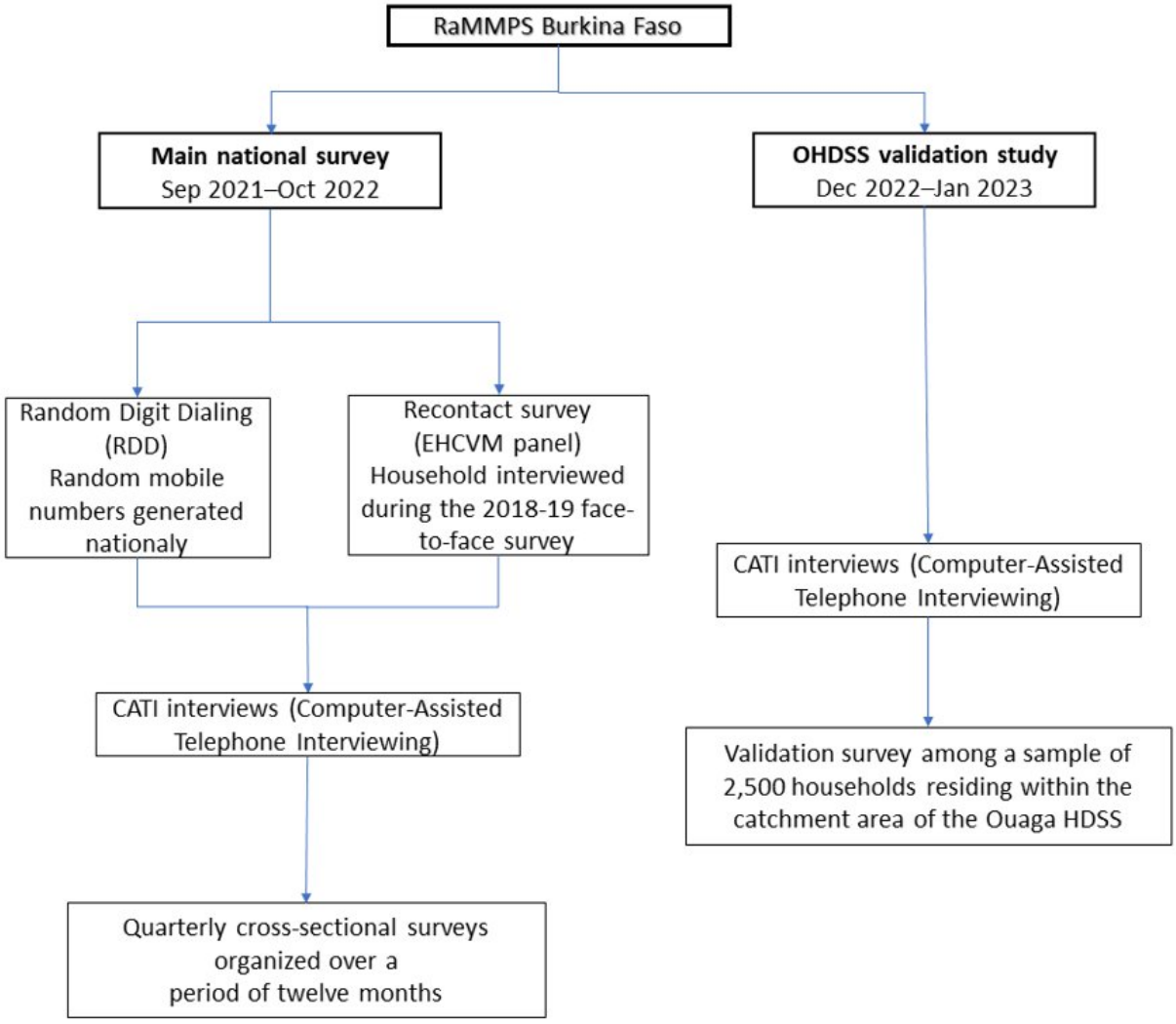
2.1.2 Survey design and target population in Burkina Faso

The target population of the RaMMPS project in Burkina Faso comprised all individuals residing within the national territory at the time of the survey who were aged 15 years or older, irrespective of sex, place of birth, or other socio-demographic characteristics. The RaMMPS survey in Burkina Faso comprised two main components. First, repeated cross-sectional surveys were conducted on samples designed to be nationally representative. Second, targeted sub-samples were drawn from populations already covered by the OHDSS to support validation analyses.

As indicated earlier, two strategies were used for recruiting participants in the cross-sectional surveys (Figure 2.2).

The first approach consisted of re-interviewing household heads who had previously participated in the 2018–19 F2F EHCVM survey and who were still residing in Burkina Faso at the time of the RaMMPS survey. The second approach included recruiting individuals aged 15 and above who were residing in Burkina Faso at the time of the survey and were reached through random digit dialing (RDD: described below). For both components, collective households were excluded from the sampling frame for practical and methodological reasons.

Figure 2.2: Overview and timeline of the RaMMPS Burkina Faso data collection



2.1.2.1 First component: Cross-sectional surveys

The RaMMPS survey in Burkina Faso relied on monthly repeated cross-sectional surveys conducted over a twelve-month period. This design was chosen to minimize the influence of seasonality, which can bias mortality estimates derived from single point-in-time surveys. In total, approximately 1,250 individuals were targeted for interview each month, corresponding to an initial objective of a cumulative sample of 15,000 individuals over the study period.

The sample size was determined based on the estimated crude death rate in Burkina Faso. This sample was sufficiently large to detect the impact of the COVID-19 pandemic on mortality, including changes occurring over sub-annual periods, thereby allowing for the analysis of short-term mortality fluctuations.

Two complementary sampling strategies were implemented. First, a sample of approximately 6,000 individuals was drawn from households previously interviewed in the EHCVM, using the mobile phone numbers collected during the F2F survey. Second, an additional sample of 9,000 individuals was obtained through RDD of mobile phone numbers. The combination of these two sampling approaches was intended to enhance population coverage and to assess potential selection biases associated with different phone-based sampling frames.

Sampling strategy 1**: EHCVM-based sample**

The EHCVM was a nationally representative household survey conducted between September 2018 and July 2019 across the entire territory of Burkina Faso. It relied on a two-stage stratified sampling design and provided representative indicators at the level of the 13 administrative regions and by place of residence (urban/rural). In total, 26 strata were defined by crossing region and residence.

At the first stage, a sample of 1,075 enumeration areas (EAs) was independently selected within each stratum. Prior to selection, the sampling frame was sorted by region, province, municipality, and EA code. Primary sampling units were then selected using systematic sampling with probability proportional to size (PPS), where size was defined as the number of households enumerated. This procedure introduced implicit stratification across lower administrative levels and strengthened the representativeness of the resulting sample.

A complete household listing operation was then carried out in each selected EA. This operation produced a comprehensive list of resident households, detailed sketch maps delineating EA boundaries, and the geographic location of each structure. At the second stage, households were selected from the updated household lists using systematic sampling with equal probability.

Among the households surveyed in the original EHCVM surveys conducted face-to-face, those for which the household head had a valid mobile phone number constituted the sampling frame for the first phone-based strategy. The regional and urban–rural distribution of these households is summarized in Table 2.1.

Table 2.1 Distribution of households with a valid phone number by region and place of residence (EHCVM 2018–2019)

Region	Rural	Urban	Total
BOUCLE DU MOUHOUN	240	332	572
CASCADES	221	220	441
CENTRE	559	263	822
CENTRE EST	235	334	569
CENTRE NORD	223	268	491
CENTRE OUEST	240	249	489
CENTRE SUD	237	226	463
EST	263	262	525
HAUTS BASSINS	347	372	719
NORD	210	227	437
PLATEAU CENTRAL	191	226	417
SAHEL	232	202	434
SUD OUEST	281	216	497
Total	3479	3397	6876

In total, 7,010 households were covered by the EHCVM in 2018-19. Among them, 6,266 mobile phone numbers were collected from household heads, and an additional 610 phone numbers were recorded for another household member in households where the head did not have a phone. Overall, 6,876 phone numbers allowed direct or indirect contact with household heads. In addition, the survey recorded 4,176 phone numbers of non–household-head members, which were used as alternative contacts in cases where the household head's number was no longer functional. The EHCVM arm of the MPS relied on both sets of numbers.

Sampling strategy 2**: Random Digit Dialing (RDD)**

In addition to the mobile phone numbers of household heads available from the EHCVM survey, the study also relied on a Random Digit Dialing (RDD) strategy, based on a sample of 9,000 mobile phone numbers generated through a multi-step process.

First, the project team generated the full universe of potential mobile phone numbers in Burkina Faso using the operator-specific prefixes assigned to the mobile network providers active in the country. At the time of the survey, three operators—Orange, Moov Africa, and Telecel—provided mobile services nationwide. Each operator used, on average, 8.33 two-digit prefixes, yielding an estimated pool of approximately 25 million possible numbers, given that mobile phone numbers in Burkina Faso consist of eight digits.

Because only a fraction of these numbers were operational, a second filtering step was implemented to identify functional phone numbers. This process was carried out with technical support from VIAMO, which used automated calls based on Interactive Voice Response (IVR) technology to screen and retain active numbers.

After excluding phone numbers already collected through the EHCVM survey, the study planned approximately 45,000 call attempts. This estimate was informed by a similar RDD-based study conducted in Burkina Faso among women of reproductive age, which reported a non-response rate of approximately 50% (Greenleaf et al., 2020). To account for additional constraints related to quota-based stratification by sex, age group, and place of residence, a more conservative non-response rate of 80% was assumed (Table 2.2).

Quota targets were derived from the most recent population census and were designed to ensure the representativeness of the sample. In particular, quotas reflected the relative population weights of Ouagadougou, Bobo-Dioulasso, other urban areas, and rural areas, as well as age group and sex distributions. Special emphasis was placed on women of reproductive age (18–49 years) to address limitations of the EHCVM-based strategy and to improve the estimation of child mortality. For practical and ethical reasons, adolescents under 15 years of age and elderly individuals (more than 64 years old) were excluded from the target population.

Calls to functional numbers were conducted quarterly until quotas for each subgroup were reached. When a specific quota was not achieved during a given quarter, respondents who did not meet eligibility criteria could be asked to refer another eligible household member. This two-step referral approach was applied selectively and aimed to achieve quota targets while avoiding the systematic interviewing of multiple individuals from the same household. Once a quarterly quota was reached, additional eligible respondents in that subgroup were, with their consent, registered and recontacted in subsequent trimesters. To prevent overrepresentation of specific age groups, the age distribution of respondents was monitored continuously, and quarterly quotas were adjusted when necessary.

Table 2.2 : *Quarterly allocation of the RDD sample by place of residence, age group, and sex.*

Place of residence	Male 18-49	Female 18-49	Both 50-64	Total
Ouagadougou	87	174	29	290
Bobo-Dioulasso	30	60	17	107
Others cities	70	140	31	241
Rural	448	896	268	1612
Total	635	1270	345	2250

2.1.2.2 Methodological validation study using the Ouagadougou Health and Demographic Surveillance System

In addition to the nationally representative surveys, a dedicated validation survey was conducted among a sample of 2,500 individuals residing within the catchment area of the population observatory of Ouagadougou (OHDSS). Participants included individuals who had resided continuously within the OHDSS area since its establishment, as well as immigrants who had moved to the area sufficiently long ago to meet the criteria for permanent residency. The primary objective of this validation exercise was to compare mortality estimates derived from the RaMMPS approach with those obtained from the routine longitudinal data collected by the OHDSS, which served as a reference source.

The OHDSS is a research and intervention platform established in late 2008 (Rossier et al., 2012). It covers five neighborhoods of the capital city, including two formal areas (Tanghin and Kilwin) and three informal settlements (Polesgho, Nonghin, and Nioko 2) (Figure 2.3). The HDSS was established through the delineation of a clearly defined geographic surveillance area, followed by a baseline census and regular follow-up rounds to monitor demographic dynamics, including births, deaths, and migrations. At the time of the validation study, the population under surveillance was estimated at approximately 90,000 individuals, distributed across nearly 20,000 households.

For each household, the OHDSS database included mobile phone numbers for the household head and for all adults aged 15 years and older. For the validation study, a total of 3,500 individuals were selected to reach 2,500 individuals using a multi-component sampling strategy designed to maximise the number of observed deaths in households and among close relatives.

First, all individus that had recorded at least one death during the period 2019–2020 in the OHDSS routine data collection were systematically included in the validation sample. On

average, the OHDSS recorded approximately 300 deaths per year. Second, individus whose reported the deaths of close relatives (parents or siblings) residing outside the OHDSS surveillance area were sampled to validate the reporting of adult mortality through the RaMMPS questionnaire modules. Finally, the remaining households were selected through a stratified random sampling design, with strata defined by neighborhood and sample sizes allocated proportionally to the number of households in each area. Details are provided in Table 2.3.

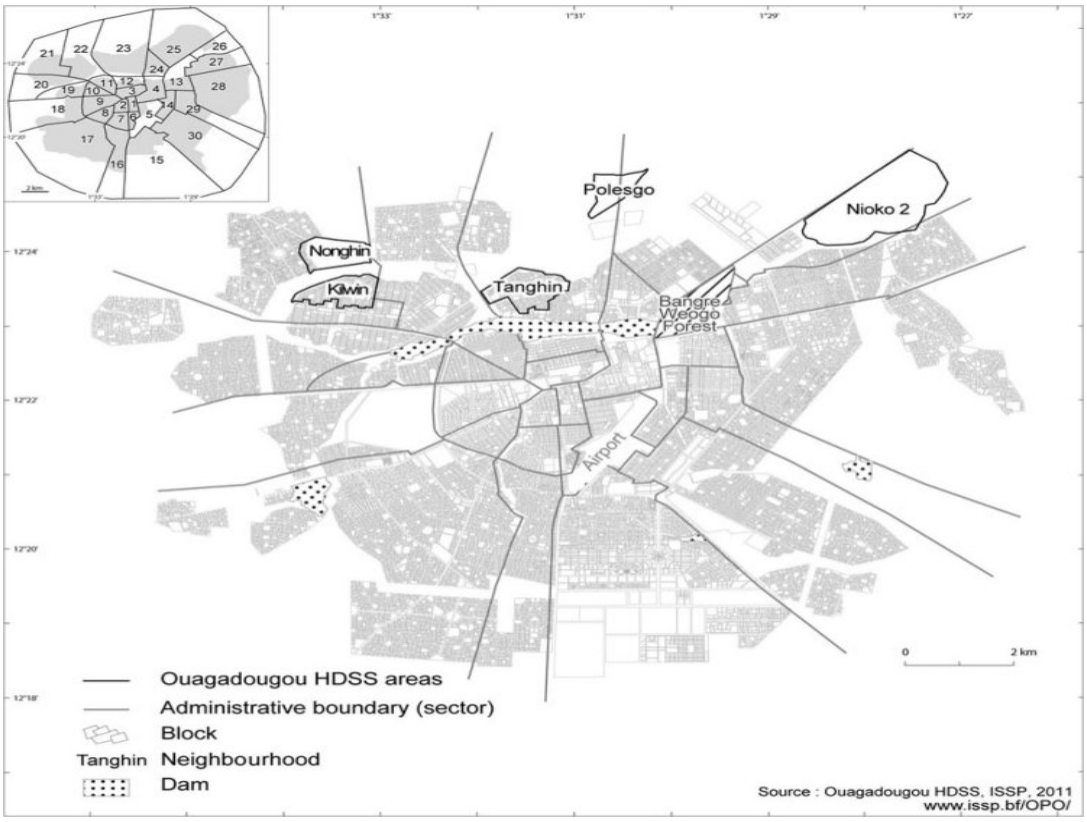
Table 2.3: Sampling criteria based on recent mortality events reported by respondents in OHDSS

	U5 child death in the last 10 years	**Sibling death in the last 5 years**	**Parental death in the last 5 years**	**Sample**
F18-49	yes	no	no	400
F18-49	yes	no	yes	17
F18-49	yes	yes	no	0
F18-49	yes	yes	yes	0
F18-49	no	no	no	343
F18-49	no	no	yes	1437
F18-49	no	yes	no	52
F18-49	no	yes	yes	3
Subtotal				2252
M18-64 or F50-64		yes	no	92
M18-64 or F50-64		no	yes	721
M18-64 or F50-64		yes	yes	11
M18-64 or F50-64		no	no	441
Subtotal				1279
Total				3517

Note: F: Female; M: Male; U5: Under-5

This design was intended to assess the accuracy, completeness, and consistency of mortality estimates produced by the RaMMPS phone-based survey approach, both for household deaths occurring within the surveillance area and for reported deaths of close relatives outside the OHDSS, using the longitudinal HDSS data as a benchmark.

Figure 2.3 : Location of settlements monitored by the Ouagadougou HDSS



2.1.3 Fieldwork

Interviews for both the national surveys and the validation study were conducted daily at dedicated call-center facilities and occasionally outside the center for specific appointments. To optimize contact rates, interviewers worked six days a week with one and a half days off, chosen flexibly but excluding weekends.

Data collection was based on tablets through CAPI and data was stored on the SurveyCTO platform. At the end of each day, interviewers reported to their controllers with a detailed summary of their activities, including total calls made, completed interviews, partial interviews (where the household questionnaire was completed but the woman of reproductive age was unavailable), unanswered calls, scheduled callbacks, invalid numbers, and any ineligible or non-resident cases.

After verifying data consistency and completeness, controllers submitted validated records to the server. Supervisors reviewed the daily uploads, flagged inconsistencies, and provided

feedback to the teams. For interviews scheduled outside standard hours, controllers ensured that the corresponding data were included in the next day's transmission.

Supervisors conducted daily visits to field teams to monitor progress, troubleshoot operational issues, and ensure compliance with data quality standards. They also participated in interviews unannounced to detect possible misconduct. Quarterly review meetings with all field teams assessed progress, discussed data inconsistencies, and identified operational challenges. Issues needing technical support were referred to the IT or coordination teams.

2.1.3.1 Pre-test phase

A pre-test was carried out to evaluate the technical, organizational, and methodological readiness of the data collection system. The pilot aimed to identify weaknesses in the questionnaires, phone interview procedures, interview duration, and population response.

The pre-test sample included participants from both survey branches. For the EHCVM-based strategy, individuals were selected from a list of 5,279 valid contact numbers collected from household heads and reference persons living outside the main household. For the RDD-based strategy, a subset of 3234 randomly generated phone numbers was used exclusively for testing and excluded from the main survey. A total of 470 respondents were surveyed: 250 by the RDD branch and 220 by the EHCVM branch.

2.1.3.2 Main data collection

The main data collection phase lasted 12 months.

Interviewers were required to maintain strict confidentiality throughout the process. All electronic questionnaires were password-protected and synchronized automatically with the central server. Interviews were conducted daily—during daytime, rest hours, public holidays, and up to 8:00 p.m. to maximize respondent reach. Each interviewer kept a follow-up log documenting refusal, unavailability, language barriers, duplicates, and rescheduled interviews.

A two-tier supervision structure ensured data quality:

- **First level – controllers:** each controller supervised 4 to 5 interviewers, coordinating fieldwork, ensuring adherence to call procedures, monitoring progress, providing technical assistance, conducting quality control through re-interviews, and verifying non-response rates. When non-response exceeded predetermined thresholds, controllers followed up directly with non-respondents and reported findings to supervisors.
- **Second level – IT assistant:** the IT assistant managed hardware and software, resolved technical issues related to data and tablets, and supported ongoing data quality monitoring during and after fieldwork.
- **Supervisors:** supervisors documented field operations, coordinated logistics, participated in training and preparation activities, and ensured data consistency through regular reviews. Their responsibilities also included redistributing phone numbers, organizing refresher sessions for interviewers, and convening regular team meetings to assess progress and challenges.

At the national level, the technical coordination team oversaw all data collection teams, monitored data flow, and reviewed daily uploads to identify anomalies and ensure smooth operations.

2.1.3.3 Validation study

To ensure consistency, the validation survey was conducted by the same interviewers who participated in the main data collection. Despite their prior experience, these interviewers received additional training on the adapted data collection instruments. These instruments were designed to facilitate record linkage. Following this training, the ten interviewers conducted a pilot series of telephone interviews with individuals within the OHDSS surveillance area. This pilot aimed to verify the internal consistency, clarity, and feasibility of the adapted questionnaires, which included specific questions and formats optimized for the OHDSS database structure and the record linkage process.

Data collection for the validation survey spanned approximately one month, from December 7, 2022 to January 21, 2023. Field operations were organised into two teams. Each team comprised four female interviewers and one field supervisor. The decision to select only female interviewers was made to enhance rapport and trust with respondents, particularly in a cultural context where female interviewers may be perceived as more approachable for sensitive health-related discussions.

2.1.4 Questionnaire content and modules

Each sampling strategy was associated with a specific questionnaire, with details varying according to the strategy used (Table 2.4). Using the EHCVM-based sampling strategy, the target population included household heads aged 15 years and older who had been interviewed during the EHCVM, and women of reproductive age (15–49 years) living in their households. Each household head was initially contacted by phone and asked questions regarding household composition, deaths in the household in the past three months, parental survival, and sibling survival, using shortened instruments, as described below. They were also asked about COVID-19 vaccination status.

With the consent of the household head, a complete list of women aged 15–49 years living in the household at the time of the phone survey was compiled. Based on EHCVM data, the average number of women of reproductive age per household was estimated to be 1.3. One woman was then randomly selected from each household and interviewed, either immediately after the household head's interview using the same phone, or later, after obtaining the woman's phone number. The women's questionnaire gathered information on truncated birth histories, parental and sibling survival, and COVID-19 vaccination status.

The questionnaire used for the RDD strategy was similar to that used for the EHCVM-based sample. Detailed questionnaires are available in Appendix Table 11.1, Table 11.2 and Table 11.3.

Table 2.4 : Overview of questionnaire modules and respondent characteristics in the EHCVM follow-up and RDD phone survey arms

Modules	EHCVM		RDD	
	HH head (15 years old or more)	Women of reproductive age (15-49 years)	Main respondent	Women of reproductive age (15-49 years)
Introduction + language screening	v	v	v	v
Interview format	v	v	v	v
Socio-demographic characteristics of the respondent	v	v	v	v
Covid-19 vaccination status of the respondent	v	v	v	v
Composition of household and deaths in the last three months	v	x	v	x

Parental survival	v	v	v	v
Sibling survival	v	v	v	v
Details on reported deaths	v	v	v	v
Summary birth history		v		v

2.1.5 Ethical considerations

This research was conducted in compliance with ethical standards in place in Burkina Faso, in accordance with internationally accepted principles for research involving human participants. Participation was entirely voluntary.

All individuals contacted by telephone received clear and comprehensive information about the study, including its objectives, the nature of the data collected, and the measures implemented to ensure confidentiality and data protection. These explanations were provided in the language in which respondents felt most comfortable, prior to obtaining their informed consent. For adolescents aged 15–17 years, participation required both the adolescent's assent and the prior consent of the household head. For respondents reached through random digit dialling, informed consent was also obtained before proceeding with the interview.

At the end of each interview, field staff sent respondents an SMS containing the contact details of a project focal person whom they could contact for additional information if needed, as well as the contact information of the relevant ethics committee. All field activities were carried out under the direct supervision of a team leader, who ensured compliance with ethical protocols and data protection procedures.

All collected data were anonymised prior to analysis, and respondents were informed about the intended dissemination of the study results, including scientific publications and policy-oriented outputs. The study protocol was approved by the Observational Research Ethics Committee of the London School of Hygiene and Tropical Medicine (reference: 26393/RR/24486) and the Burkina Faso Health Ethics Committee (Ref N° 2021-07-177). All participants provided verbal consent for the survey, including consent for storing anonymized data in a public repository and consent to audio-record the interview.

2.1.6 Difficulties experienced during data collection

2.1.6.1 Difficulties encountered during the main RaMMPS survey

To document the challenges and operational changes encountered across the different phases of RaMMPS data collection, I conducted a semi-structured qualitative interview with all fieldworkers involved in the different surveys. The interviews focused on their experience of the survey process, the difficulties encountered, the strategies adopted to address them, and suggestions for improving future MPS data collection. All interviews were audio-recorded using secure digital devices, transferred to a protected storage environment, and anonymized to remove any personally identifiable information. Recordings were transcribed verbatim and checked for accuracy and completeness. The qualitative material was analyzed using NVivo, which was used to develop and apply a thematic coding framework centered on recurrent challenges, adaptive practices, and operational recommendations. The coded data were used to complement the quantitative analyses and to provide contextual interpretation of the data collection process. I interviewed a total of 11 respondents. All interviews and analyses were conducted in French; excerpts and verbatim quotations presented in this section were translated into English.

2.1.6.1.1 Security-related constraints and population displacement

The security situation constituted one of the most significant challenges of the survey mentioned by interviewers. The ongoing destruction of mobile phone towers in insecure areas affected network coverage and call quality, particularly in the Sahel region, where a large number of phone numbers were unreachable or no longer functional. As one interviewer explained, *"with the EHCVM sample, it was very difficult because most of my numbers were in rural areas and many of them did not go through."* Network constraints were reported across all mobile operators, with marked differences by place of residence. Orange numbers were more common in rural areas and, despite frequent connectivity problems, accounted for a large share of completed interviews, whereas Onatel and Telecel predominated in urban settings. As noted by an interviewer, *"we often choose Orange to reach more rural areas… when we complete 20 interviews, more than 10 are with Orange numbers."* These findings are consistent with a study conducted by the Burkinabè Regulatory Authority for Posts and Electronic Communications (ARCEP: Autorité de régulation des postes et des communications électroniques in French), as reported by the Ecofin Agency, which identifies the Orange

network as the leading provider in terms of network coverage in Burkina Faso (Ecofin, 2025). The same source reports a sharp increase in the number of mobile phone towers destroyed by terrorist groups, from 11 in 2019 to 106 in 2022. In addition, the number of sites that were out of service or inaccessible rose from 632 in 2022 to 681 in August 2023. According to the authorities, this deterioration has resulted in a 10–20% reduction in overall network coverage (Ecofin, 2025).

In addition, the prevailing climate of insecurity generated fear, mistrust, and reluctance among potential respondents, which reduced participation and led to frequent refusals. Interviewers reported that respondents sometimes associated unsolicited phone calls with security threats or fraud: *"If the call goes through, there are many refusals because of mistrust in this context of insecurity. Some people even say that it is terrorists or scammers calling."* Population displacement further complicated data collection, as internal mobility altered household structures and availability. Several respondents could only be reached because they had temporarily relocated to urban areas with better network coverage. As one agent reported, *"we often reach the household head, and he tells us that the call goes through only because he has come to the city; otherwise, in his village there is no network."* These dynamics contributed to difficulties in meeting rural quotas, as displacement flows were largely directed toward urban centres and IDP camps.

2.1.6.1.2 Sampling and coverage challenges related to phone ownership

Unequal access to mobile phones across population groups posed additional limitations. It proved particularly difficult to reach women of reproductive age in rural areas and adults aged 50 years and above, who are less likely to own or use mobile phones. These constraints were compounded by weak and uneven network coverage in rural settings, where a substantial share of phone numbers could not be reached, regardless of the operator. As one interviewer noted, *"with the EHCVM sample, it was very difficult because most of my numbers were in rural areas and many of them did not go through,"* while another emphasized that *"across all three mobile networks, there were phone numbers that did not go through."* In some cases, contact was only possible because respondents had temporarily relocated to urban areas with better connectivity: *"we often reach the household head, and he tells us that the call only goes through because he has come to the city."*

2.1.6.1.3 Difficulties in obtaining informed consent and accessing female respondents

Although overall non-response rates remained relatively low, obtaining informed consent was sometimes challenging. Some respondents refused participation due to the absence of prior public sensitisation campaigns through television, radio, newspapers, or community leaders, while others conditioned their participation on financial compensation. In addition, mistrust related to insecurity occasionally led respondents to restrict access to selected household members or to disengage after initial contact.

Gaining access to women of reproductive age proved particularly complex and was often mediated by male household heads. In several cases, men questioned the relevance of interviewing women, stating that *"it is not necessary for women to answer these questions, because men have already been interviewed."* When interviewers requested to speak directly with a woman, household heads sometimes refused to share contact details or claimed that the woman did not own a phone; follow-up calls frequently went unanswered. As one interviewer explained, *"if the household head does not trust you, he may not pass on the number, and when you call back, he no longer answers."*

In other situations, household heads challenged the respondent selection process, asking *"why not just talk to the person who is here instead of selecting someone else,"* or attempting to replace the randomly selected woman with another household member. One interviewer reported that *"the tablet selected the first woman, but the household head insisted on switching to the second woman, otherwise there would be no woman interviewed in the household."* Control over the interview also extended to communication itself, with interviewers sometimes required to explain the survey in detail to the husband before he agreed to hand over the phone: *"you are forced to repeat everything you want to say to the woman before he passes the phone."*

Even when women answered the call, participation often depended on male approval. Interviewers noted that *"some women hand the phone to their husband as soon as you start speaking, and without his approval, they do not talk."* Conversely, cooperation was generally easier when the household head had already agreed to the interview or had introduced the study to the woman: *"when the woman is selected through the interview with the household head, she cooperates more easily."* Nevertheless, practical constraints remained, as women sometimes declined participation after receiving the phone, citing lack of time or competing domestic responsibilities.

2.1.6.1.4 Limitations in the accuracy and completeness of reported information

Several types of information proved difficult to collect reliably:

2.1.6.1.4.1 Location, age, and personal identifiers

Respondents were often reluctant to disclose their location at the time of the call, their exact age, or their names, particularly the names of children. Age misreporting was frequent, with a tendency toward rounded or implausible ages, especially among non-literate respondents and rural populations. In several cases, inconsistencies only became apparent during the reproductive history module. As one interviewer reported, *"a woman said she was 18 years old, but during the birth history she reported having four children; after further questioning, she then said she was 30"*.

Women, in particular, sometimes understated their age, either because of limited knowledge or as a deliberate strategy to limit disclosure. The interviews also suggest that fear and mistrust related to the security context played a role. Some respondents initially provided incomplete or inaccurate information, then later contacted the survey team to correct it, explaining that *"they were afraid at the beginning"* and subsequently giving their true name and place of residence. These patterns indicate that age misreporting and incomplete identification were not only measurement issues but also responses shaped by insecurity and perceived risks associated with phone-based interviews.

2.1.6.1.4.2 COVID-19–related information

The COVID-19 module posed particular difficulties, especially among respondents who questioned the relevance or even the existence of the disease. Some respondents explicitly rejected the topic, arguing that COVID-19 was not a priority in a context marked by insecurity and other pressing concerns, and in some cases terminated the interview immediately. As one interviewer noted, *"some respondents said they did not believe that COVID-19 existed, that the country had more urgent security problems, and then hung up the phone."*

In other cases, respondents expressed confusion about the link between COVID-19 and questions on deaths, particularly when the reported events preceded the pandemic. Interviewers reported that *"some people do not want to talk about deaths because they occurred long ago and have no connection with COVID-19, and they do not understand why these questions are*

asked." Socio-economic hardship also shaped responses: several respondents emphasized food insecurity or malaria as more immediate concerns, stating that *"when there is food, or a solution to malaria, then they will talk."* In addition to these refusals and objections, many respondents who agreed to continue were unable to recall the name of the COVID-19 vaccine or the number of doses received, further limiting the completeness of the information collected.

2.1.6.1.4.3 Parental and sibling survival histories

Information on parents' ages, whether current or at death, was often imprecise, particularly among older respondents. Interviewers reported that many respondents did not consider parental age as salient information and therefore provided only approximate values. As one interviewer explained, *"many people do not really pay attention to their parents' age, so they give approximate answers."* This imprecision was frequently associated with low literacy levels, as respondents sometimes expressed age using local linguistic conventions rather than numerical values.

Similar difficulties were observed in the sibling survival module, where respondents often struggled to recall the number, names, and ages of siblings, especially older or deceased ones. These reporting challenges appeared to stem primarily from limited knowledge and recall constraints, although in some cases they were compounded by hesitation or mistrust toward the interviewer.

2.1.6.1.5 Sensitivity of mortality-related questions

Questions related to the circumstances of death were among the most emotionally sensitive components of the survey. Many respondents avoided providing details because recalling deaths triggered emotional distress or painful memories. In some cases, respondents explicitly declined to answer after disclosing traumatic experiences. As one interviewer reported, *"there was a respondent who kept saying that he did not know the details of his parents' death; eventually he said that his father had hanged himself, which was why he did not want to answer."*

Other respondents questioned the relevance of certain items, such as the place of burial, which they viewed as intrusive or unrelated to the survey objectives. As one interviewer noted, *"some people think that it is not necessary to know where the deceased was buried."* In addition, several respondents expressed concern that questions on death circumstances were intended to

attribute deaths to COVID-19, *"some people think that these questions are meant to claim that COVID caused the death"*.

These difficulties were especially pronounced when deaths had occurred early in respondents' lives or when respondents were elderly. Interviewers noted that *"the parents died when the respondents were very young,"* limiting the availability of detailed information. While some interviewers reported that women were generally more willing to discuss these issues than men, repeated probing often increased discomfort and, in some cases, led to early termination of the interview.

2.1.6.1.6 Household composition and women's reproductive histories

Misunderstandings arose regarding household size, as respondents sometimes included non-resident children or extended family members. In women's birth histories, reluctance to disclose children's names and ages was common. In some cases, pseudonyms (e.g., "Baby") were used to avoid refusal. These difficulties were more frequent in rural areas and among certain ethnic groups. For example, *"for women of Peulh ethnicity, it is especially for their first child that they do not want to provide this information."* Reporting on multiple child deaths was particularly challenging due to the emotional burden. As one interviewer noted, *"there was a woman who had eight births and five of the children died."*

2.1.6.2 Other difficulties and comments from the RaMMPS interviewers.

2.1.6.2.1 Interviewers' experience and comparison between survey modes

Most interviewers had prior experience in data collection and had conducted both F2F and MPS. In terms of productivity and perceived data reliability, the majority expressed a preference for F2F interviews. According to them, poor network coverage exacerbated by the country's security situation and frequent electricity shortages limited the feasibility of MPS in many areas. As one interviewer noted, *"When the call does not go through or the person does not answer, there is nothing you can do."*

A major difficulty of MPS concerned informed consent and the establishment of trust. Several interviewers emphasized that the absence of physical interaction reinforced suspicion, especially in a context marked by widespread phone scams. One agent noted that *"information is more reliable in face-to-face surveys because when the person sees you and you interact*

physically, there is an 80% chance of getting good information compared to the phone. With all the scams going on, calling someone who has never seen you and does not know you makes it uncertain whether they will provide accurate information." By contrast, trust was perceived as easier to establish during F2F interviews, where supervisors could also intervene to address refusals. Some interviewers nevertheless suggested that increased experience with phone interviewing or prior community sensitization could help reduce mistrust and refusal rates.

Interviewers also expressed concerns about data reliability in phone interviews. Physical presence during F2F surveys allowed some degree of verification, such as checking identity documents or clarifying household composition, which was not possible by phone. In addition, respondents interviewed remotely were perceived as less attentive and less likely to reflect carefully on their answers. As one interviewer observed, *"the respondent does not really have time to think, for example to properly count household members before answering."*

Despite these limitations, several interviewers acknowledged the operational advantages of MPS. They were described as easier to organize, safer in insecure contexts, and capable of reaching respondents in remote areas or individuals absent from their households during in-person visits.

2.1.6.2.2 Comparison of EHCVM and RDD strategies

Interviewers reported differences between the two sampling strategies. Under EHCVM, trust was established more quickly due to prior contact and availability of background information, which often improved cooperation and data quality. As mentioned by one interviewer "*For consent, things went relatively well with the EHCVM strategy, since some people were already familiar with participating in several studies, and some therefore accepted quite easily. ... As for the RDD approach, personally I did not experience major difficulties in reaching people, because it largely depends on how you approach the respondent.*" However, repeated use of the same contacts led to respondent fatigue and frustration.

RDD offered access to less survey-exposed respondents and sometimes facilitated higher completion rates, especially before quotas were reached. Nonetheless, suspicion regarding the source of phone numbers was common *"... Others also ask how we obtained their phone number and consider us to be scammers"*, and some interviewers questioned the reliability of responses due to limited trust.

Overall, interviewers agreed that data quality depended less on the sampling strategy itself than on their ability to establish trust. Once consent was obtained, perceived differences in response reliability between EHCVM and RDD diminished.

2.1.7 Recommendations

Interviewers recommended implementing advance communication campaigns through radio, television, and social media to inform the population about upcoming surveys. One of the interviewers suggested, before adding that "*we encountered difficulties because many people complained that the information had not been disseminated and that they were not aware of the survey*". Such campaigns could improve participation rates and enhance data quality, as many respondents reported not being aware of the survey. Raising public awareness before and throughout the data collection period would help legitimize the survey and reduce suspicion. Interviewers emphasized that communication and sensitization campaigns should be conducted in multiple local languages to improve accessibility and cooperation. Among respondents who refused to participate, several cited unfamiliarity with the survey or the absence of prior information disseminated through trusted media channels, such as radio or television, as their main reasons for refusal. An interviewer added, "…m*any people do not cooperate with the phone survey because they say they cannot see the interviewer. Others do cooperate but make the same remark, while some say they were not informed about our work because it was not announced on the radio or on television*." Continuous sensitization throughout the data collection period rather than only before its launch was seen as critical to building trust, reducing fear, and dispelling concerns about phone-based scams.

To improve working conditions and overall data collection quality, interviewers emphasized the importance of adequate call-center infrastructure. This includes sufficiently large and well-spaced rooms to minimize noise and echo during phone interviews, as well as proper infrastructure such as electricity, ventilation, and reliable internet access. In contexts where space is limited, reducing the number of interviewers per room was suggested as an alternative. Interviewers also mentioned the need for higher-quality headsets and more suitable tablets to facilitate clear communication and efficient data entry.

Another key recommendation concerns the timely and continuous provision of call credit. Ensuring that interviewers have uninterrupted access to call credits would allow them to honor scheduled appointments with respondents. Similarly, respondent incentives should be delivered promptly. Delays in sending airtime incentives undermine trust and may negatively affect participation in future surveys, as some respondents follow up to complain or express

dissatisfaction. To further enhance credibility, interviewers suggested registering survey SIM cards under the name of the hosting institution (e.g., ISSP), enabling respondents to easily identify the caller and verify the legitimacy of the survey.

Survey fatigue emerged as an important factor contributing to refusals, particularly in the context of repeated telephone contacts. Interviewers reported that many respondents expressed frustration at being frequently called without receiving any tangible benefit, noting that *"there are many refusals because respondents say they are tired of phone calls; it is always them who are called and they gain nothing from it."* This frustration was sometimes reinforced by comparisons with neighboring communities, as some respondents pointed out that *"in nearby villages, surveys were conducted and people received many things, while they are tired of being called and receive nothing."* Unfulfilled promises made during previous phone-based surveys further undermined trust in telephone data collection. As one interviewer explained, *"there have also been unfulfilled promises of rewards in previous so-called MPS, which makes future MPS increasingly difficult."* In some cases, respondents explicitly voiced their irritation, stating that they recognized their phone number but felt harassed: *"they acknowledge that it is them, but they say we are bothering them."* Complaints about promised but undelivered incentives were common, with interviewers reporting that *"many complain that they were promised gifts that they never received, so they no longer want to talk to us."* While negotiation sometimes allowed interviews to proceed, others categorically refused participation, arguing that *"they no longer want to talk and prefer face-to-face visits."* With regard to the EHCVM-based sampling strategy, interviewers emphasized growing dissatisfaction linked to repeated use of the same contact lists. Several respondents suggested that *"if there were another study based on the EHCVM, the new data should be used instead of the old EHCVM database, since many other studies have already been conducted using these same phone numbers."* In response to these concerns, interviewers recommended updating and diversifying phone number databases to reduce repeated contacts, limit respondent fatigue, and improve cooperation in future MPS. Finally, improvements in team management and supervision were suggested. Extending rest periods from one and a half to two days and setting clear, realistic performance targets were also mentioned as ways to improve interviewer motivation and productivity.

Additional interviewers also reported that several respondents expressed a desire for higher incentives; the current level of compensation may be insufficient to motivate participation in certain contexts.

2.2 RaMMPS surveys in Malawi and DRC

This section presents, more succinctly than for the survey in Burkina Faso, the corresponding RaMMPS surveys conducted in Malawi and DRC, as these surveys will be used to compare results from Burkina Faso with other contexts. The RaMMPS survey was coordinated in DRC by the *Ecole de Santé Publique de l'Université de Kinshasa* (UNIKIN); and in Malawi, it was a joint collaboration between the *Malawi Epidemiology and Interventions Research Unit* (MEIRU) and the *Institute for Public Opinion Research* (IPOR). All protocols received approval from both national health ethics committees and the LSHTM Research Ethics Committees. The study protocol for DRC was reviewed by Ethics Committee of the University of Kinshasa, and the University of Malawi Research Ethics Committee (reference: P.07/21/76) for Malawi. Ethics Committee of the London School of Hygiene and Tropical Medicine (reference: 26393/RR/24486) for both countries. All participants provided oral consent for each survey, including consent for storing anonymized data in a public repository and consent to audio record the interview (RaMMPS, 2024).

The characteristics of the two MPS are summarized in Table 2.5. Interviews were conducted via mobile phone calls using the SurveyCTO application, which allowed both real-time data entry and automated call scheduling. Callback attempts were managed through SurveyCTO's built-in scheduling system, following a predefined protocol. Each selected phone number was called at least one time, and those that did not pick up or were temporarily unreachable during initial attempts were called at least seven times, across different days and time slots. This approach aimed to maximise the likelihood of contact with all potential respondents. Following a few eligibility screening questions, participants provided verbal informed consent. Respondents were also informed that they would receive call credit upon completing the interview to improve survey participation (Cheung et al., 2019; Gibson et al., 2022; Singer & Ye, 2013).

Across the two countries, the research teams opted for the same sampling designs and introduced variations in the questionnaires to assess respondent selectivity based on the recruitment approach (Table 2.5).

In DRC and Malawi, the survey teams only used RDD. In these two countries, they worked with a third party to randomly draw numbers based on the mobile phone structure used by the major operators in these countries. In the DRC, these were further restricted to numbers that were active in the provinces of Kinshasa and North Kivu in the recent past. As in Burkina Faso,

they also resorted to quotas informed by national or provincial distribution of the population on a number of key attributes.

Table 2.5 : Characteristics of MPS in the three countries covered

	Burkina Faso	DRC	Malawi
Data collection period	09/2021 – 10/2022	08/2021 – 08/2022	01/2022 – 07/2023
Sample size	21 339	11 924	14 663
Coverage	National	Kinshasa and North Kivu provinces	National
Recruitment strategy	Numbers based on a previous face-to-face survey [EHCVM] and random digit dialing	Random digit dialing	Random digit dialing
Target population for post-stratification	Population of heads of households [for the EHCVM arm] and population aged 15-64 (for random digit dialing) in the 2019 census	Population aged 18 and above in the MICS 2017-2018	Population aged 18 an above in the DHS 2015-2016
Study team	ISSP, Louvain University and LSHTM	UNIKIN and LSHTM	MEIRU, IPOR and LSHTM
	Burkina Faso	DRC	Malawi
Data collection period	09/2021 – 10/2022	08/2021 – 08/2022	01/2022 – 07/2023
Sample size	21 339	11 924	14 663
Coverage	National	Kinshasa and North Kivu provinces	National
Recruitment strategy	Numbers based on a previous face-to-face survey [EHCVM] and random digit dialing	Random digit dialing	Random digit dialing

Target population for post-stratification	Population of heads of households [for the EHCVM arm] and population aged 15-64 (for random digit dialing) in the 2019 census	Population aged 18 and above in the MICS 2017-2018	Population aged 18 an above in the DHS 2015-2016
Study team	ISSP, Louvain University and LSHTM	UNIKIN and LSHTM	MEIRU, IPOR and LSHTM

Notes: DHS: Demographic and Health Survey. EHCVM: Enquête harmonisée sur les conditions de vie des ménages. IPOR: Institute for Public Opinion Research. ISSP: Institut Supérieur des Sciences de la Population of Joseph Ki-Zerbo University. LHSTM: London School of Hygiene & Tropical Medicine MEIRU: Malawi Epidemiology and Interventions Research Unit. MICS: Multiple Indicator Cluster Survey. UNIKIN: Université de Kinshasa

3 Phone follow-up versus random digit dialing: comparing mobile phone survey strategies for mortality measurement[1]

In this chapter, I evaluate the effectiveness, representativeness, and data quality of the two mobile phone survey strategies used to measure mortality in Burkina Faso: (i) the phone follow-up of respondents previously interviewed F2F (EHCVM-based), and (ii) the de novo Random Digit Dialing (RDD) approach. The analysis aims to identify the strengths, limitations, and trade-offs of each strategy.

3.1 Introduction

Traditional F2F interviews, long considered the cornerstone of population data collection, have progressively been supplemented and in some contexts replaced by alternative modes such as telephone, SMS, or web-based surveys (Koyuncu, 2021; Lavrakas et al., 2007). Despite this

[1] This chapter draws on an article published in Demographic Research: Dianou, Kassoum, Soura, Abdramane B., Lankoandé, Bruno, Bassinga, Hervé, Luhar, Shammi, Menashe-Oren, Ashira, McCain, Kelly, Tlhajoane, Malebogo, Reniers, Georges & Masquelier, Bruno (2025). The use of mobile phone surveys for rapid mortality monitoring: A national study in Burkina Faso. *Demographic Research*, *52*, 479-518. doi:10.4054/demres.2025.52.16

diversification, a substantial body of literature demonstrates that the mode of data collection itself can influence survey responses, response patterns, and measurement error, thereby shaping the quality and interpretation of survey-based indicators (Ben et al., 2015; Klausch et al., 2015; Lamanna et al., 2019). Each mode therefore carries specific methodological trade-offs.

Existing studies indicate that MPS can serve as effective tools for data collection in crisis contexts (Chasukwa et al., 2022; Kuehne et al., 2016). As indicated in the first chapters, compared to F2F surveys, they are generally less expensive, faster to deploy, and more flexible in adapting questionnaires to evolving information needs (Brubaker et al., 2021; Gibson et al., 2017; Labrique et al., 2017). In addition, centralized survey operations facilitate interviewer training, supervision, and quality control (Biemer & Lyberg, 2003), while audio recordings enable post-hoc verification and monitoring of interview quality. In high-income countries, telephone-based surveys have already replaced F2F interviews in several domains (Lavraska, 2008; De Leeuw et al., 1995; Vehovar et al., 2012). In SSA, however, the use of MPS remains comparatively understudied.

Following the COVID-19 pandemic, the adoption of MPS accelerated across Africa, often supported by international organizations and NGOs seeking to monitor crisis impacts and inform public policy. This trend builds on earlier experiences, including the use of phone-based surveys during the 2007–2008 global food crisis, the 2014 Ebola outbreak, and food security assessments conducted in Nigeria in 2017 (Himelein & Kastelic, 2015; Morse et al., 2016; World Bank Group, 2016). Since 2020, the World Bank has implemented large-scale MPS in several countries, including Burkina Faso, to track the socioeconomic and health impacts of COVID-19 (Kasidi et al., 2022; World Bank, 2021). Despite their growing use, MPS are subject to both sampling and non-sampling biases. Sampling bias is linked to the strategy used to construct the sampling frame. Three main approaches are commonly employed: unfiltered random digit dialing (RDD), filtered RDD, and sampling from lists derived from previous F2F surveys (Himelein, Eckman, Lau, et al., 2020; Steeh, 2008). Each approach carries distinct advantages and limitations. Sampling from prior F2F surveys offers rich auxiliary information and benefits from established respondent trust, improving response rates and data accuracy. However, it may exclude newly formed or recently migrated households, particularly when surveys are conducted several years apart. Unfiltered RDD provides a more up-to-date snapshot of mobile phone users but suffers from high ineligibility rates and low cooperation due to the absence of pre-contact. Filtered RDD, which involves restricting random digit dialing to ranges of phone numbers known to be active or associated with specific geographic areas using pre-

existing operator or commercial lists, can improve operational efficiency by reducing non-working numbers. However, this approach may under-represent specific population groups if the underlying lists are outdated or incomplete, and it often requires strong partnerships with mobile network operators or third-party providers.

To date, few studies have systematically compared the representativeness and data quality of MPS and F2F surveys, particularly in LMICs and across different MPS sampling strategies. Existing comparative evidence is largely drawn from high-income settings and rarely focuses on demographic indicators such as mortality (Brick et al., 2007; McBride et al., 2012).

This chapter aims to address this gap by comparing the effectiveness, representativeness, and data quality of MPS implemented using different sampling strategies. The analysis relies on a range of operational and analytical indicators, including interview duration, number of call attempts, number of phone numbers dialed per completed interview, response rates, and sample composition. Particular attention is given to sociodemographic characteristics in analysing sample representativeness and key demographic indicators related to mortality in analysis of data quality.

3.2 Methods and analysis

This study evaluates and compares the two sampling strategies of EHCVM-based follow-up and RDD along two primary axes: fieldwork efficiency, sample representativeness, and data quality. Chapter 2 provides a detailed description of the data used in this evaluation.

3.2.1 Data collection procedures

As indicated earlier, both survey arms were administered by trained interviewers using a Computer-Assisted Telephone Interviewing (CATI) system. Multiple call attempts were allowed for each phone number, up to a maximum of five attempts, scheduled across different days of the week and time slots to maximize the likelihood of contact.

For each call attempt, interviewers systematically recorded:

- the call outcome (successful contact, non-contact, refusal, appointment, etc.);
- The attempt sequence number;
- the day and month of the call;

- the duration of the interview.

3.2.2 Definition of acceptability and fieldwork efficiency indicators

The acceptability of MPS was assessed using several complementary indicators that provide a comprehensive assessment of the feasibility, productivity, and operational burden associated with each sampling strategy:

- **Contact and participation profiles**, describing the sociodemographic characteristics of individuals who were contacted and those who agreed to participate (sex, age, language spoken, and place of residence) in the EHCVM arm.
- **AAPOR rates**, including response, cooperation, refusal, and contact rates, calculated separately for the EHCVM and RDD survey arms. Final call outcomes were coded in accordance with the standards of the American Association for Public Opinion Research (AAPOR, 2016), enabling the standardized calculation of response, cooperation, refusal, and contact rates for each sampling strategy.
- **Operational efficiency**, measured by the average number of phone numbers dialed to obtain a completed interview, the mean interview duration, and the estimated cost per completed interview.

3.2.3 Descriptive analyses

Descriptive analyses were first conducted to compare:

- the characteristics of contacted, interviewed, and non-interviewed individuals;
- the distribution of call attempts by day of the week, month, and number of attempts;
- the time required to fill quotas by population subgroup and by trimester of data collection.

Ninety-five percent confidence intervals were computed for all proportions to account for sampling variability. To examine the relationships between the variables and the main dependent variable, we performed chi-square tests.

3.2.4 Modelling determinants of survey participation

To identify factors associated with the likelihood of accepting participation among contacted individuals, we estimated a series of bivariate and multivariate logistic regression models. The dependent variable was defined as acceptance of the interview (1 = completed or partially completed interview; 0 = refusal or break-off). Explanatory variables included :

- sex;
- age group (18–49 years vs. 50 years and older);
- place of residence (Ouagadougou, Bobo-Dioulasso, other urban areas, rural areas);
- language spoken;
- type of day (weekday vs. weekend);
- number of call attempts.

Models were estimated separately by trimester of data collection as well as on the pooled sample, for an assessment of temporal changes in the determinants of participation. Results are presented as unadjusted and adjusted odds ratios with 95% confidence intervals.

3.2.5 Assessment of representativeness and selection bias

The representativeness of samples obtained through the two strategies was evaluated by comparing their distributions with external population benchmarks derived from:

- the General Population and Housing Census (RGPH 2019) for household heads and the population aged 15–64 years;
- the 2021 DHS for women of reproductive age.

These comparisons allowed the identification of discrepancies attributable to selective mobile phone ownership and differential non-response across sociodemographic groups. In addition, a specific analysis of the determinants of mobile phone ownership among women of reproductive age was conducted using logistic regression models, in order to document the selection mechanisms operating upstream of survey participation.

3.2.6 Weighting and post-stratification adjustment

To correct for imbalances between the phone survey samples and the general population, post-stratification weights were constructed using census margins by age, sex, and place of residence

(Kolenikov, 2016; Little, 1993). These weights were applied in representativeness analyses and in subsequent mortality estimations to reduce biases associated with coverage limitations and non-response. Finally, sensitivity and robustness analyses were undertaken to evaluate the extent to which post-stratification adjustments affected the levels and trends of key indicators, thereby assessing the corrective capacity of the weighting strategy.

3.3 Results

3.3.1 Acceptability of telephone-based surveys

From the outset, the collection of data through MPS raises several concerns. These include issues related to the sampling frame, relatively low response rates, and the sensitive nature of the questions asked.

3.3.1.1 Profiles and determinants of successful contact and survey participation

The objective of this analysis is to describe the socio-demographic characteristics of individuals who were reachable by phone (contacted), with a distinction between those who agreed to participate in the MPS (surveyed) and those who declined participation (not surveyed). But also included here is an analysis of mobile phone ownership and the total no of respondents by trimester. Differences between these two groups were assessed using chi-square tests to determine whether participation was associated with respondents' characteristics.

3.3.1.1.1 Profile of successful contact and survey participation

A comparison between individuals who were successfully contacted and those who agreed to participate in the survey reveals significant differences across language groups (Table 3.1). Respondents who spoke languages other than French or Mooré were more likely to consent to the interview, with an acceptance rate of 47.0%, compared to 43.5% among Mooré speakers and 31.6% among French speakers. This difference is statistically significant. Age was also associated with willingness to participate: individuals aged 50 and above showed a higher participation rate (59.7%) compared to those aged 18–49 (34.8%). However, neither the total number of call attempts, the day of the week, nor the type of day (weekday vs. weekend) was significantly associated with the likelihood of participation.

Table 3.1 : Sociodemographic differences between RaMMPS (EHCVM arm) survey respondents and non-respondents

	Not surveyed		**Surveyed**		**Total contacted**	**P-value**
	%	CI	%	CI		
Language						0.000
French	68.4	[67.8,69.1]	31.6	[30.9,32.2]	17,973	
Mooré	56.5	[55.6,57.4]	43.5	[42.6,44.4]	11,218	
Others	53.0	[51.0,55.1]	47.0	[44.9,49.0]	2,312	
Total	63.0	[62.5,63.6]	37.0	[36.4,37.5]	31,503	
Gender						0.000
Male	59.9	[59.0,60.7]	40.1	[39.3,41.0]	13,322	
Female	36.5	[35.6,37.5]	63.5	[62.5,64.4]	9,906	
Total	49.9	[49.3,50.6]	50.1	[49.4,50.7]	23,228	
Age group						0.000
Less than 18 yrs	65.2	[59.5,70.6]	34.8	[29.4,40.5]	279	
18-49 yrs	50.4	[49.7,51.1]	49.6	[48.9,50.3]	19,629	
50-64 yrs	40.3	[38.5,42.1]	59.7	[57.9,61.5]	2,854	
More than 64 yrs	79.2	[75.3,82.6]	20.8	[17.4,24.7]	466	
Total	49.9	[49.3,50.6]	50.1	[49.4,50.7]	23,228	
Place of residence						0.000
Ouagadougou	79.7	[78.9,80.5]	20.3	[19.5,21.1]	9,755	
Bobo D.	72.0	[70.3,73.6]	28.0	[26.4,29.7]	2,863	
Other town	68.5	[67.3,69.7]	31.5	[30.3,32.7]	5,853	
Rural areas	13.0	[12.3,13.8]	87.0	[86.2,87.7]	8,069	
Total	56.2	[55.6,56.8]	43.8	[43.2,44.4]	26,540	
Category of eligibility						0.000
Male female 50-64 yrs	46.8	[45.1,48.5]	53.2	[51.5,54.9]	3,267	
Female 18-49 yrs	43.3	[42.3,44.3]	56.7	[55.7,57.7]	9,251	
Male 18-49 yrs	67.8	[67.0,68.6]	32.2	[31.4,33.0]	13,883	
Total	56.6	[56.0,57.2]	43.4	[42.8,44.0]	26,401	
Day of interview						0.000
Friday	63.4	[62.1,64.7]	36.6	[35.3,37.9]	5,249	
Monday	62.2	[60.9,63.6]	37.8	[36.4,39.1]	5,156	
Saturday	62.5	[60.5,64.5]	37.5	[35.5,39.5]	2,19	
Sunday	67.1	[65.1,68.9]	32.9	[31.1,34.9]	2,383	
Thursday	63.1	[61.9,64.3]	36.9	[35.7,38.1]	6,124	
Tuesday	64.5	[63.2,65.8]	35.5	[34.2,36.8]	5,1	
Wednesday	64.9	[63.7,66.1]	35.1	[33.9,36.3]	5,953	
Total	63.8	[63.3,64.4]	36.2	[35.6,36.7]	32,155	

Call period					Pr = 0.122
Weekend	64.1	[62.7,65.5]	35.9	[34.5,37.3]	4,471
Working day	62.9	[62.3,63.4]	37.1	[36.6,37.7]	27,032
Total	63.0	[62.5,63.6]	37.0	[36.4,37.5]	31,503
Number of call attempts					Pr = 0.938
Once	63.9	[63.3,64.5]	36.1	[35.5,36.7]	24,389
Twice	63.4	[62.1,64.6]	36.6	[35.4,37.9]	5,712
Three times	63.9	[61.4,66.4]	36.1	[33.6,38.6]	1,456
Four times	64.2	[59.4,68.8]	35.8	[31.2,40.6]	397
More than four times	62.6	[56.2,68.6]	37.4	[31.4,43.8]	230
Total	63.8	[63.3,64.4]	36.2	[35.6,36.7]	32,184
Month of interview					Pr = 0.000
January	25.7	[23.2,28.4]	74.3	[71.6,76.8]	1,076
February	73.9	[71.9,75.7]	26.1	[24.3,28.1]	2,016
March	69.1	[67.4,70.8]	30.9	[29.2,32.6]	2,864
April	55.6	[53.3,57.8]	44.4	[42.2,46.7]	1,891
May	72.9	[71.2,74.5]	27.1	[25.5,28.8]	2,809
June	64.6	[62.9,66.2]	35.4	[33.8,37.1]	3,274
July	38.3	[36.0,40.7]	61.7	[59.3,64.0]	1,672
August	69.2	[67.3,71.0]	30.8	[29.0,32.7]	2,398
September	76.5	[75.0,77.9]	23.5	[22.1,25.0]	3,381
October	51.3	[50.0,52.6]	48.7	[47.4,50.0]	5,791
November	71.6	[70.1,73.1]	28.4	[26.9,29.9]	3,431
December	80.3	[78.2,82.2]	19.7	[17.8,21.8]	1,565
Total	63.8	[63.3,64.3]	36.2	[35.7,36.7]	32,168

Note: "Contacted" refers to individuals successfully reached by phone. "Surveyed" refers to those who consented to participate and completed the interview. "Not surveyed" includes individuals who were contacted but did not participate (e.g., refusals, interruptions) as well as those who could not be reached.

3.3.1.1.2 Determinants of successful contact and survey participation

Table 3.2 presents the coefficients of a series of logistic regression models estimating the likelihood that a contacted individual agreed to participate in the telephone survey. Results are reported separately by trimester as well as for the pooled sample, and include both unadjusted (raw) and adjusted (net) odds ratios. This approach allows us to assess not only the overall determinants of participation, but also how these effects evolved over the course of the data collection period.

Several key factors significantly influenced survey participation, including gender, age group, place of residence, language spoken, timing of the call, and the number of call attempts. These effects remain largely robust after adjustment for other covariates, although their magnitude and statistical significance vary across trimesters.

Across all trimesters and in the pooled model, women were more likely than men to agree to take part in the interview. In the fully adjusted pooled model, contacting a woman increased the odds of participation by more than threefold (OR = 3.27; 95% CI: 3.07–3.49). This gender differential intensified over time, reaching particularly high levels in the later trimesters. Individuals aged 50 years and older were more likely to participate than those aged 18–49. In the pooled adjusted model, belonging to the older age group increased the odds of participation by about 60% (OR = 1.60; 95% CI: 1.46–1.75). However, this effect varied across trimesters, with weaker or non-significant associations observed in some periods.

Place of residence influenced participation outcomes. Compared to residents of Ouagadougou, individuals living in other cities and especially in rural areas showed higher odds of participation. Rural residents consistently displayed the highest likelihood of accepting the interview, with adjusted odds ratios exceeding 30 in the pooled model. This striking result reflects both the effectiveness of MPS in reaching rural populations and the strong willingness to participate once contact is established, despite well-documented coverage challenges.

In unadjusted models, speakers of Mooré and other local languages appeared more likely to participate than French speakers. However, after controlling for other factors, these differences were attenuated and often lost statistical significance, particularly in the pooled model. This suggests that the observed language differentials are largely mediated by other sociodemographic characteristics, such as place of residence or age.

With respect to the timing of calls, contacting respondents on working days (Monday to Friday) was associated with a modest but statistically significant increase in participation in the pooled adjusted model (OR = 1.12; 95% CI: 1.03–1.23). Nevertheless, this effect was not consistently observed across all trimesters, meaning that day-of-week effects were relatively context-dependent.

Finally, the number of call attempts was negatively associated with participation. Compared to individuals who agreed to participate on the first call, those reached after multiple attempts were significantly less likely to consent. In the pooled adjusted model, the odds of participation decreased to 0.81 (95% CI: 0.74–0.88) for the second attempt and to 0.77 (95% CI: 0.66–0.90) for the third attempt.

Table 3.2 : Determinants of survey participation: logistic regression results by trimester and pooled sample

	Trimester 1		**Trimester 2**		**Trimester 3**		**Trimester 4**		**Pooled**	
	Raw	Net	Raw	Net	Raw	Net	Raw	Net	Raw	Net
Respondents speaking language										
French	1	1	1	1	1	1	1	1	1	1
Moorée	1.72*** [1.54;1.91]	1.049 [0.907,1.213]	1.77*** [1.58;1.99]	1.113 [0.941,1.315]	2.13*** [1.93;2.34]	1.203** [1.048,1.382]	1.48*** [1.35;1.61]	0.879* [0.781,0.990]	1.67*** [1.59;1.75]	1.003 [0.938,1.074]
Others	1.98*** [1.67;2.35]	1.368* [1.071,1.748]	2.48*** [2.00;3.07]	2.067*** [1.515,2.820]	1.91*** [1.61;2.28]	1.144 [0.884,1.479]	1.66*** [1.41;1.94]	1.132 [0.908,1.411]	1.92*** [1.75;2.09]	1.316*** [1.162,1.490]
Gender										
Male	1	1	1	1	1	1	1	1	1	1
Female	1.90*** [1.71;2.11]	2.064*** [1.819,2.343]	2.00*** [1.78;2.25]	2.193*** [1.875,2.564]	2.85*** [2.58;3.15]	4.134*** [3.617,4.724]	2.54*** [2.33;2.77]	5.162*** [4.571,5.830]	2.32*** [2.21;2.44]	3.271*** [3.067,3.488]
Age group										
Less than 50 yrs	1	1	1	1	1	1	1	1	1	1
50 or more	1.68*** [1.46;1.93]	2.128*** [1.789,2.532]	1.23** [1.04;1.46]	1.588*** [1.263,1.996]	1.17** [1.02;1.34]	1.370** [1.125,1.667]	1.00 [0.88;1.13]	1.252** [1.059,1.481]	1.25*** [1.17;1.34]	1.599*** [1.459,1.753]
Place of residence										
Ouagadougou	1	1	1	1	1	1	1	1	1	1
Bobo	1.45*** [1.20;1.76]	1.464*** [1.202,1.784]	1.26* [1.00;1.59]	1.169 [0.909,1.503]	1.30*** [1.07;1.59]	1.395** [1.124,1.732]	1.97*** [1.67;2.33]	1.983*** [1.648,2.387]	1.52*** [1.38;1.68]	1.525*** [1.376,1.690]
Others city	2.06*** [1.79;2.37]	2.170*** [1.873,2.515]	1.48*** [1.24;1.77]	1.522*** [1.266,1.830]	1.61*** [1.38;1.89]	1.717*** [1.458,2.021]	1.86*** [1.62;2.12]	2.041*** [1.767,2.358]	1.80*** [1.67;1.94]	1.929*** [1.786,2.085]
Rural	24.82*** [20.67;29.81]	25.580*** [21.130,30.968]	41.20*** [33.02;51.41]	41.497*** [32.976,52.219]	28.45*** [24.27;33.35]	33.025*** [27.703,39.370]	23.11*** [20.21;26.43]	37.050*** [31.702,43.301]	26.21*** [24.16;28.43]	30.493*** [27.933,33.287]

Call period										
Week-end	1	1	1	1	1	1	1	1	1	1
Working day	0.98 [0.86;1.11]	1.048 [0.885,1.240]	0.98 [0.84;1.15]	1.055 [0.840,1.325]	1.01 [0.89;1.16]	1.030 [0.856,1.239]	1.26*** [1.11;1.43]	1.482*** [1.252,1.753]	1.05 [0.98;1.12]	1.121* [1.025,1.227]
Attempt number										
Ones	1	1	1	1	1	1	1	1	1	1
Twice	0.68*** [0.59;0.77]	0.506*** [0.421,0.609]	0.99 [0.84;1.15]	0.800 [0.636,1.005]	1.23*** [1.09;1.39]	0.981 [0.830,1.161]	1.24*** [1.12;1.36]	1.039 [0.911,1.185]	1.02 [0.96;1.08]	0.808*** [0.744,0.877]
Three times	0.44*** [0.33;0.58]	0.364*** [0.247,0.537]	0.96 [0.72;1.28]	0.760 [0.490,1.178]	1.10 [0.87;1.39]	0.759 [0.536,1.076]	1.51*** [1.28;1.78]	1.108 [0.887,1.383]	0.99 [0.89;1.11]	0.771*** [0.661,0.899]
Four times	0.31*** [0.19;0.50]	0.392** [0.206,0.745]	1.10 [0.64;1.90]	0.832 [0.358,1.933]	1.25 [0.80;1.95]	0.950 [0.505,1.790]	1.75*** [1.26;2.43]	1.261 [0.798,1.995]	0.98 [0.80;1.21]	0.862 [0.643,1.156]
More than four	0.42*** [0.24;0.72]	0.388* [0.186,0.810]	0.81 [0.39;1.65]	0.710 [0.237,2.129]	1.85** [1.02;3.36]	2.389 [0.958,5.958]	1.78** [1.14;2.77]	0.650 [0.358,1.179]	1.05 [0.80;1.38]	0.709 [0.484,1.038]
Observations		6028		4675		6867		8967		26537

Exponentiated coefficients; 95% confidence intervals in brackets
** p<0.05, ** p<0.01, *** p<0.001*

3.3.1.2 Phone call outcomes according to AAPOR norm

Table 3.3 presents the phone call outcome rates by study arm from the MPS survey, using the final disposition codes established by the AAPOR (AAPOR, 2016). We obtained higher response rates, higher cooperation rates, and higher contact rates in the EHCVM study arm, in which the respondents had previously been interviewed F2F, compared to the RDD approach. With the EHCVM study arm, to survey 5,087 heads of households, we called 8,809 telephone numbers, or around 2 phone numbers to complete a questionnaire. By contrast, for the RDD approach, we called 43,841 different numbers to reach 11,176 eligible people, or around 4 telephone numbers to complete a questionnaire. The response rate was 45% in the RDD arm, against 59% in the EHCVM arm. This is much lower than in a similar survey of women of reproductive age in Burkina Faso, which had a response rate of 68% (Greenleaf et al., 2020). The low response rate, especially in the RDD arm, is largely explained by people not picking up calls from interviewers. The vast majority of eligible people who responded to the calls participated in the interview, i.e., 84% and 91% respectively for the RDD and EHCVM arms. Refusal rates were low and similar for the two arms (around 6% to 7%). This pattern is consistent with evidence from a recent MPS conducted in Brazil, which indicates that low response rates mainly result from difficulties in contacting respondents rather than from explicit refusals (Schmertmann et al., 2024). In that study in Brazil, most non-response occurred because calls were not answered, while refusal rates among individuals who were reached remained limited (6.3 %). The time needed to complete an interview was longer for the EHCVM arm (23 mins on average) compared to the RDD arm (17 mins) (Table 3.4). This may be because respondents in the EHCVM arm reacted to the fact that some questions had already been asked in the original F2F survey. We analyzed audio recordings and noticed that for many of the basic questions asked, some respondents from the EHCVM branch interrupted the interview, to remind the interviewers that they had already provided this information when interviewers visited the households in 2018-2019.

Table 3.3 : Final disposition code and phone call outcome rates by study arm and heaping indices

	EHCVM	***RDD***
Total* number of *phone numbers used	8,809	43,841
I=Complete interviews (1.1)	5,087	11,176
P=Partial interviews (1.2)	100	4,063
R=Refusal and break-off (2.1)	457	2,181
NC=Non-contact (2.2)	3,039	15,035
O=Other (2.0, 2.3)	46	736
UH=Unknown household (3.1)	0	0
UO=Unknown other (3.2–3.9)	60	881
***Response* rates**		
Response rate 1: I/(I+P)+(R+NC+O)+(UH +OU)	0.58	0.33
Response rate 2: (I+P)/(I+P)+(R+NC+O)+(UH+OH)	0.59	0.45
***Cooperation* rates**		
Cooperation rate 1[&3]: I/((I+P)+R+O)	0.89	0.62
Cooperation rate 2[&4]: (I+P)/((I+P)+R+O))	0.91	0.84
***Refusal* rates**		
Refusal rate 1: R/((I+P)+(R+NC+O)+UH+UO))	0.05	0.06
Refusal rate 3: R/((I+P)+(R+NC+O))	0.06	0.07
***Contact* rates**		
Contact rate 1: (I+P)+R+O/(I+P)+R+O+NC+(UH+UO)	0.65	0.53
Contact rate 3: (I+P)+R+O/(I+P)+R+O+NC	0.65	0.55
Survey length, costs, and productivity		
Average survey length (mins) [min–max]	23 [7–55]	17 [7–45]
*Average estimated cost per interview (US*D*)*	4	3
Telephone numbers used to get an interview	2	4

Note: EHCVM: Enquête harmonisée sur les conditions de vie des ménages; RDD: random digit dialing.

3.3.1.3 Average interview duration

The average duration of interviews between the data collector and the respondent, by survey branch, is presented in Table 3.4. For completed interviews, the discussions tended to last longer in the EHCVM-based branch, with an average duration of 23.5 minutes, compared to 16.5 minutes for the RDD branch.

It is important to note that a direct comparison between the two sampling strategies is somewhat challenging. In the EHCVM branch, interviews with the household head and the woman of reproductive age were often conducted successively using the same phone number, typically that of the household head. As a result, the available data do not always distinguish between the duration of the interview for each respondent. Therefore, the total interview time, including both components, was used to compute the average durations presented below.

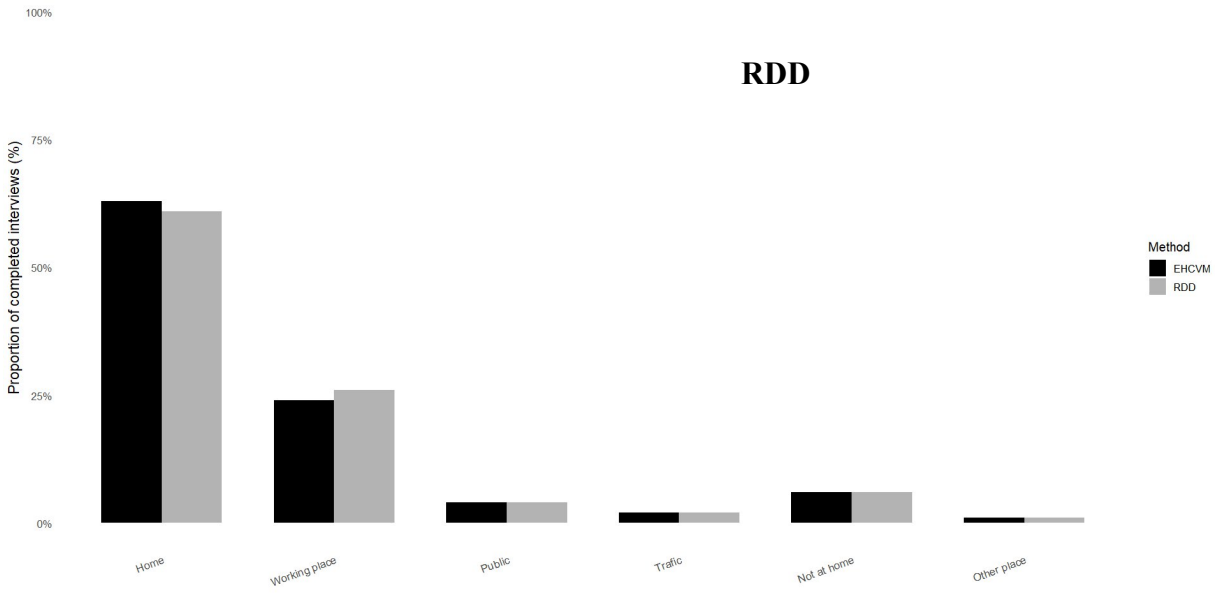
Table 3.4 : Average interview duration by interview outcome and survey arm

	EHCVM	**RDD**
Outcome	***Duration** (mn) **CI** [min - max]*	***Duration** (mn) **CI** [min - max]*
Completed	23,5 [23,0 – 23,9]	16,5 [16,3 – 16,8]
Already surveyed	2,5 [0,3 – 4,8]	6,1 [1,0 – 11,2]
Partially completed	6.0 [3,3 – 8,8]	1.9 [1,8 – 2,0]
Refused	7,3 [6,3 – 8,2]	5,0 [4,8 – 5,0]
Appointment	4,8 [4,0 – 5,6]	3,9 [3,7 – 4,2]
Transferred	4,8 [4,0 – 5,6]	5.7 [1,6 – 9,9]
Transferred to the next trimester	-	4,6 [4,5 – 4,7]
Others	-	5.7 [5,4 – 6,0]

3.3.1.4 Conditions and place of interview

Figure 3.1 presents the interview conditions and locations, which could affect data quality. 60% of interviews took place at home, regardless of the survey arm. Only a quarter of respondents were interviewed at their workplace. No significant difference in interview location was observed between the two study arms.

Figure 3.1 : Interview setting in the EHCVM-based and RDD phone survey arms



3.3.2 Selection biases and poststratification weighting

3.3.2.1 Unweighted sample of the general population and women of reproductive age

The compositions of the two samples for the MPS differed substantially from that of the general population enumerated in the latest census of Burkina Faso, due to the selectivity of mobile phone owners and differential rates of non-response. The comparison of the sociodemographic characteristics of household heads in the EHCVM and of individuals aged 15–64 years in the RDD with those of the 2019 Population and Housing Census (RGPH) is presented in Table 3.5. The EHCVM sample is not fully representative. Individuals with no formal education and those residing in rural areas are underrepresented. For example, according to the RGPH, 68.7% of household heads reside in rural areas, compared with only 42.6% in the EHCVM. Although the EHCVM was designed to be nationally and regionally representative, these discrepancies suggest potential selection biases related to nonresponse or inaccessibility of certain households (e.g., due to nonfunctional phone numbers), as shown in this chapter. Such deviations need to be adjusted through the application of survey weights to restore population representativeness. Among individuals aged 15–64 years, the RDD sample shows smaller deviations from the census distribution, following the implementation of quota-based sampling. These quotas effectively controlled for the distribution by age group and place of residence. The overrepresentation of women is also consistent with the survey design, which aimed to enhance the precision of mortality estimates. However, the RDD sample still shows a significant underrepresentation of individuals with low education levels; 45% of respondents reported having no formal education, compared with 70% in the census. Moreover, the spatial distribution of respondents indicates an overrepresentation of individuals from the Centre and Hauts-Bassins regions, where the two main urban centers are located, and a clear underrepresentation of respondents from the East and Sahel regions affected by insecurity.

Among women aged 15–49 years, who constituted a key target group, the selection effects appear to operate differently (Table 3.6). In terms of age distribution within the reproductive-age population, young women aged 15–19 are underrepresented in both survey arms, with a stronger selection bias observed in the RDD. Women interviewed by phone also tend to have lower educational attainment levels, compared with those surveyed in the DHS, although the differences are not substantial. Selection bias is particularly pronounced with respect to marital status: nearly eight out of ten women in both survey arms are in union, compared with just over half in the DHS. This overrepresentation of married women may reflect the increased likelihood of reaching respondents through the phone numbers of co-resident relatives or their spouse.

Finally, the regional distribution reveals an underrepresentation of women from the Centre region across both telephone survey branches.

Table 3.5 : Comparison of the sociodemographic characteristics of respondents, RaMMPS and RGPH 2019

Respondents' characteristics	**EHCVM (Heads of households)**	**RGPH**	**RDD arm (population aged 15–64 years)**	**RGPH**
	Proportion		Proportion	
	%	%	%	%
Gender				
Male	76,7	84,0	34,3	46,3
Female	23,3	16,0	65,7	53,7
Age group				
15-29 yrs	17,5	22,6	41,5	43,7
30-49 yrs	52,0	49,1	46,8	42,2
50 yrs &+	30,6	28,3	11,7	14,1
Education				
None	52,0	72,2	44,9	69,8
Primary	20,2	10,0	16,5	9,6
Secondary	21,4	13,5	29,5	15,9
Higher	6,4	4,2	9,0	3,6
Marital status				
Maried	83,6	84,2	75,4	72,5
Widowed	5,5	1,1	3,3	3,4
Divorced/separed	0,8	5,6	0,8	0,9
Single	10,1	9,1	20,4	23,2
Place of residence				
Ouagadougou	11,1	14,4	15,8	14,5
Bobo-Dioulasso	6,1	5,0	6,7	5,2
Others city	40,2	11,9	14,3	11,4
Rural	42,6	68,7	63,2	69,0
Region of residence				
Boucle du Mouhoun	7,1	9,6	6,8	9,5
Cascades	7,4	3,9	4,1	4,1
Centre	15,7	18,4	24,3	18,0
Centre-Est	7,8	7,7	6,9	7,4
Centre-Nord	7,9	7,0	9,2	7,3
Centre-Ouest	6,8	7,8	7,6	8,0
Centre-Sud	5,6	4,0	4,3	3,9
Est	7,1	7,5	4,0	7,8
Hauts-Bassins	12,7	11,8	14,2	12,0
Nord	6,5	7,8	7,4	8,1
Plateau-Central	6,3	4,6	6,2	4,7
Sahel	2,9	5,3	1,7	4,6
Sud-Ouest	6,2	4,8	3,4	4,6

Table 3.6 : Comparison of sociodemographic characteristics of women of reproductive age, RaMMPS and DHS-2021

	RaMMPS				**DHS**		
	RDD	EHCVM	Total	N	All women	Mobile phone owners	N
	%	%	%			%	
Age group							
15-19	12,6	18,4	14,3	1291	21,8	16,2	3816
20-24	22,4	18,6	21,3	2180	18,4	20,3	3244
25-29	18,5	18,0	18,4	2119	15,2	16,4	2664
30-34	14,7	14,8	14,8	2057	14,3	15,5	2542
35-39	13,0	12,7	12,9	1518	12,8	13,6	2253
40-44	10,7	8,3	10,0	1215	10,1	10,3	1809
45-49	8,0	9,2	8,4	1007	7,5	7,7	1331
Education							
None	69,6	62,4	67,5	5350	58,3	55,2	10254
Primary	10,2	18,2	12,5	1776	14,2	14,2	2515
Secondary	16,8	17,1	16,9	3547	25,2	27,5	4548
Higher	3,4	2,3	3,1	714	2,3	3,0	342
Marital status							
Maried	80,8	82,7	81,3	8746	53,3	56,5	9593
Widowed	4,1	0,5	3,1	295	21,1	21,0	3576
Divorced/separed	0,8	0,6	0,7	109	1,8	2,2	344
Single	14,3	16,2	14,9	2237	23,8	20,3	4146
Place of residence							
Urban	23,1	23,0	23,1	4789	32,5	38,6	6227
Rural	76,9	77,0	76,9	6598	67,5	61,4	11432
Region of residence							
Boucle du Mouhoun	10,0	11,6	10,4	730	9,7	9,0	149
Cascades	4,0	3,5	3,9	548	3,1	3,3	925
Centre	13,0	11,4	12,5	2573	20,1	24,0	2102
Centre-Est	8,4	5,7	7,6	818	9,9	10,0	1599
Centre-Nord	9,5	9,6	9,5	1069	8,3	8,6	1167
Centre-Ouest	8,2	6,3	7,6	792	10,3	9,2	1605
Centre-Sud	5,1	4,4	4,9	542	4,3	4,3	1137
Est	8,3	11,3	9,2	602	6,5	4,7	948
Hauts-Bassins	10,3	12,0	10,8	1522	10,2	11,0	1917
Nord	9,1	7,5	8,6	810	5,6	5,7	1375
Plateau-Central	4,5	4,1	4,4	699	6,0	6,5	1457
Sahel	6,2	7,7	6,6	221	2,6	1,3	618
Sud-Ouest	3,6	5,0	4,0	461	3,4	2,5	1319
HH size							
1-4 members	31,3	23,9	29,2	2473	18,5	20,6	3207
5-8 members	39,3	37,5	38,8	5118	44,0	44,9	7657
9 members &+	29,4	38,7	32,1	3796	37,5	34,5	6795

3.3.2.2 Post-stratification weighting

To obtain representative samples of the population, data on basic household assets, place of residence, age, and education were collected from respondents during the MPS and used to compute post-stratification weights, using the census data as the benchmark (Leo et al., 2015).

The post-stratification weights were computed by adjusting the existing weights, based either on the original weights of the EHCVM F2F survey or on the quotas for the RDD sample using a raking (iterative proportional fitting) procedure, in such a way that the marginal distribution of the key variables listed above in the weighted sample matched the distribution in the national census conducted in 2019–2020. To avoid high variability and loss of precision when using weights, we capped the maximum weight per individual at 5 (DeBell, 2009). In addition, we calculated a second set of weights specifically for women of reproductive age to ensure that the weighted distribution of women aged 15–49, aligned with their characteristics in the census in terms of the same selected characteristic. The combined weighting for the general population and targeted adjustment for reproductive-age women helps to ensure that both the overall sample and the sub-population of interest accurately reflect census distributions (Table 3.7 and Table 3.9).

3.3.2.3 Weighted sample characteristics

Table 3.7 presents the composition of the weighted RaMMPS samples and provides a comparison with the characteristics of the population enumerated in the 2019–2020 census. For the EHCVM study arm, we compare our sample with the population of heads of households in the census, while our comparator for the RDD sample is the population aged 15–64. The weighted estimation indicates that post-stratification improves the alignment between the RaMMPS samples and the population distributions observed in the 2019–2020 census, although important differences remain across survey arms and population characteristics (Table 3.7).

In the EHCVM arm, post-stratification effectively corrects several major imbalances observed in the unweighted sample. After weighting, the sex distribution aligns with census figures, with men and women representing 84.0% and 16.0% of respondents, respectively, closely matching census proportions of heads of households. Age distributions also improve: for each age group (15–29, 30–49, and 50 years and older), the confidence intervals of the weighted proportions include the corresponding census proportion. For education, while unweighted data underrepresented individuals with no formal education, post-stratification raises their share to 69.5%, approximating the census estimate (72.2%). Minor discrepancies persist for secondary and tertiary education, but these differences remain limited. Marital status distributions are also well aligned, particularly for married and single respondents, with weighted estimates matching census values. With respect to place of residence, post-stratification corrects the strong urban bias present in the unweighted EHCVM sample. The weighted proportion of rural residents (70.1%) matches the census figure (68.7%), while the shares of Ouagadougou and other towns

also converge toward census benchmarks. After weighting, the confidence intervals of the weighted regional proportions include the corresponding census proportions for most regions, including those affected by insecurity such as Sahel and Est. Finally, household size distributions improve after weighting, particularly for small households (1–4 members), although slight residual differences persist for large households (9+ members). After applying post-stratification, the EHCVM arm matches census distributions, indicating that weighting reduces coverage and selection biases from the original F2F sampling frame.

Post-stratification also improves representativeness in the RDD arm, but discrepancies relative to the census remain more pronounced for several characteristics. After weighting, sex distributions align closely with census. Age distributions also improve, particularly for younger respondents aged 15–29 years (41.5 to 43.7 and aligne with census), whose weighted share matches the census benchmark. In terms of educational attainment, although the weighted proportion of respondents with no formal education increases (44.9 to 67.6 CI [66.1–69.0]), it remains marginally below census estimates (69.8), while respondents with secondary education remain overrepresented (5.2 CI [4.6–5.9] vs 3.6 for census). While weighted estimates for married and widowed individuals approximate census figures, single respondents remain underrepresented compared to the census (18.2 [17.0–19.4] vs 23.2 for census), suggesting persistent selection effects related to phone ownership or availability. Despite post-stratification, rural residents remain overrepresented relative to the census, while urban populations particularly in Ouagadougou and Bobo-Dioulasso remain underrepresented. Regional distributions in the RDD arm also show greater divergence from census benchmarks than in the EHCVM arm, especially in regions with limited network coverage or heightened insecurity. Finally, although weighting improves alignment, small households remain underrepresented and large households overrepresented relative to census proportions (39.2 CI [37.6–40.7] vs 49.4 for census).

These results indicate that post-stratification enhances the representativeness of both survey arms but is more effective for the EHCVM-based sample than for the RDD-based sample. The closer alignment observed in the EHCVM arm may reflect the advantages of sampling frames derived from recent F2F surveys, which retain links to the underlying population structure. In contrast, the RDD approach remains subject to residual coverage and selection biases that cannot be fully eliminated through weighting alone, particularly for older adults, urban populations, and specific regions: Centre, Sahel, Sud-Ouest.

Table 3.7 : Composition of the RaMMPS sample in Burkina Faso, by study arm, compared with the population enumerated in the 2019–2020 census

Respondents' characteristics	EHCVM arm (heads of households)			Census	RDD arm (population aged 15–64 years)			Census
	Unweighted	Weighted			Unweighted	Weighted		
	%	%	95% CI	%	%	%	95% CI	%
Sex								
Men	76.7	84.0	[82.0–85.7]	84.0	34.3	46.2	[44.7–47.8]	46.3
Women	23.3	16.0	[14.3–18.0]	16.0	65.7	53.8	[52.2–55.3]	53.7
Age group								
15–29 yrs	17.5	22.9	[20.7–25.1]	22.6	41.5	43.7	[42.2–45.3]	43.7
30–49 yrs	52.0	49.3	[46.8–51.9]	49.1	46.8	42.2	[40.7–43.8]	42.2
50+ yrs	30.6	27.8	[25.6–30.2]	28.3	11.7	14.1	[13.0–15.2]	14.1
Education								
None	52.0	69.5	[67.1–71.8]	72.2	44.9	67.6	[66.1–69.0]	69.8
Primary	20.2	11.2	[9.7–12.9]	10.0	16.5	11.5	[10.5–12.5]	9.6
Secondary	21.4	13.7	[12.1–15.6]	13.5	29.5	15.7	[14.6–16.8]	15.9
Tertiary and higher	6.4	5.6	[4.5–6.9]	4.2	9.0	5.2	[4.6–5.9]	3.6
Marital status								
Married	83.6	83.3	[81.3–85.1]	84.2	75.4	77.5	[76.2–78.8]	72.5
Widowed	5.5	5.0	[4.0–6.2]	1.1	3.3	3.6	[3.1–4.3]	3.4
Divorced/separated	0.8	0.7	[0.4–1.3]	5.6	0.8	0.7	[0.5–1.0]	0.9
Single	10.1	11.0	[9.5–12.7]	9.1	20.4	18.2	[17.0–19.4]	23.2
Type of place of residence								
Ouagadougou	11.1	13.0	[11.4–14.8]	14.4	15.8	11.5	[10.6–12.4]	14.5
Bobo-Dioulasso	6.1	3.4	[2.6–4.4]	5.0	6.7	3.8	[3.3–4.4]	5.2
Other town	40.2	13.5	[12.0–15.3]	11.9	14.3	9.3	[8.5–10.2]	11.4
Rural area	42.6	70.1	[67.7–72.3]	68.7	63.2	75.4	[74.1–76.6]	69.0
Region of residence								
Boucle du Mouhoun	7.1	10.5	[9.0–12.2]	9.6	6.8	10.6	[9.6–11.7]	9.5
Cascades	7.4	4.3	[3.4–5.5]	3.9	4.1	4.1	[3.5–4.8]	4.1
Centre	15.7	16.8	[14.9–18.8]	18.4	24.3	13.4	[12.5–14.5]	18.0
Centre-Est	7.8	7.9	[6.6–9.4]	7.7	6.9	8.1	[7.3–9.1]	7.4
Centre-Nord	7.9	7.6	[6.4–9.1]	7.0	9.2	8.5	[7.6–9.4]	7.3
Centre-Ouest	6.8	7.4	[6.1–8.9]	7.8	7.6	8.3	[7.5–9.2]	8.0
Centre-Sud	5.6	4.5	[3.6–5.7]	4.0	4.3	4.6	[3.9–5.3]	3.9
Est	7.1	8.5	[7.2–10.1]	7.5	4.0	8.3	[7.5–9.3]	7.8
Hauts-Bassins	12.7	12.0	[10.4–13.7]	11.8	14.2	11.0	[10.1–11.9]	12.0
Nord	6.5	7.7	[6.4–9.2]	7.8	7.4	8.5	[7.6–9.4]	8.1
Plateau-Central	6.3	4.5	[3.6–5.7]	4.6	6.2	4.8	[4.2–5.6]	4.7
Sahel	2.9	3.8	[2.9–4.9]	5.3	1.7	5.4	[4.7–6.2]	4.6
Sud-Ouest	6.2	4.4	[3.5–5.6]	4.8	3.4	4.3	[3.7–5.0]	4.6
Household size								
1–4 members	21.5	32.9	[30.5–35.3]	49.4	28.5	39.2	[37.6–40.7]	49.4
5–8 members	43.0	37.4	[34.9–39.9]	36.5	41.9	33.7	[32.3–35.3]	36.5
9+ members	35.4	29.7	[27.4–32.1]	14.1	29.6	27.1	[25.7–28.6]	14.1

Note: EHCVM: Enquête harmonisée sur les conditions de vie des ménages; RDD: random digit dialing.

Table 3.8 compares the characteristics of household heads interviewed in the original 2018–2019 EHCVM face-to-face survey with those successfully interviewed in the EHCVM MPS. The table shows differences between households without access to a mobile phone and those owning a phone. Mobile phone ownership was more common among men, respondents

aged 30–49 years, individuals with higher educational attainment, urban residents, households with electricity and improved housing conditions, and larger households. Conversely, households without a phone were disproportionately rural, less educated, older, and characterized by lower levels of infrastructure and housing quality.

The composition of the EHCVM mobile phone sample also differs from that of all phone-owning households identified in the original EHCVM survey. Compared with the latter, the mobile phone sample includes a higher proportion of women (23.3% vs. 14.9%), younger respondents aged 15–29 years (17.5% vs. 10.7%), respondents with secondary or higher education (27.8% vs. 16.7%), residents of urban areas (57.4% vs. 44.9%), and members of large households containing nine or more persons (35.4% vs. 21.7%). At the regional level, participation also varied, with notably lower representation of the Sahel region (2.9% vs. 6.5% among phone owners).

The observed differences indicate that the EHCVM mobile phone sample was not fully representative of either the original EHCVM population or all households with access to a mobile phone. The discrepancies show the presence of differential participation among eligible households, and provide descriptive evidence consistent with the potential for selection bias due to differential re-contact and survey participation.

Table 3.8 : Composition of the EHCVM (mobile phone) sample in Burkina Faso, compared with the population enumerated in the 2018–2019 F2F EHCVM survey

Respondent's characteristics	Household heads in original F2F EHCVM survey						Household head in MPS	
	No phone		**Phone owner**		**Both**		**EHCVM**	**EHCVM**
	%	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**
Sex of respondent								
Men	68.7	298.0	86.2	5666.0	85.1	5964.0	76.7	3908.0
Women	31.3	136.0	13.8	909.0	14.9	1045.0	23.3	1189.0
Age group								
15–29 yrs	9.9	43.0	10.7	705.0	10.7	748.0	17.5	890.0
30–49 yrs	36.8	160.0	51.0	3355.0	50.1	3515.0	52.0	2649.0
50+ yrs	53.3	232.0	38.3	2515.0	39.2	2747.0	30.6	1558.0
Education								
None	94.9	413.0	67.8	4456.0	69.5	4869.0	52.0	2649.0
Primary	3.9	17.0	14.4	950.0	13.8	967.0	20.2	1031.0
Secondary+	1.1	5.0	17.8	1169.0	16.7	1174.0	27.8	1417.0
Marital status								
Married	73.8	321.0	85.7	5635.0	85.0	5956.0	83.6	4262.0
Widowed	21.4	93.0	8.2	539.0	9.0	632.0	5.5	279.0
Divorced/separated	2.5	11.0	1.6	106.0	1.7	117.0	0.8	41.0

Single	2.3	10.0	4.5	295.0	4.4	305.0	10.1	515.0
Type of place of residence								
Ouagadougou	0.2	1.0	8.2	539.0	7.7	540.0	11.1	566.0
Bobo-Dioulasso	0.5	2.0	4.2	273.0	3.9	275.0	6.1	312.0
Other town	14.9	65.0	34.5	2269.0	33.3	2334.0	40.2	2048.0
Rural area	84.4	367.0	53.1	3494.0	55.1	3861.0	42.6	2171.0
Region of residence								
Boucle du Mouhoun	9.0	39.0	8.3	548.0	8.4	587.0	7.1	361.0
Cascades	2.1	9.0	6.6	433.0	6.3	442.0	7.4	376.0
Centre	2.3	10.0	12.4	818.0	11.8	828.0	15.7	800.0
Centre-Est	11.7	51.0	8.0	525.0	8.2	576.0	7.8	400.0
Centre-Nord	5.7	25.0	7.3	479.0	7.2	504.0	7.9	405.0
Centre-Ouest	6.2	27.0	7.1	465.0	7.0	492.0	6.8	349.0
Centre-Sud	10.6	46.0	6.4	421.0	6.7	467.0	5.6	285.0
Est	8.3	36.0	7.7	503.0	7.7	539.0	7.1	360.0
Hauts-Bassins	3.2	14.0	10.7	705.0	10.3	719.0	12.7	645.0
Nord	3.4	15.0	6.5	427.0	6.3	442.0	6.5	332.0
Plateau-Central	4.4	19.0	6.1	400.0	6.0	419.0	6.3	323.0
Sahel	11.7	51.0	6.2	405.0	6.5	456.0	2.9	146.0
Sud-Ouest	21.4	93.0	6.8	446.0	7.7	539.0	6.2	315.0
Household size								
1–4 persons	52.9	230.0	31.4	2066.0	32.8	2296.0	21.5	1098.0
5–8 persons	39.5	172.0	45.9	3020.0	45.5	3192.0	43.0	2193.0
9+ persons	7.6	33.0	22.6	1489.0	21.7	1522.0	35.4	1806.0
Electricity								
Yes	3.2	14.0	29.0	1906.0	27.4	1920.0	32.4	1652.0
No	96.8	421.0	71.0	4669.0	72.6	5090.0	67.6	3445.0
Roof								
Improved	57.9	252.0	86.8	5704.0	85.0	5956.0	90.2	4598.0
Not improved	42.1	183.0	13.2	871.0	15.0	1054.0	9.8	499.0
Water source								
Improved	76.1	331.0	83.9	5519.0	83.5	5850.0	86.7	4418.0
Not improved	23.9	104.0	16.1	1056.0	16.5	1160.0	13.3	679.0
Region and place of residence								
Boucle du Mouhoun urban	1.1	5.0	3.2	211.0	3.1	216.0	3.6	185.0
Boucle du Mouhoun rural	7.8	34.0	5.1	337.0	5.3	371.0	3.5	176.0
Cascades urban	0.7	3.0	3.2	211.0	3.1	214.0	4.0	206.0
Cascades rural	1.4	6.0	3.4	222.0	3.3	228.0	3.3	170.0
Centre urban	0.2	1.0	8.2	539.0	7.7	540.0	12.7	648.0
Centre rural	2.1	9.0	4.2	279.0	4.1	288.0	3.0	152.0
Centre-Est urban	2.3	10.0	3.0	194.0	2.9	204.0	3.5	178.0
Centre-Est rural	9.4	41.0	5.0	331.0	5.3	372.0	4.4	222.0
Centre-Nord urban	0.2	1.0	3.1	203.0	2.9	204.0	3.9	198.0
Centre-Nord rural	5.5	24.0	4.2	276.0	4.3	300.0	4.1	207.0
Centre-Ouest urban	0.7	3.0	3.1	201.0	2.9	204.0	3.5	178.0
Centre-Ouest rural	5.5	24.0	4.0	264.0	4.1	288.0	3.4	171.0

Centre-Sud urban	0.9	4.0	2.9	188.0	2.7	192.0	2.6	134.0
Centre-Sud rural	9.7	42.0	3.5	233.0	3.9	275.0	3.0	151.0
Est urban	1.1	5.0	3.6	234.0	3.4	239.0	4.3	217.0
Est rural	7.1	31.0	4.1	269.0	4.3	300.0	2.8	143.0
Hauts-Bassins urban	0.5	2.0	4.9	321.0	4.6	323.0	8.1	415.0
Hauts-Bassins rural	2.8	12.0	5.8	384.0	5.6	396.0	4.5	230.0
Nord urban	0.7	3.0	2.9	188.0	2.7	191.0	3.4	175.0
Nord rural	2.8	12.0	3.6	239.0	3.6	251.0	3.1	157.0
Plateau-Central urban	0.9	4.0	2.5	163.0	2.4	167.0	2.3	115.0
Plateau-Central rural	3.4	15.0	3.6	237.0	3.6	252.0	4.1	208.0
Sahel urban	1.8	8.0	3.2	208.0	3.1	216.0	2.1	105.0
Sahel rural	9.9	43.0	3.0	197.0	3.4	240.0	0.8	41.0
Sud-Ouest urban	4.4	19.0	3.3	220.0	3.4	239.0	3.4	172.0
Sud-Ouest rural	17.0	74.0	3.4	226.0	4.3	300.0	2.8	143.0
Total	100.0	435.0		6575.0		7010.0		5097.0

Table 3.9 compares women's socio-demographic characteristics across four data sources: the RaMMPS RDD arms, the RaMMPS EHCVM follow-up arms, the DHS, and the national census. For the RaMMPS arms, both unweighted and weighted proportions are presented, allowing an assessment of the extent to which survey weighting improves alignment with external population benchmarks, particularly the census.

Across most characteristics, weighting improves the comparability of both RDD and EHCVM arms with census and DHS estimates. As observed for household heads and the adult population, unweighted RDD and EHCVM arms show selection biases when considering women of reproductive age, particularly for urban residence, education, and household living conditions, in line with differences in mobile phone ownership. After weighting, distributions generally move closer to census proportions, although the degree of alignment varies by variable and by sampling strategy.

Before weighting, both RDD and EHCVM samples overrepresent urban areas, particularly Ouagadougou and Bobo-Dioulasso. Weighting reduces this bias. In the RDD sample, the weighted proportion of rural women (78.0%) slightly exceeds the census estimate (70.1%), while the weighted EHCVM estimate (72.3%) is closer to the census benchmark. Urban proportions in both weighted samples converge toward census levels, although RDD remains somewhat more rural-leaning than both DHS (67.5% rural) and the census.

Geographic alignment improves after weighting. In the RDD arm, the weighted share of rural residents increases from 63.2% to 78.0% (95% CI: 76.8–79.2), moving closer to the census value (70.1%), while urban areas, especially Ouagadougou, remain underrepresented (10.4%

vs 15.8% in DHS). The EHCVM weighted sample shows closer correspondence with both the census and DHS across urban–rural residence and regions. In conflict-affected regions (Sahel, Est, Nord), weighting increases representation in both samples, narrowing gaps with the census and DHS estimates. For marital status, weighted estimates of married respondents reach 81.3% (RDD) and 81.5% (EHCVM), closer to DHS (72.9%) than unweighted figures, though still above the Census (70.3%). Single individuals remain underrepresented in both weighted samples. Age distributions also improve moderately after weighting. The proportion aged 15–29 years increases to 55.5% in RDD (95% CI: 53.9–57.0) and 50.7% in EHCVM (95% CI: 48.3–53.0), approaching DHS levels (55.8%). Education-related biases are reduced but not fully eliminated: weighting substantially raises the share of women with no education (RDD: 67.7%, EHCVM: 60.6%), exceeding DHS estimates (56.6%), while higher education remains slightly underrepresented. After weighting, socioeconomic indicators align with census values. The prevalence of unimproved roofing, lack of electricity, and unimproved water sources increases in both samples, correcting the upward bias observed in unweighted data. Nevertheless, discrepancies persist between DHS and the census—particularly for electricity access. Finally, household size distributions improve after weighting, with better alignment for small (1–4 members) and large households, although RDD continues to underrepresent very large households relative to the census.

In sum, post-stratification enhances the representativeness of phone survey data, especially for the EHCVM arm. While weighting cannot fully eliminate selection biases linked to phone access and response behavior, it plays an important role in bringing RDD and EHCVM estimates closer to established population benchmarks.

Table 3.9 : Comparison of women's characteristics according to data collection source DHS, MPS and the census

Respondents' characteristics	**RDD**			**EHCVM**			**DHS**		**Census**
	Unw	Weighted		Unw	Weighted		Weighted		
	%	%	CI	%	%	CI	%	CI	%
Place of residence									
Ouaga	16.5	10.4	[9.5,11.3]	9.0	9.8	[8.5,11.3]	15.8	[15.1,16.5]	
Bobo	6.6	3.3	[2.9,3.9]	5.4	3.1	[2.5,3.9]	5.2	[4.9,5.5]	
Others towns	13.6	8.2	[7.5,9.1]	40.5	14.8	[13.4,16.4]	11.5	[11.1,11.9]	
Rural	63.2	78.0	[76.8,79.2]	45.1	72.3	[70.2,74.2]	67.5	[66.7,68.3]	
Marital statut									
Married	76.9	81.3	[80.1,82.5]	76.6	81.5	[79.6,83.2]	72.9	[72.2,73.7]	70.3
Widowed	3.3	4.2	[3.6,4.8]	0.8	0.6	[0.3,1.1]	1.7	[1.5,2.0]	2.0

Divorced/sep	1.0	0.9	[0.7,1.3]	0.8	0.5	[0.3,0.9]	1.4	[1.3,1.7]	0.9
Single	18.8	13.6	[12.5,14.7]	21.8	17.4	[15.7,19.2]	23.9	[23.2,24.6]	26.8
Region									
Boucle du mouhoun	6.3	10.8	[9.8,11.8]	6.7	8.7	[7.4,10.1]	9.7	[9.2,10.2]	
Cascades	3.8	3.8	[3.2,4.4]	7.4	5.3	[4.3,6.4]	3.1	[2.8,3.3]	
Centre	26.1	13.1	[12.2,14.1]	13.9	14.7	[13.1,16.4]	20.1	[19.3,20.9]	
Centre est	7.1	9.9	[9.0,10.8]	7.5	9.0	[7.7,10.5]	9.9	[9.4,10.4]	
Centre nord	9.5	10.4	[9.4,11.3]	9.1	9.3	[8.0,10.8]	8.3	[7.8,8.8]	
Centre ouest	7.3	9.2	[8.3,10.2]	6.1	6.8	[5.7,8.1]	10.3	[9.8,10.8]	
Centre sud	4.4	5.3	[4.6,6.0]	5.7	5.2	[4.3,6.4]	4.3	[4.1,4.6]	
Est	3.9	6.9	[6.1,7.8]	8.7	8.6	[7.4,10.1]	6.5	[6.1,7.0]	
Hauts-bassins	13.7	10.2	[9.3,11.2]	12.6	13.2	[11.7,14.9]	10.2	[9.8,10.7]	
Nord	7.4	9.1	[8.3,10.1]	6.5	7.3	[6.2,8.6]	5.6	[5.3,6.0]	
Plateau central	6.0	4.0	[3.5,4.6]	6.6	4.9	[4.0,5.8]	6.0	[5.7,6.3]	
Sahel	1.5	2.9	[2.4,3.5]	3.1	2.3	[1.7,3.1]	2.6	[2.3,2.8]	
Sud-ouest	3.2	4.4	[3.8,5.1]	6.1	4.7	[3.8,5.7]	3.4	[3.2,3.6]	
Place of residence									
Urban	36.8	22.0	[20.8,23.2]	54.9	27.7	[25.8,29.8]	32.5	[31.7,33.3]	29.9
Rural	63.2	78.0	[76.8,79.2]	45.1	72.3	[70.2,74.2]	67.5	[66.7,68.3]	70.1
Age group									
15-29 yrs	49.0	55.5	[53.9,57.0]	49.4	50.7	[48.3,53.0]	55.8	[55.0,56.6]	
30-49 yrs	51.0	44.5	[43.0,46.1]	50.6	49.3	[47.0,51.7]	44.2	[43.4,45.0]	
Main roof material									
Improved	91.7	82.3	[81.1,83.5]	89.2	81.6	[79.7,83.3]	88.1	[87.6,88.7]	81.2
Unimproved	8.3	17.7	[16.5,18.9]	10.8	18.4	[16.7,20.3]	11.9	[11.3,12.4]	18.8
HH has electricity									
Yes	76.2	65.0	[63.5,66.5]	72.8	65.1	[62.8,67.3]	23.3	[22.6,24.0]	56.0
No	23.8	35.0	[33.5,36.5]	27.2	34.9	[32.7,37.2]	76.7	[76.0,77.4]	44.0
Improved Water Source									
Improved	91.0	80.0	[78.7,81.3]	90.0	81.9	[80.0,83.6]	83.9	[83.3,84.5]	68.5
Unimproved	9.0	20.0	[18.7,21.3]	10.0	18.1	[16.4,20.0]	16.1	[15.5,16.7]	31.5
Education									
No education	45.3	67.7	[66.3,69.1]	51.1	60.6	[58.4,62.9]	56.6	[55.8,57.4]	
Primary	15.3	12.4	[11.4,13.5]	16.3	14.7	[13.1,16.4]	15.4	[14.8,16.0]	
Secondary	31.8	17.2	[16.1,18.4]	29.6	22.4	[20.6,24.4]	25.3	[24.6,26.0]	
Higher	7.6	2.6	[2.2,3.1]	3.0	2.2	[1.6,3.0]	2.7	[2.4,3.0]	
Household size									
1-4 members	25.7	31.3	[29.9,32.7]	12.1	17.0	[15.4,18.9]	18.5	[17.8,19.1]	29.9
5-8 members	45.1	39.2	[37.7,40.7]	44.7	40.0	[37.8,42.3]	44.0	[43.2,44.9]	40.6

9 members	29.3	29.6	[28.2,31.0]	43.2	42.9	[40.6,45.3]	37.5	[36.7,38.3]	29.5
Regional context									
Conflict	35.6	49.9	[48.4,51.5]	41.6	45.2	[42.9,47.6]	42.6	[41.8,43.4]	
Non conflict	64.4	50.1	[48.5,51.6]	58.4	54.8	[52.4,57.1]	57.4	[56.6,58.2]	

3.3.3 Data quality

The absence of physical interaction between respondents and interviewers, combined with the inability to observe the respondents' living environment, raises concerns regarding the quality of data collected through MPS. We therefore assess several key indicators commonly used to evaluate data quality in demographic research. Specifically, we examine the sex ratio at birth, as well as the quality of age reporting. In addition, we analyse a set of aggregated indicators directly related to mortality estimation, including the mean number of children ever born, the mean number of siblings reported by respondents and the proportions of surviving parents. These same indicators are also examined for deceased children and siblings.

3.3.3.1 Age heaping

We assessed the quality of age reporting using two complementary measures: the Myers Blended Index and the Whipple Index (Table 3.10). The Myers Index evaluates the overall tendency for respondents to report ages ending in particular digits (0–9). It can be interpreted as the estimated percentage of individuals whose ages would need to be adjusted to eliminate terminal-digit preference (Siegel et al., 2004). The Whipple Index, on the other hand, focuses more specifically on the attraction or avoidance of ages ending in 0 or 5.

The results, summarized in Table 3.10 below, show that the Myers Index was 18% in the EHCVM arm and 33% in the RDD arm, indicating a concentration of reported ages on certain terminal digits in the RDD data. The Whipple Index confirms this pattern, revealing a more frequent attraction to round ages (ending in 0 or 5) among RDD respondents.

Comparison with recent census data shows that age reporting in the EHCVM arm aligns with census quality, while the RDD arm shows more digit preference.

Table 3.10 : Whipple and Myers index by data source

Index	Whipple	Myers
EHCVM	122	18

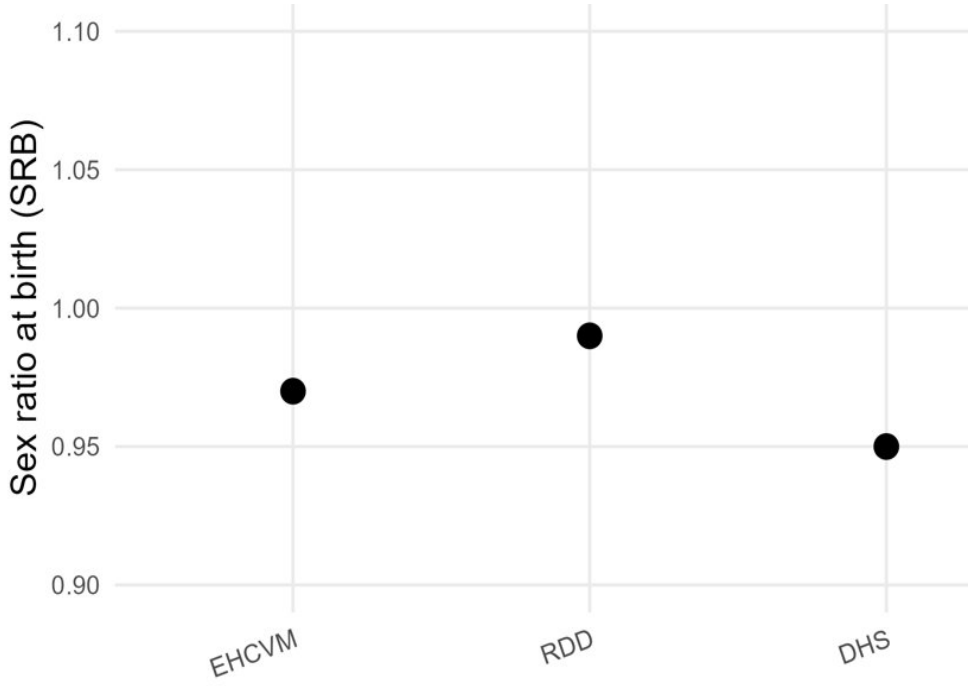
RGPH HH head	142	18
RDD	175	33
RGPH 15-64 years	145	19

3.3.3.2 Sex ratio at birth

The sex ratio at birth (SRB) reported in birth histories is presented in Figure 3.2. The SRB, defined as the number of male live births per 100 female live births, is a key demographic indicator used to assess the consistency and reliability of birth data (Bongaarts & Guilmoto, 2015; *UN. Population Division*, 2011). In the absence of sex-selective behaviors or systematic reporting errors, the natural sex ratio at birth typically ranges between 103 and 107 male births per 100 female births (WPP, 2022). Deviations from the expected range may indicate reporting biases, such as underreporting of female births, sampling effects, or errors in recall.

The results presented in Figure 3.2 show that the sex ratio at birth derived from both study arms is higher than that observed in the DHS 2021. Nonetheless, the differences remain within biologically plausible limits.

Figure 3.2 : Sex ratio at birth according to RaMMPS and DHS 2021



3.3.3.3 Mean number of children by women's age group

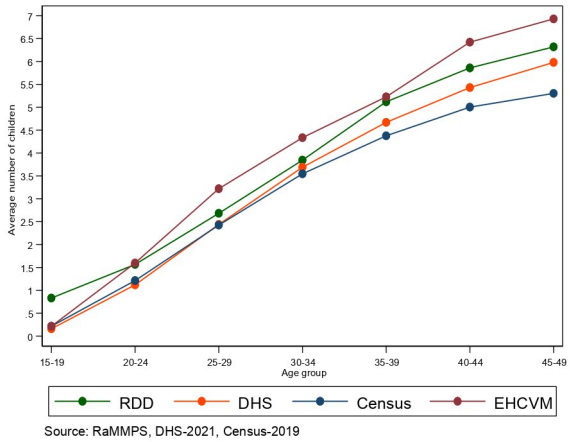
The mean number of children by women's age group is a key indicator for assessing the quality of data on birth histories (Hill, 2014). In contexts where fertility has been declining, this indicator is expected to increase with women's age, reflecting cumulative childbearing over the life course.

Figure 3.3 presents the mean number of children ever born by women's age group at the time of data collection and compares estimates from the RaMMPS survey arm with those from the 2021 DHS and the 2019–2020 population census. All three data sources show the expected increase in parity with age, though at varying levels. The mean number of children ever born reported in the RaMMPS survey is consistently higher than that observed in the 2021 DHS, while estimates from the most recent census are lower than those from both survey sources.

A similar pattern appears when examining the mean number of surviving children (Figure 3.4), although the differences between data sources are less pronounced. Appendix Figure 11.1 (on page 342) further compares these results with the 2010 DHS, which shows higher reported numbers of children ever born and surviving, a pattern that is consistent with the documented decline in fertility since 2010.

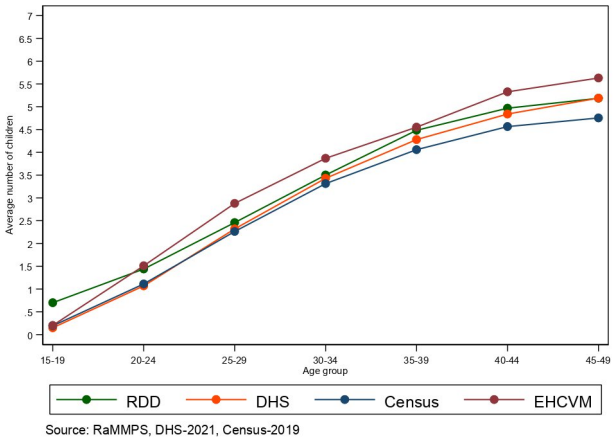
The discrepancies observed across data sources may result from underestimation in some surveys or from differences in how questions were understood in the RaMMPS survey, which may have led some women to include non-biological children in their reported birth histories.

Figure 3.3 : Mean number of children ever born in the RaMMPS survey, DHS 2021, and 2019–2020 census, by age of women.



Source: RaMMPS, DHS-2021, Census-2019

Figure 3.4 : Mean number of children surviving in the RaMMPS survey, DHS 2021, and 2019–2020 census, by age of women.



Source: RaMMPS, DHS-2021, Census-2019

3.3.3.4 Truncated birth histories and transfer of births outside of the reference period

The use of truncated birth histories (TBH) in MPS could have generated biases in the reporting of child deaths, likely resulting in an underestimation of recent mortality levels. Following the diagnostic approach proposed by Hill (Hill, 2014), we compared the proportion of deceased children born before the truncation date (2015) to the proportion of those born within the

truncation window (Table 3.11). In the absence of reporting bias, this ratio should be close to one, reflecting a consistent reporting of deaths across birth cohorts.

Our results show that, in the RaMMPS MPS data, these ratios are systematically well above unity across all age groups, with values exceeding 1.55 and reaching as high as 2.87 among women aged 15–19 years and 2.23 among those aged 35–39 years when both arms are combined. This pattern contrasts with the DHS 2021, where the corresponding ratios remain consistently lower, generally below 1.35 and often close to one. Such differences suggest a deficit of reported deaths among children born during the truncation window in the MPS, consistent with either omission of recent deaths or displacement of events outside the reference period. This pattern has been observed elsewhere with Malaria Indicator Surveys conducted within the DHS Program (Masquelier et al., 2023).

The EHCVM-based phone follow-up shows high ratios, exceeding 3.0 for mothers aged 15–19 and staying above 1.9 for several older age groups. In contrast, the RDD arm shows lower ratios overall, generally ranging between 1.2 and 1.7, although values still exceed those observed in the DHS for most age groups. This suggests that truncation bias affects both MPS sampling strategies, but it appears to be more pronounced when MPS are anchored to a prior F2F household survey, for unknown reasons.

Table 3.11 : Ratio of proportions of deceased children by whether the birth occurred before or during the TBH date window.

Age group	Proportion of children declared deceased before the truncation date (1)	Proportion of children declared deceased after the truncation date (2)	Both arms combined (1/2)	EHCVM only	RDD only	DHS 2021
15–19	0.14	0.05	2.87	3.14	1.22	0.00
20–24	0.07	0.03	2.36	2.60	1.70	1.32
25–29	0.09	0.05	1.71	1.73	1.66	1.23
30–34	0.10	0.06	1.56	1.48	1.68	1.16
35–39	0.13	0.06	2.23	3.39	1.48	1.26
40–44	0.16	0.10	1.60	1.99	1.24	0.99
45–49	0.18	0.09	1.98	1.86	2.24	0.46

Note: EHCVM: Enquête harmonisée sur les conditions de vie des ménages; RDD: random digit dialing; MPS: mobile phone survey; DHS: Demographic and Health Survey.

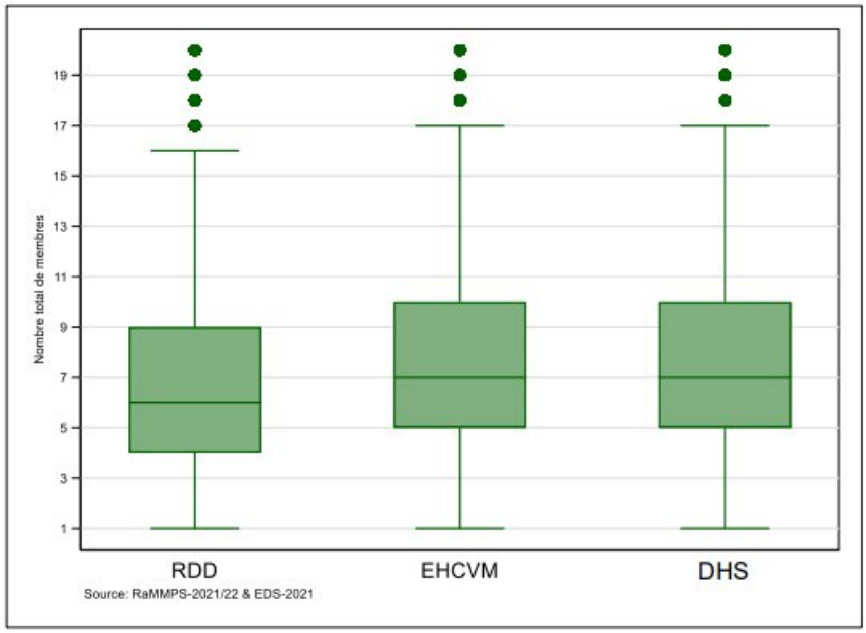
3.3.3.5 Household size by data source

Estimates of mortality based on recent household deaths are sensitive to how household size is reported and measured. The distribution of household size is similar between the EHCVM-

based RaMMPS sample and the 2021 DHS, despite differences in measurement approaches (Figure 3.5). In the RaMMPS survey, household size is obtained through a direct question, whereas in the 2021 DHS, it is derived from a complete household roster based on individual enumeration.

In contrast, the RDD-based RaMMPS sample yields smaller household sizes compared with the DHS. This pattern may be attributable to selection effects inherent to the RDD approach, which tends to underrepresent larger and more complex households, for reasons that still need to be studied.

Figure 3.5 : Distribution of household size by data source



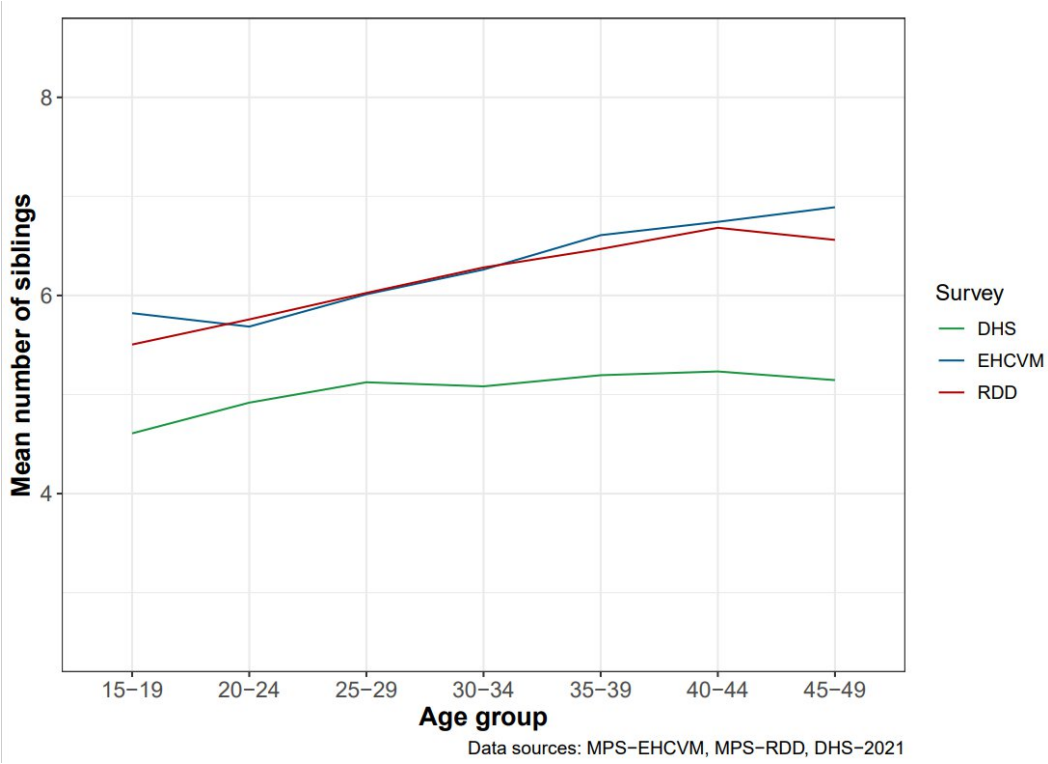
3.3.3.6 Mean number and proportions of siblings alive or deceased by women's age group

3.3.3.6.1 Mean number of siblings

To evaluate the quality of reports on sibling survival, we analyzed the mean number of siblings reported and the distribution of sibling survival status, according to the sex of siblings. Figure 3.6 presents the mean number of siblings by age group of respondents for the two study arms and the 2021 DHS, while Table 11.4 (in Appendix, page 343) presents a similar comparison for both arms combined with the 2010 DHS. Respondents in the 2010 DHS tended to report a slightly higher number of siblings up to the 35–39 age group, while the reverse is true for older respondents. However, these differences are quite small (less than 0.5 siblings on average). By contrast, the average number of living siblings is higher in both the EHCVM and RDD arms

across all age groups, when compared to the more recent DHS conducted in 2021. The patterns observed in the two study arms are consistent.

Figure 3.6 : Mean number of siblings ever born by age group of respondent and study arm, compared to the 2021 DHS



3.3.3.6.2 Proportion of surviving or deceased siblings

Figure 3.7 depicts the proportion of surviving siblings by age group of respondents in the MPS and DHS. Because we asked additional questions about recent deaths, Figure 3.8 also shows the proportion of siblings who had passed away within the last 3 years. As expected, there is a steady decline in the proportion of surviving siblings across age groups in all three data sources. Overall, the proportions of siblings still alive are significantly lower in the EHCVM and RDD MPS compared to the DHS, with consistent patterns in both arms. However, the proportions of deaths that occurred within the three years preceding the surveys are also much lower, and this is likely to substantially affect recent mortality estimates. For instance, the proportions of sisters reported as recently deceased are 24% lower in the EHCVM compared to the DHS, and 13% lower in the RDD compared to the DHS. There is no clear pattern of deviation from the DHS based on respondent age, and the two study arms show similar patterns.

Figure 3.7 : Proportion of surviving brothers and sisters in MPS and DHS, by age group of respondents

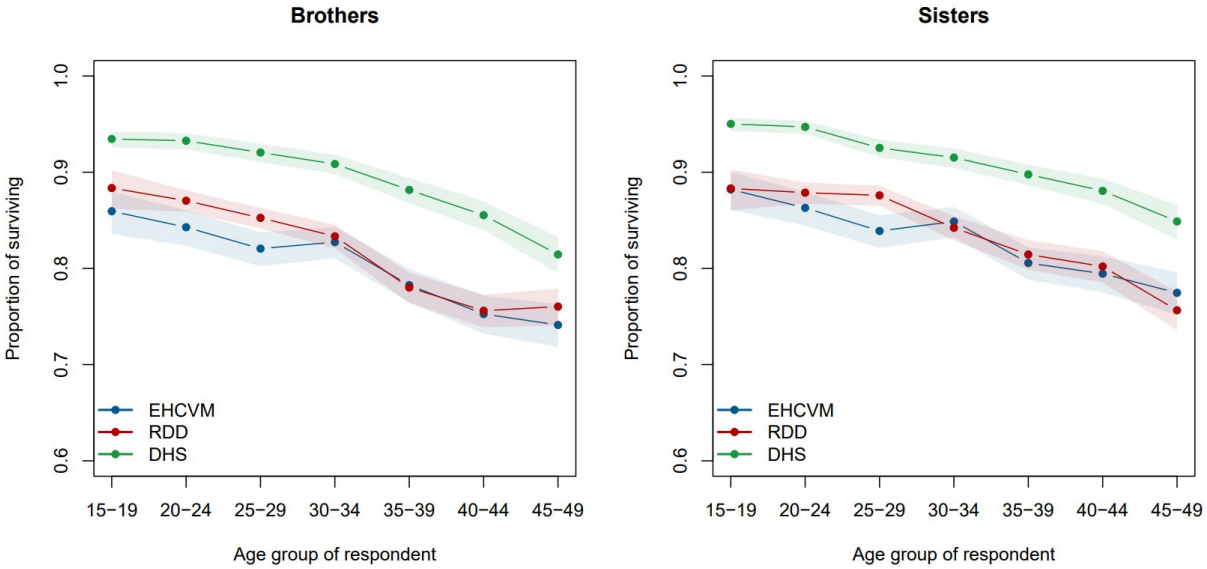
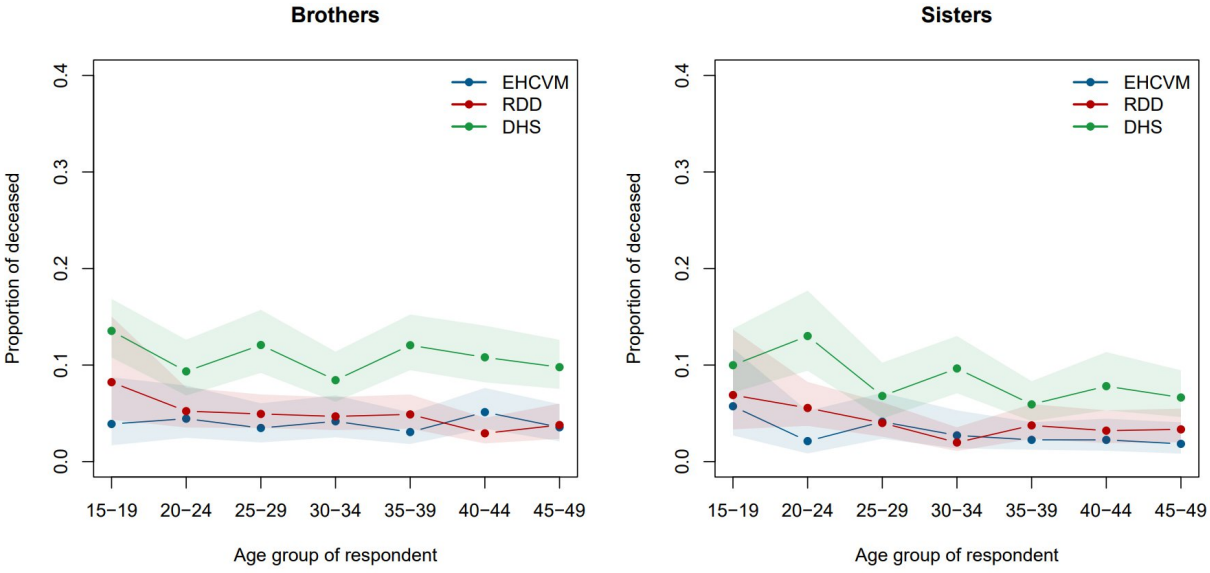


Figure 3.8 : Proportion of deceased brothers and sisters who died in the previous three years in DHS and since January 2019 in MPS, by age group of respondents



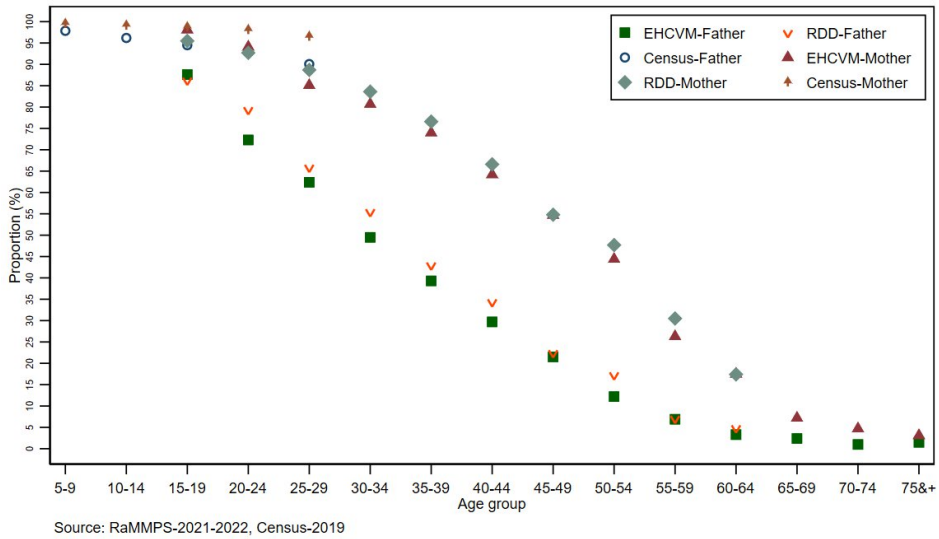
This comparison with the 2021 DHS suggests that the summary data collected on sibship sizes and the proportions of siblings surviving in MPS are of acceptable quality, but there are problems with the dating of recent deaths.

3.3.3.7 Parental survival histories

Figure 3.9 presents the proportion of parents surviving according to the sex of the parent and the age group of the respondents at the time of data collection, in the 2019 census and each arm of the MPS. Information on parental survival in the census was collected from respondents

under the age of 30 only, and in the MPS, this information was collected from all respondents. In both sources, we observe the expected downward trend in the proportion of parents still alive according to the age group of the respondents, with a faster decline for fathers. The proportion of respondents with parents surviving is much higher in the 2019 census data, compared to those calculated from the MPS survey for the age groups 15–19, 20–24 and 25–29 years old, for both mothers and fathers. Censuses and surveys are known to be affected by adoption bias, introducing upward bias in the proportions of parents surviving (Feeney, 2001; Masquelier et al., 2017; Robertson et al., 2008), but it is unclear why the census would be more affected by this misreporting error than the MPS.

Figure 3.9 : Proportions of respondents with surviving parents, according to the sex of the parent and the age group of the respondents at the time of data collection, in the 2019 census and 2021–2022 RaMMPS study arms



Note: EHCVM: Enquête harmonisée sur les conditions de vie des ménages; RDD: random digit dialing

3.4 Discussion

This chapter examined the performance of two MPS sampling strategies, the EHCVM-based follow-up and RDD in terms of fieldwork efficiency, participation patterns, sample representativeness, and data quality. The EHCVM follow-up achieved higher contact, response, and cooperation rates than the RDD approach. Participation in MPS depended on a combination of individual characteristics (including sex, age, language, and place of residence), contextual conditions, and operational features of the calling strategy. Some determinants remained stable over time, while others varied across survey trimesters. Despite the use of quotas, both sampling

strategies showed deviations from external population benchmarks, indicating persistent coverage and non-response biases linked to mobile phone ownership and survey participation. Post-stratification weighting improved correspondence with national demographic distributions but did not fully correct for selection and measurement biases.

By combining descriptive analyses and multivariate regression models, our results shed light on the social, spatial, and operational mechanisms that shape participation in MPS in Burkina Faso, with insights for other LMICs. Our findings first confirm that successful contact through mobile phones is highly selective. Individuals who answered calls were predominantly men, younger adults (18–49), French speakers, and residents of major urban centers, particularly Ouagadougou. These patterns are consistent with previous evidence showing that mobile phone ownership, network coverage, and digital literacy are unevenly distributed across population groups in SSA (Dabalen et al., 2016; Tran et al., 2015).

However, while urban residents were easier to reach and quotas for Ouagadougou and Bobo-Dioulasso were filled rapidly, once contact was established, individuals living outside the capital, especially in rural areas, were more likely to agree to participate. This apparent paradox shows an important distinction between *coverage* and *cooperation*. Similar findings have been reported in MPS in Africa, where rural respondents, though harder to reach, often display higher willingness to participate once contacted, possibly due to fewer survey solicitations and stronger norms of cooperation (Gibson et al., 2017). Women in our study were more than three times as likely as men to accept participation, even after adjusting for residence, age, language, and calling conditions. This finding contrasts with the initial contact profile dominated by men. Age also played a significant role, with individuals aged 50 and above being more likely to participate than younger adults. Age differences in survey participation have been documented in the survey literature. Several studies show that participation rates differ by age. Middle-aged and older adults tend to participate more often than younger adults. This pattern is commonly linked to greater availability and lower mobility among older individuals, while younger adults face more work-related and time constraints. Similar age gradients in participation have been documented across alternative survey modes (Mulder & Bruijne, 2019) and in large epidemiological studies, where the likelihood of participation increases with age (Green et al., 2018). Additionally, national social surveys report variable response rates across cycles that are partly driven by differential engagement across demographic groups, including by age (Gouvernement du Canada, 2020). Although descriptive analyses revealed differences in participation based on language, these differences diminished in adjusted models. This indicates that language itself is likely not the main determinant of participation, but instead correlates

with other factors like place of residence, education, or socioeconomic status. Conversely, repeated call attempts were associated with lower participation. Similar patterns have been reported in the survey methodology literature, where additional contact attempts often yield progressively smaller improvements in response rates (Alrababah et al., 2025). Methodological reviews also indicate that increasing the number of call attempts or attempting refusal conversion may impose additional burden on respondents without achieving proportional gains in participation (Sangster, 2003). More broadly, studies of telephone survey performance indicate that high volumes of unsolicited calls contribute to respondent fatigue and higher non-response, consistent with observed declines in willingness to participate after multiple contacts (Grigoreva et al., 2019).

The trimester-specific analyses reveal that determinants of participation varied over time. Some factors such as gender and residence remained robust, while others, including call timing and number of attempts, showed temporal heterogeneity. This dynamic dimension is rarely documented in MPS studies but is particularly relevant in contexts like Burkina Faso, where security conditions, population displacement, and network reliability fluctuate over time (Ecofin, 2025).

Applying the AAPOR final disposition codes provides a standardized framework to assess and compare the performance of the two sampling strategies implemented in RaMMPS (AAPOR, 2016). In our analysis, the EHCVM-based follow-up yielded higher response, cooperation, and contact rates than the RDD approach, as captured by these outcome measures. This aligns with previous research showing that prior F2F contact enhances respondents' willingness to participate in subsequent telephone interviews, leading to higher cooperation and reduced nonresponse (Dillman et al., 2014). Empirical studies of mixed-mode designs further corroborate that personal contact fosters familiarity and trust, which in turn improve both contact and cooperation rates in follow-up MPS (Dabalen et al., 2016; Gibson et al., 2017; Keeter et al., 2000).

The contrast between the two arms is particularly striking in terms of operational efficiency. In the EHCVM arm, approximately two phone numbers were dialed to complete one interview, compared to about four numbers in the RDD arm. This difference reflects the limitation of RDD in LMICs, where a large proportion of generated numbers are unreachable (Greenleaf et al., 2020; Himelein, Eckman, Lau, et al., 2020). For example, in a national mobile phone RDD survey in Ghana, more than 85% of numbers dialed were unanswered or invalid before obtaining a completed interview (Himelein, Eckman, Kastelic, et al., 2020). Similarly, methodological assessments indicate that a large proportion of randomly generated telephone

numbers in LMICs settings are either non-functional or not associated with households, which increases the number of call attempts required and reduces overall survey efficiency compared with sampling from lists of verified numbers (L'Engle et al., 2018). The lower response rate observed in the RDD arm (45%), compared to the EHCVM arm (59%), is largely driven by non-contact rather than refusal, as refusal rates were low and similar across both strategies (6%). Importantly, once contact was successfully established, cooperation was high in both arms: over 84% of eligible respondents in the RDD arm and more than 90% in the EHCVM arm agreed to participate.

The analysis of interview duration reveals differences between the two survey arms, though direct comparison must be interpreted with caution. In the RDD arm, interviews were shorter on average when considering completed interviews alone, whereas the EHCVM-based arm presented longer average durations. However, this apparent difference is partly methodological. In the EHCVM arm, interviews with household heads and women of reproductive age were often conducted sequentially using the same phone number, making it difficult to disentangle the duration attributable to each respondent. Therefore, total interview time was used as the unit of comparison. In addition to these measurement constraints, audio recordings offer information on respondent behaviour. Many EHCVM respondents explicitly referred to their prior participation in the 2018–2019 F2F survey and occasionally interrupted interviewers to signal that certain questions had already been asked. This familiarity led to an increased need for more in-depth explanations, thus lengthening the interviews. Yet longer interview durations in the EHCVM arm did not translate into lower data quality or higher misreporting. These findings are consistent with prior research indicating that interview length alone is a poor predictor of data quality, particularly when respondents are familiar with survey topics and trust the interviewing institution (Torrisi et al., 2024).

Interview conditions and locations provide additional context for interpreting data quality. The majority of interviews were conducted at respondents' homes, regardless of the sampling strategy, with only a minority taking place at workplaces. No significant differences were observed between the EHCVM and RDD arms in this respect. Conducting interviews at home may have facilitated more thoughtful responses, particularly for sensitive topics such as household deaths, birth histories, and survival of relatives. At the same time, the absence of physical presence limits the interviewer's ability to observe the respondent's environment or verify information, a limitation inherent to all MPS (Berzelak & Vehovar, 2018).

Differential selection mechanisms in the RDD and EHCVM arms

Both telephone survey strategies RDD and EHCVM follow-up are affected by non-random selection processes, but through distinct mechanisms. In the EHCVM arm, selection bias arises primarily from attrition and differential re-contact success among households previously interviewed F2F. In the RDD arm, bias stems mainly from unequal mobile phone ownership and differential response behavior. Although quota-based sampling is designed to approximate population distributions, it may introduce selection bias when recruitment within strata is constrained by differential reachability or participation, leading to non-random inclusion within quota cells. The EHCVM sample of household heads deviates from census benchmarks, notably through the underrepresentation of rural residents and individuals with no formal education. These discrepancies suggest that, even within an initially representative F2F sample, telephone follow-up introduces a second layer of selectivity. This "double selection" phenomenon, first through phone ownership, then through successful contact and cooperation, has been documented in other low-income settings and is a key challenge for longitudinal phone-based surveys (Dabalen et al., 2016; Leo et al., 2015). In contrast, the RDD sample shows closer alignment with census distributions for age and place of residence, due to the use of quota-based sampling. However, substantial underrepresentation of individuals with low education levels and residents of insecure regions (Sahel, Est) remains evident. These gaps can be attributed to structural coverage limitations of RDD in fragile contexts, where network coverage, displacement, and phone access are uneven (Cedoca, 2022; HRW, 2023). Among women aged 15–49, selection effects differ in magnitude and direction across survey arms. Both RDD and EHCVM underrepresent adolescents (15–19) and unmarried women, with stronger biases observed in the RDD sample. The overrepresentation of married women across both arms suggests that MPS disproportionately capture women embedded in stable household structures, often reachable through shared or spouse-owned phones.

Effectiveness and limits of post-stratification weighting

Post-stratification weights improve the representativeness of both the RDD and EHCVM samples relative to national census distributions. After weighting, estimates of key sociodemographic characteristics—including place of residence, educational attainment, household amenities, and age structure—move closer to census benchmarks. These results are consistent with the survey methodology literature, which shows that calibration methods such as raking and post-stratification reduce coverage and non-response biases when auxiliary variables are associated with both survey participation and the outcomes of interest (Deville &

Särndal, 1992; Kalton & Flores-Cervantes, 2003). Unsurprisingly, weighting's corrective effect is particularly noticeable for variables directly included in the raking or post-stratification algorithm, like residence and age group. (Bethlehem, 2009; Little, 1993). However, despite these improvements, discrepancies persist for variables not explicitly included in the weighting scheme. For example, marital status and household size remain misaligned with census benchmarks even after weighting. Variables not used in weighting, especially those weakly correlated with the auxiliary margins or for with the mechanism of non-response remains subject to residual bias (Brick & Kalton, 1996; Särndal et al., 2007). Therefore, while post-stratification can substantially improve representativeness on key margins, it cannot eliminate all bias arising from underlying differences between the survey sample and the target population. Careful selection of auxiliary variables for weighting is therefore important, and analysts should interpret weighted estimates for characteristics not included in the calibration procedure cautiously.

Thus, the choice between RDD and using a previous survey should not be framed in binary terms but rather as a context-dependent trade-off: (i) using a previous survey appears to be preferable when recent, high-quality F2F data exist, when longitudinal consistency is required, and when regional representativeness is critical; (ii) RDD is better suited for rapid data collection, first-time surveys, or contexts where F2F follow-up is infeasible, but requires stronger weighting adjustments and careful interpretation.

4 Mortality measurements from the mobile phone survey conducted in Burkina Faso[2]

In this chapter, I compare mortality levels obtained from the MPS conducted in Burkina Faso to estimates derived from the last census, recent surveys, and modelled estimates from United Nations Agencies.

4.1 Introduction

As indicated in Chapter 1, MPS have several advantages that render them promising for data collection (Chasukwa et al., 2022; Kuehne et al., 2016; Soullier et al., 2022). They are less expensive, are quicker to deploy, can be conducted at higher frequencies than traditional F2F surveys, and allow for flexibility in questionnaire design to meet changing data needs (Brubaker et al., 2021; D. Gibson et al., 2017; Labrique et al., 2017; Leo et al., 2015). In SSA, there has been a proliferation of MPS in recent years. However, these are often small-scale surveys, such as opinion surveys (GeoPoll, 2015). MPS have also been used for evaluating health interventions with specific populations and for interim updates between household visits in HDSS (Brinkel, Kraemer, et al., 2014; Debrah et al., 2020; Jennings et al., 2015; G. Pariyo et al., 2019; van Heerden et al., 2010). More recently, MPS have been used to study the impact of the Ebola and COVID-19 crises on household living conditions and assess prevention behaviors (Headey, et al., 2020; PMA, 2023; Vinceti et al., 2020; World Bank Group, 2022). Few MPS have focused explicitly on measuring mortality, however, with a few exceptions. For example, an MPS carried out in Monrovia by Doctors Without Borders showed that this collection method was a feasible and acceptable alternative to F2F data collection, and enabled the

[2] This chapter is based on two manuscripts published in 2025 and another under revision:

1. Dianou, Kassoum, Soura, Abdramane B., Lankoandé, Bruno, Bassinga, Hervé, Luhar, Shammi, Menashe-Oren, Ashira, McCain, Kelly, Tlhajoane, Malebogo, Reniers, Georges & Masquelier, Bruno (2025). The use of mobile phone surveys for rapid mortality monitoring: A national study in Burkina Faso. *Demographic Research*, *52*, 479-518. doi :10.4054/demres.2025.52.16
2. Dianou, K., Masquelier, B., Luhar, S., Lankoandé, B., Oren, A. M., Soura, A., Bassinga, H., Tlhajoane, M., Dulani, B., & Akilimali, P. (2025). Measuring adult mortality from mobile phone surveys in Burkina Faso, Malawi and the Democratic Republic of the Congo. BMJ Global Health, 10(11), e019678. https://doi.org/10.1136/bmjgh-2025-019678.
3. Dianou, K., Jamali-Phiri, M., & al., (Manuscript under internal review). Estimating old-age mortality from parental survival histories: evidence from mobile phone surveys conducted in Malawi and Burkina Faso.

capturing of excess mortality resulting from deaths associated with Ebola (Kuehne et al., 2016). Jha and colleagues also used an independent MPS of adults in India to demonstrate that cumulative COVID deaths in India in September 2021 were six to seven times higher than officially reported (Jha et al., 2022). Similarly, a MPS-based study in Matlab, Bangladesh, showed a 28% increase in excess deaths among the elderly in the early months of the pandemic (Hanifi et al., 2021). Another study conducted in collaboration between Médecins Sans Frontières (MSF) and Cameroon's Ministry of Health in the country's Far North region revealed that the crude mortality rate (CMR) calculated from telephone interviews was higher than the rate derived from F2F surveys (Gignoux et al., 2020). Yet these previous studies mostly based their estimates on reports of recent household deaths, and there is a need to assess to what extent other instruments, such as birth or pregnancy histories and sibling histories, can be used or adapted for an MPS.

Compared to F2F interviews, MPS are prone to sampling and non-sampling bias. First, as discussed in the previous chapter, selection biases are expected, due to inequalities in mobile phone ownership (Chasukwa et al., 2022; Ellis & Krosnick, 1999; Kreuter et al., 2010; C. Q. Lau et al., 2019; Leo et al., 2015). Younger, urban, and male respondents with higher levels of education tend to be overrepresented in MPS (L'Engle et al., 2018). Further, data quality and non-response may be affected by network connectivity and quality, and the limitations of a mobile phone interview for the establishment of a trusting relationship between enumerator and respondent (Aquilino, 1994; Blumenstock & Eagle, 2012; Ekholm et al., 2010; Greenleaf et al., 2020; Lynn & Kaminska, 2013; M. I. Sinclair et al., 2012). MPS might, however, improve the data quality on sensitive topics. For example, MPS offer the advantage of allowing greater privacy, as the respondent is able to choose where and when to take the call (Aquilino, 1994; Dabalen et al., 2016; Groves, 1979; Roberts et al., 2006).

Few studies have compared the data quality of mortality indicators derived from F2F and MPS surveys. After exploring data quality markers in the previous chapter, we report here on mortality levels and trends extracted from the Burkina Faso survey conducted as part of the RaMMPS project. We compare the RaMMPS estimates with those obtained from the 2019–2020 census and the latest DHS available in the country, in addition to mortality estimates derived from United Nations agencies. This comparison covers under-5 mortality ($_5q_0$), captured in the MPS through truncated birth histories; mortality in adults aged 15–49 ($_{35}q_{15}$), measured through summary sibling survival histories; and old-age mortality ($_{30}q_{50}$), measured through a new survey module collecting parental survival histories.

4.2 Methods

4.2.1 Information collected for mortality estimation

Large-scale surveys such as the DHS or Multiple Indicator Cluster Surveys (MICS) generally include *full birth histories* (FBH) for estimating under-5 mortality (and fertility), and some also include full *siblings' survival histories* (SSH) for estimating adult mortality. Collecting FBH consists of asking a sample of women about their reproductive life, specifying the sex and date of birth of each child, his/her survival status, and, in case of death, the child's age at death. SSH are obtained by asking each respondent the name of each of his or her siblings born to the same mother, their sex, age, survival status, and, in case of death, their age at death and time since death (Helleringer, et al., 2014). In the RaMMPS survey, we revised these two instruments to limit interview length and added a new module to measure old-age mortality. This new module is based on questions on parental survival and collects information on the survival status of respondents' biological parents, their current age if alive, or their age and date of death if deceased (Masquelier et al., 2024). For deaths occurring from 2019 onwards, additional details were recorded, including month and year of death as well as place of residence prior to death. By focusing on parental survival rather than full sibling histories, this approach reduces respondent burden while allowing the estimation of mortality levels at older adult ages, a population segment that is rarely captured through standard demographic modules in MPS (Ouedraogo, 2020; Randall & Coast, 2016).

4.2.2 Methods for direct estimation

4.2.2.1 Method for estimating under-5 mortality

To measure under-5 mortality, we used *truncated birth history* (TBH). Truncated birth histories involve asking questions about only recent births (defined according to a reference period prior to the survey) or latest births (based on birth order), rather than a complete history of all past births. They have the advantage of being faster to collect, but they also pose additional risks in terms of recall errors and selection biases (Hill, 2014). For example, some respondents or interviewers could perceive an interest in moving births out of the reference period to end the interview more quickly. There could also be genuine difficulties in placing births in the reference period. For the MPS, we limited the data collection to births that had occurred in the last seven years only. Prior to this truncated history, we also collected the total number of children born alive and the total number of surviving children, by sex. The estimation of infant

and child mortality can therefore be based on direct methods (from the truncated birth histories) or indirect methods (from the summary birth histories). Direct estimates were obtained by dividing the deaths by the corresponding exposure times, by age and period since data collection, converting death rates into probabilities of survival, chaining survival probabilities together, and converting these cumulative probabilities into summary indices such as ${}_5q_0$ (Hill, 2014). We used the demogsurv package available for the R statistical software. This package provides estimates of infant (${}_1q_0$) or under-5 mortality (${}_5q_0$) and confidence intervals for these indicators via Taylor linearization or the jackknife method[3].

4.2.2.2 Method for estimating adult mortality

4.2.2.2.1 SSH collected in the Burkina Faso MPS

SSH are widely used for estimating adult mortality in LMICs (Timaeus & Jasseh, 2004) and offer many advantages, such as capturing a larger number of deaths and person-years than questions related to household deaths in the past twelve months. All the same, SSH have several well-documented limitations, including recall bias (especially for deaths that occurred in the distant past), age misreporting, omission of deceased siblings (particularly those who died in early adulthood or before the respondent was born), and displacement of death dates to avoid sensitive topics or due to poor memory (Helleringer, et al., 2014; Timaeus & Jasseh, 2004). Such biases can lead to the underestimation of adult mortality. When SSH is implemented via MPS, these limitations may be exacerbated. The abbreviated interview format, lack of visual cues, and potential distractions during phone calls may reduce respondents' ability to recall and report detailed sibling histories accurately. In addition, shorter question modules may leave less room for probing or clarifying inconsistent responses. These constraints can lead to further omissions and misclassifications, which may contribute to the underestimation of mortality levels.

4.2.2.2.2 Imputation to obtain full SSH

The full SSH module used in DHS, with questions on ages at the survey or at death and the timing of deaths, makes it possible to estimate adult mortality rates directly. Because both the occurrence of death and the exposure time (i.e., the age and duration lived) are recorded or can be derived, mortality rates can be calculated by dividing the total number of deaths observed in

[3] https://github.com/mrc-ide/demogsurv

a specific age group by the total person-years lived by all siblings in that age group, yielding an age-specific mortality rate (Reniers et al., 2011). In our case, as we did not know the age at the time of the interview for surviving siblings and the age at death for deceased siblings who died before 2019, we could not estimate mortality directly and had to resort to imputation or modelling. Drawing from methods used by Hill and al. (2015) to impute summary birth histories (Hill et al., 2015), we imputed ages and dates of death from an earlier DHS survey onto the summary sibling data collected in the MPS. We used the 2021 DHS in Burkina Faso.

Two approaches were used, referred to as *partial* and *complete* imputation in what follows. With *partial imputation*, we used all the information provided by respondents regarding the ages at death and the dates of death of recently deceased siblings, and we only imputed the age at the time of the survey for the surviving siblings, as this information was not collected. In practice, we randomly drew an age difference between each respondent and their surviving siblings from distributions found in the DHS, tabulated for each five-year age group of respondents and by the sex of the sibling. Using the age difference and the respondent's age, we recalculated the age of all surviving siblings at the time of the survey.

For the *complete* imputation, we also imputed an age of death and a date of death for the deceased siblings, although this information had been collected for those who died recently. We cross-tabulated the siblings' age at death and time since death from the DHS, categorised by the five-year age group of respondents and by sex of the siblings. Based on these matrices, we proportionally sampled an age at death and a time since death for each deceased sibling. From the imputed values, we could then calculate the date of death and infer the date of birth for deceased siblings. With the *complete* imputation, we thus discard all the information reported in the MPS on ages and dates for recent deaths, and keep only the number of siblings ever born and deceased, combining these summary counts with data from the previous DHS to impute all ages and dates.

Box 1: ***Assessing the performance of partial and complete imputation methods with DHS data***

To ensure that our two imputation approaches produced acceptable results, we tested them on existing DHS where at least two surveys had included a module on sibling mortality (82 DHS from 41 countries, listed in Figure 4.1, Figure 4.2, Figure 4.3 and Table 4.1). For each country, we retained the most recent DHS and applied both the *partial* and *complete* imputation approaches, using the preceding DHS to draw ages and times since death. We calculated

mortality rates from the imputed sibling histories and compared the results with rates obtained directly from the reported ages and dates in the last survey.

Figure 4.1 depicts the male probability ${}_{35}q_{15}$ estimated directly from the full SSH in the latest DHS, compared to the probability obtained when we impute only the ages of surviving siblings from an earlier survey in the same country (referred to in the main text as "partial imputation"). The differences between the two sets of estimates are negligible (Table 4.1). Absolute differences vary from -5‰ in Guinea to 14‰ in Togo (for females). Relative differences vary from -3% in several surveys to 10% in Morocco (for men), and the mean absolute percentage deviation between the imputed and reference estimates is lower than 2.5% for each sex. In all DHS, the imputed estimate falls within the 95% confidence intervals around the direct estimate obtained from the reported ages.

In contrast, there are relatively large deviations between estimates calculated directly and those based on the complete imputation, when we discard all the information reported on ages and dates, keep only the number of siblings ever born and deceased, and impute the dates of birth and dates of death from a previous DHS (Figure 4.2). The median ratio of imputed to reference estimates is 0.89 for men and 0.96 for women, indicating that this approach tends to produce under-estimates, except for a few countries. Absolute differences range from -85‰ in Haiti to +138‰ in Zimbabwe (for men). Even if we account for the fact that both the reference and imputed estimates are affected by sampling errors, the relative deviations are quite large: the mean absolute percentage deviation is 23% for each sex. For male mortality, the estimates based on imputation fall outside the confidence intervals around the reference estimates in 27 surveys, representing about two-thirds of our sample. This is the case in 30 surveys for female mortality. There are several potential explanations for these discrepancies. Firstly, some surveys may have occurred at intervals that are too far apart, to the point where the structure of sibships or the level and age pattern of mortality of the previous survey no longer accurately reflects the experience captured in the more recent survey. This could be the case in South Africa, for example, where there is a gap of 20 years between successive surveys. In other countries, the disruptions introduced by the HIV/AIDS epidemic could play a role in these discrepancies; the full imputation works particularly badly in Namibia or Zimbabwe, where adult mortality has declined thanks to the scale-up of ART. It is also possible that differences between surveys in terms of data quality or sample composition lead to such deviations. Comparisons of the mean number of siblings reported per cohort of respondents are not always consistent, and in some cases, the numbers reported in the most recent survey are implausibly low when compared to the preceding survey (Figure 4.3).

Despite these limitations, the imputation method produces acceptable results in several countries. In the three countries in which MPS were carried out as part of the RaMMPS project, the mean absolute percentage deviation averages 17.7% for men and 12.7% for women in the DHS. In these three cases, we also have a relatively recent DHS to impute data from a full sibling history onto the age-specific distributions of the total number of siblings ever born and the number of deceased siblings reported in the MPS to generate mortality estimates.

Figure 4.1 : Risk of dying in adulthood ($_{35}q_{15}$) in males, as obtained from full SSH in the latest DHS with sibling data (0-5 years prior to the survey), compared to levels based when imputing only the ages of surviving siblings from a preceding DHS (partial imputation)

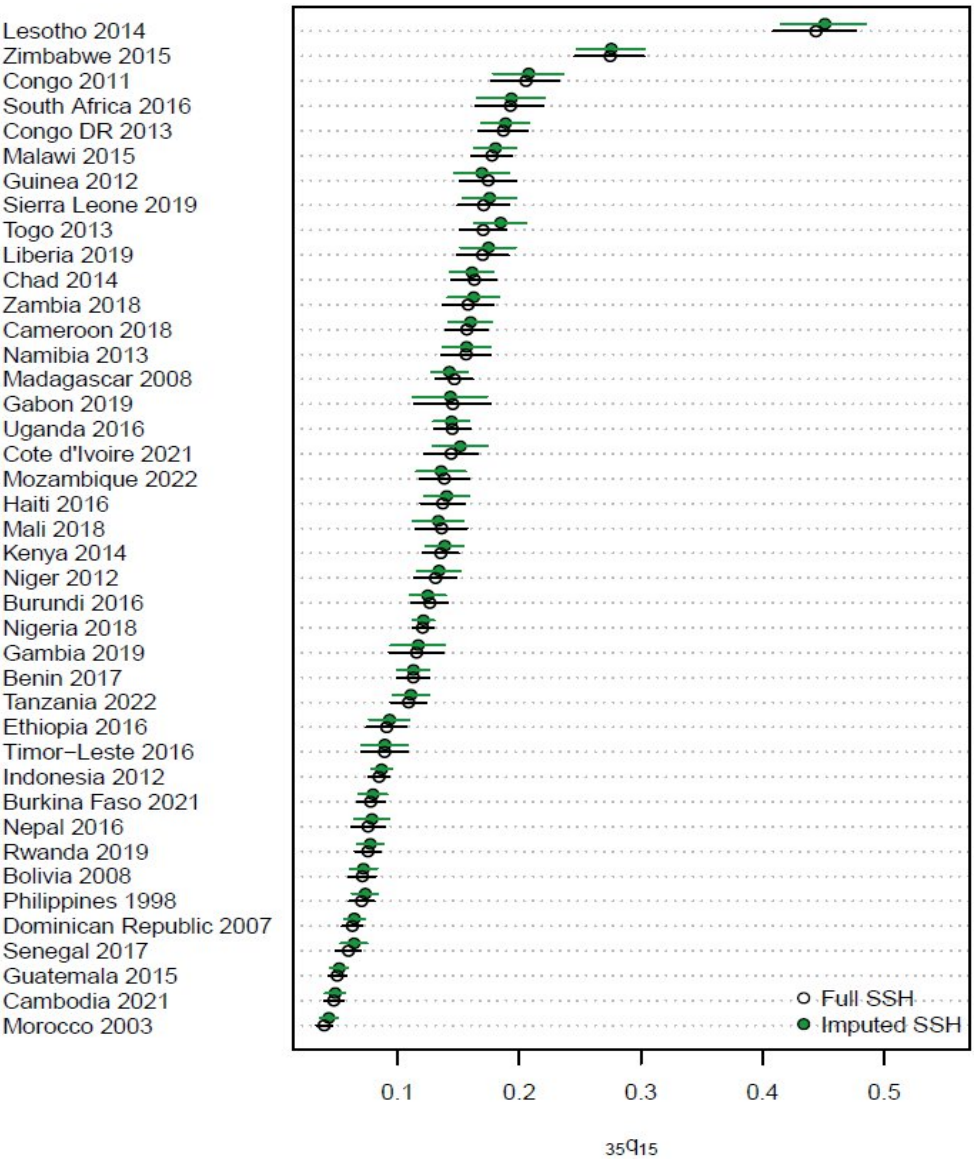


Figure 4.2 : Risk of dying in adulthood ($_{35}q_{15}$) in females, as obtained from full SSH in the latest DHS with sibling data (0-5 years prior to the survey), compared to levels based when imputing all ages and dates of death from a preceding DHS (complete imputation)

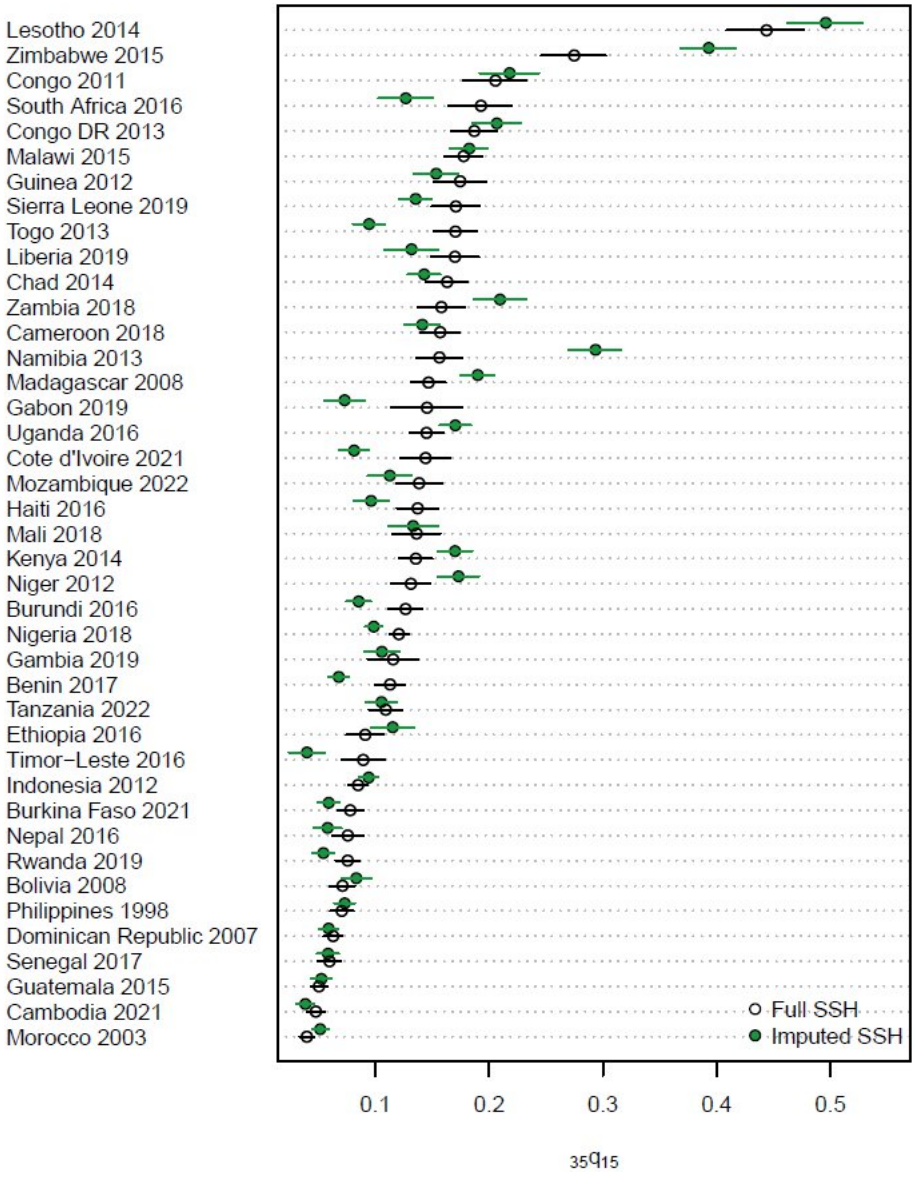
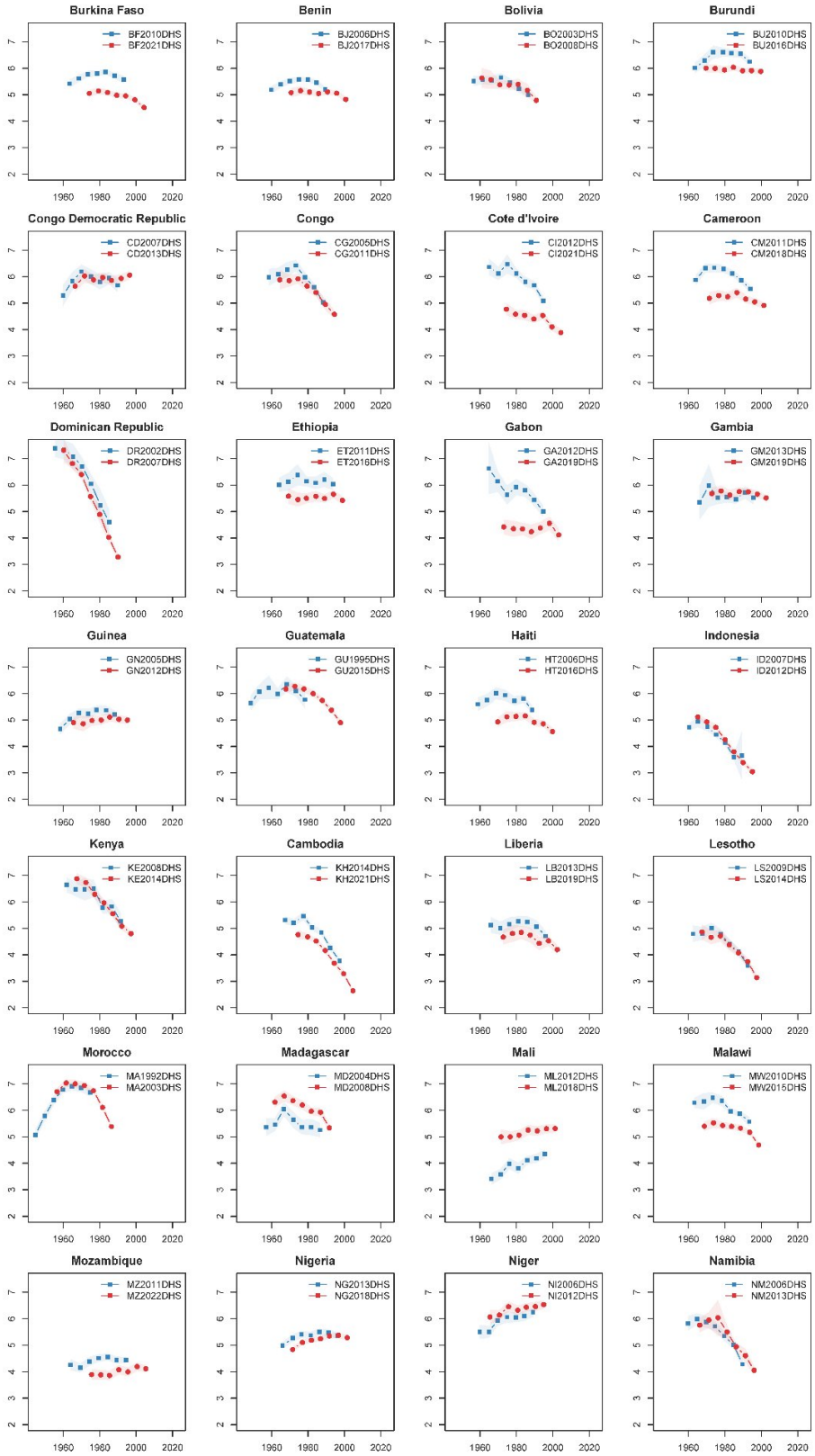


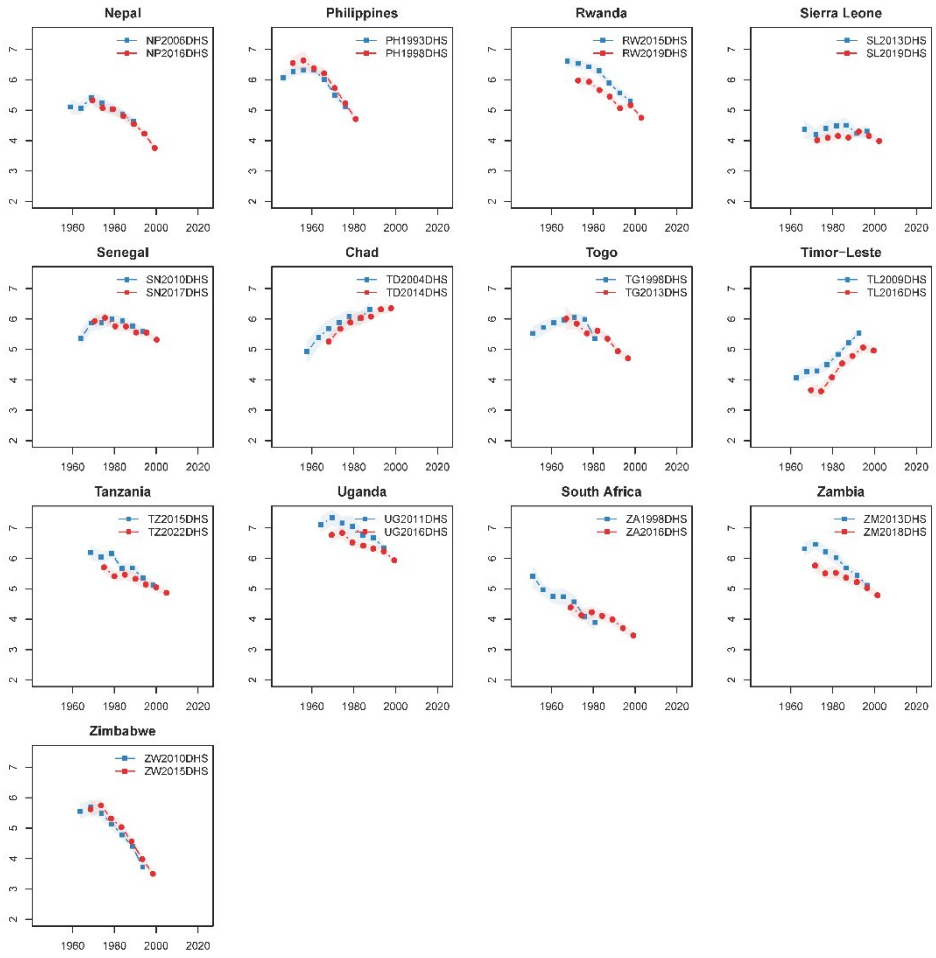
Table 4.1 : Estimates of the probability $_{35}q_{15}$ estimated from the most recent DHS with sibling histories, without imputation and with two imputation approaches based on a previous DHS

		Full SSH **Using all reported ages and dates**				**Partial imputation** **Imputation of ages of living siblings only**				**Complete imputation** **Imputation of all ages and dates of death**			
		Males		Females		Males		Females		Males		Females	
Most recent DHS	Previous survey	$_{35}q_{15}$	95%CI	$_{35}q_{15}$	95%CI	$_{35}q_{15}$	95%CI	$_{35}q_{15}$	95%CI	$_{35}q_{15}$	95%CI	$_{35}q_{15}$	95%CI
Burkina Faso 2021	2010	0.104	0.092-0.116	0.078	0.067-0.089	0.107	0.094-0.12	0.080	0.068-0.091	0.067	0.057-0.076	0.059	0.049-0.069
Benin 2017	2006	0.157	0.140-0.173	0.113	0.100-0.126	0.156	0.14-0.171	0.113	0.100-0.126	0.083	0.071-0.094	0.068	0.059-0.077
Bolivia 2008	2003	0.087	0.075-0.099	0.071	0.060-0.082	0.089	0.077-0.101	0.072	0.061-0.083	0.098	0.086-0.110	0.083	0.070-0.096
Burundi 2016	2010	0.182	0.165-0.199	0.127	0.111-0.142	0.181	0.164-0.197	0.125	0.110-0.139	0.134	0.120-0.149	0.085	0.075-0.096
Congo DR 2013	2007	0.195	0.175-0.215	0.187	0.167-0.207	0.192	0.172-0.211	0.189	0.169-0.208	0.213	0.194-0.232	0.207	0.185-0.228
Congo 2011	2005	0.177	0.149-0.204	0.206	0.177-0.233	0.19	0.159-0.219	0.208	0.179-0.236	0.184	0.159-0.208	0.218	0.192-0.244
Cote d'Ivoire 2021	2012	0.15	0.128-0.171	0.144	0.123-0.165	0.161	0.137-0.184	0.152	0.129-0.174	0.073	0.059-0.088	0.081	0.068-0.094
Cameroon 2018	2011	0.186	0.165-0.206	0.157	0.140-0.174	0.187	0.167-0.207	0.16	0.143-0.177	0.143	0.126-0.161	0.141	0.126-0.156
Chad 2014	2004	0.190	0.169-0.210	0.163	0.145-0.181	0.189	0.169-0.209	0.161	0.143-0.179	0.156	0.139-0.172	0.143	0.129-0.157
Dominican Republic 2007	2002	0.118	0.106-0.130	0.063	0.055-0.071	0.121	0.108-0.133	0.065	0.056-0.073	0.118	0.107-0.130	0.059	0.050-0.068
Ethiopia 2016	2011	0.123	0.105-0.140	0.091	0.075-0.107	0.126	0.108-0.144	0.094	0.077-0.110	0.131	0.113-0.149	0.115	0.096-0.134
Gabon 2019	2012	0.125	0.100-0.148	0.146	0.114-0.176	0.129	0.103-0.154	0.144	0.113-0.173	0.073	0.052-0.094	0.073	0.055-0.091
Gambia 2019	2013	0.128	0.108-0.147	0.116	0.094-0.137	0.131	0.111-0.150	0.117	0.095-0.139	0.099	0.084-0.113	0.106	0.091-0.121
Guinea 2012	2005	0.178	0.153-0.202	0.175	0.151-0.198	0.178	0.153-0.202	0.169	0.147-0.191	0.166	0.143-0.189	0.154	0.134-0.172
Guatemala 2015	1995	0.111	0.101-0.121	0.051	0.044-0.057	0.115	0.105-0.125	0.052	0.045-0.059	0.091	0.081-0.102	0.053	0.044-0.061
Haiti 2016	2006	0.171	0.150-0.192	0.137	0.119-0.155	0.171	0.151-0.191	0.140	0.122-0.158	0.086	0.071-0.102	0.096	0.081-0.111
Indonesia 2012	2007	0.102	0.092-0.112	0.085	0.077-0.093	0.103	0.093-0.112	0.087	0.078-0.095	0.126	0.115-0.136	0.094	0.086-0.102
Kenya 2014	2008	0.180	0.161-0.198	0.136	0.121-0.150	0.182	0.163-0.201	0.139	0.124-0.154	0.225	0.205-0.244	0.17	0.155-0.185
Cambodia 2021	2014	0.105	0.092-0.117	0.048	0.040-0.056	0.107	0.094-0.119	0.049	0.041-0.057	0.06	0.052-0.068	0.039	0.031-0.046
Liberia 2019	2013	0.198	0.168-0.228	0.170	0.149-0.191	0.206	0.174-0.237	0.175	0.152-0.197	0.133	0.110-0.155	0.132	0.108-0.155
Lesotho 2014	2009	0.474	0.429-0.514	0.444	0.409-0.477	0.471	0.430-0.509	0.451	0.416-0.485	0.54	0.505-0.573	0.496	0.462-0.528
Morocco 2003	1992	0.055	0.047-0.063	0.04	0.033-0.046	0.061	0.051-0.070	0.044	0.036-0.051	0.061	0.052-0.069	0.052	0.044-0.059
Madagascar 2008	2004	0.158	0.144-0.172	0.147	0.132-0.162	0.154	0.139-0.168	0.143	0.128-0.158	0.234	0.216-0.251	0.19	0.175-0.205
Mali 2018	2012	0.142	0.121-0.162	0.136	0.115-0.157	0.139	0.118-0.159	0.134	0.113-0.154	0.127	0.108-0.146	0.133	0.111-0.155
Malawi 2015	2010	0.220	0.202-0.238	0.178	0.161-0.194	0.219	0.200-0.237	0.181	0.164-0.197	0.204	0.186-0.221	0.183	0.166-0.199
Mozambique 2022	2011	0.174	0.146-0.201	0.139	0.118-0.158	0.173	0.144-0.200	0.136	0.116-0.156	0.132	0.113-0.150	0.113	0.093-0.132
Nigeria 2018	2013	0.125	0.116-0.135	0.121	0.112-0.129	0.125	0.115-0.135	0.121	0.113-0.13	0.094	0.086-0.103	0.099	0.091-0.106

Niger 2012	2006	0.139	0.119-0.158	0.131	0.114-0.148	0.138	0.119-0.157	0.134	0.116-0.152	0.142	0.122-0.160	0.173	0.155-0.191
Namibia 2013	2006	0.242	0.217-0.267	0.156	0.136-0.176	0.251	0.225-0.275	0.157	0.137-0.176	0.347	0.317-0.377	0.294	0.270-0.316
Nepal 2016	2006	0.093	0.077-0.109	0.076	0.062-0.089	0.099	0.081-0.116	0.079	0.065-0.093	0.073	0.058-0.088	0.058	0.046-0.070
Philippines 1998	1993	0.133	0.119-0.146	0.071	0.060-0.081	0.136	0.122-0.150	0.074	0.063-0.084	0.143	0.131-0.156	0.073	0.064-0.082
Rwanda 2019	2015	0.125	0.109-0.141	0.076	0.065-0.086	0.128	0.111-0.144	0.078	0.067-0.088	0.07	0.059-0.080	0.054	0.045-0.064
Sierra Leone 2019	2013	0.207	0.186-0.227	0.171	0.149-0.192	0.208	0.188-0.228	0.176	0.154-0.197	0.134	0.118-0.149	0.136	0.121-0.150
Senegal 2017	2010	0.073	0.061-0.085	0.060	0.050-0.070	0.078	0.065-0.090	0.064	0.054-0.075	0.072	0.06-0.084	0.058	0.049-0.068
Togo 2013	1998	0.180	0.160-0.199	0.170	0.151-0.189	0.185	0.164-0.205	0.185	0.163-0.206	0.135	0.117-0.152	0.095	0.08-0.109
Timor-Leste 2016	2009	0.109	0.083-0.133	0.089	0.070-0.108	0.106	0.082-0.129	0.09	0.070-0.109	0.039	0.025-0.053	0.040	0.024-0.056
Tanzania 2022	2015	0.135	0.116-0.152	0.109	0.094-0.124	0.140	0.121-0.159	0.111	0.096-0.126	0.116	0.099-0.132	0.106	0.092-0.119
Uganda 2016	2011	0.220	0.203-0.237	0.145	0.130-0.160	0.220	0.202-0.236	0.144	0.130-0.159	0.213	0.198-0.228	0.170	0.157-0.184
South Africa 2016	1998	0.224	0.193-0.255	0.193	0.165-0.220	0.225	0.194-0.255	0.194	0.165-0.221	0.187	0.157-0.217	0.127	0.103-0.15
Zambia 2018	2013	0.240	0.200-0.277	0.158	0.137-0.178	0.249	0.208-0.289	0.163	0.141-0.183	0.234	0.212-0.256	0.210	0.186-0.232
Zimbabwe 2015	2010	0.302	0.274-0.329	0.275	0.246-0.303	0.304	0.277-0.331	0.276	0.248-0.303	0.440	0.412-0.467	0.393	0.368-0.417

Figure 4.3 : Mean number of siblings ever born, tabulated by cohort of respondents, last two DHS surveys with SSH





4.2.2.2.3 Obtaining age-specific mortality and the probability ${}_{35}q_{15}$

After expanding the summary SSH collected in MPS to a full SSH through imputation, we estimated adult mortality using a direct method, by dividing the deaths by the corresponding exposure times, by age and by period since data collection. We converted the mortality rates into survival probabilities (assuming that deaths occur halfway through 5-year intervals), chained the survival probabilities together and converted these cumulative probabilities into ${}_{35}q_{15}$, the probability that an adolescent aged 15 years would die before reaching age 50 years. We used again the "demogsurv" package of the statistical software R (https://github.com/mrc-ide/demogsurv). Confidence intervals around the probability ${}_{35}q_{15}$ were obtained through the jackknife method. All estimates were weighted using individual sampling weights that account for the survey design and ensure population-level representativeness. The probability ${}_{35}q_{15}$ was retained as this is a common summary measure of adult mortality.

4.2.2.3 Method for estimating older adult mortality

To measure mortality among older adults, which is likely to be more affected by excess mortality caused by COVID-19, we used a new tool, called *parental survival histories* (PSH). Adults reported on the survival status of their mother and father, their current age or their age at death when deceased, and the year of death. Although full parental survival histories have seldom been collected, except in a survey conducted in Vietnam in the early 1990s (Hirschman et al., 1995), they are one of the few data collection instruments to measure mortality in older age groups (Menashe-Oren, Masquelier, et al., 2023). Again, they can provide direct estimates (dividing the deaths by the corresponding exposure time tabulated by age and period), or indirect estimates, using the classical orphanhood method, which converts proportions of respondents with surviving parents into survivorship probabilities (Timaeus, 1992).

As with any survey-based collection of survival information, missing data and reporting inconsistencies are likely to be common in PSH. Respondents may not know their parents' exact age or date of death, and reported ages may include rounding or heaping. Such gaps and irregularities, if left unaddressed, can bias mortality estimates and distort age-specific mortality patterns. To ensure robust and reliable estimates, these issues must be carefully managed through systematic data processing and imputation strategies. Box 2 details the approach we used to handle missing parental survival information, correct for age heaping, and mitigate irregular mortality patterns in Burkina Faso and Malawi.

Box 2: Addressing missing parental survival information, age heaping, and irregular mortality patterns[4]

Multiple imputation

An initial assessment of the data collected in PSH revealed missing information regarding parental survival status, particularly for variables such as current age, age at death, and year of death. For instance, in Burkina Faso, 20.45% of respondents were unaware of their father's age at death, and 23.45% were unaware of their mother's age at death (Table 4.2). Similarly, in Malawi, a significant number of responses were missing: 34.14% of respondents did not know their father's age at death, and 28.0% did not know their mother's age at death (Table 4.2). To address these missing data, we employed multiple imputation. The procedure was carried out under the assumption that the missing data were missing at random (MAR), meaning the

[4] This analysis was conducted in collaboration with Monica during a research visit at the Institute of Public Opinion and Research, University of Malawi, Zomba, Malawi, in preparation of the article "Estimating old-age mortality from parental survival histories: evidence from mobile phone surveys conducted in Malawi and Burkina Faso."

likelihood of a missing value for one variable was independent of the missingness of other variables (Morris et al., 2014). The imputation process involved filling in missing values for incomplete cases using values derived from complete cases. For each incomplete variable (e.g., age at death), an imputation model was developed using the complete cases of the parameter of interest, along with relevant covariates such as the sex of the parent, the sex of the respondent, and the respondent's age group. Given the correlation between age at death and year of death, missing values for age at death and year of death were imputed separately. For cases with missing values for month, year, or both, we applied a random redistribution of the month of death. Individuals who were unable to report both the year and age at death of their parents were excluded from the dataset.

Table 4.2 : Missing responses in parental survival histories

		Burkina Faso		Malawi	
		Father	Mother	Father	Mother
		(%)	(%)	(%)	(%)
Survival status		0.02	0.10	0.20	1.1
Age	Alive	9.52	9.16	13.10	8.70
	Deceased	20.45	23.45	34.4	28.0
Date of death	Year	0.65	1.00	9.44	7.84
	Month	7.73	6.22	5.74	5.34
Both age and DoD		0.71	0.16	0.16	0.05

Smoothing data and Gompertz model

The age distributions of parents, alive or deceased, show irregularities in Burkina Faso and Malawi, with pronounced heaping at ages ending in 0 and 5 (Figure 4.4 and Figure 4.5). These patterns are characteristic of age misreporting and reflect well-documented challenges in the collection of age data in contexts where CRVS are incomplete and where respondents often lack precise knowledge of dates of birth or death (Randall & Coast, 2016).

Among living parents, the distributions show visible spikes at ages such as 40, 45, 50, 55, and 60. This digit preference is observed in both countries, though it appears more pronounced in Malawi than in Burkina Faso. Such age heaping suggests a tendency among respondents to round ages to culturally salient or cognitively convenient numbers when exact ages are unknown (Lau et al., 2025; Lyons-Amos & Stones, 2017).

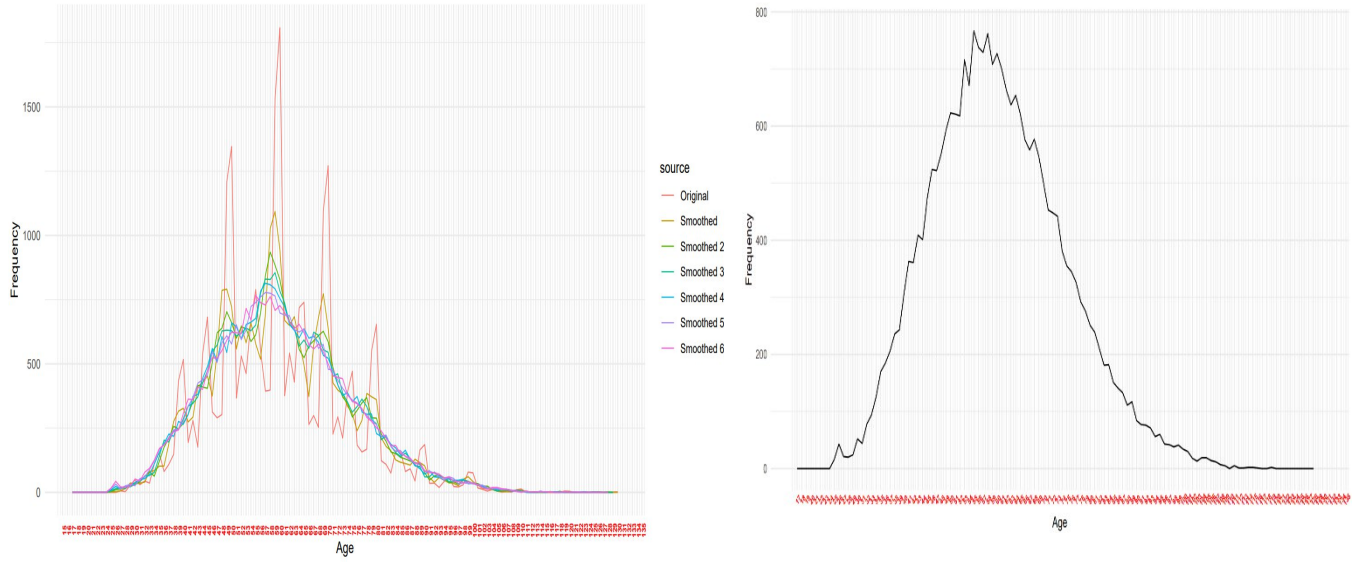
For deceased parents, the distortions are even more marked. The age distributions at death display sharper peaks at rounded ages, especially when the death occurred many years prior to the survey or when the respondent was young at the time of the event. In both countries, the distributions suggest not only digit preference but also possible age displacement, with deaths

being shifted toward socially meaningful ages. Age misreporting appears more severe for fathers than for mothers, particularly at older ages. This may be related to differences in parental age gaps, longer exposure times, and weaker intergenerational transmission of precise age information for men. Additionally, the distortions increase at advanced ages, where fewer respondents are able to provide accurate information, leading to greater reliance on approximations. These anomalies have important implications for mortality estimation. Age heaping and displacement can generate artificial fluctuations in age-specific mortality rates, especially at adult and older ages, and may bias estimates of mortality levels and trends if left uncorrected. The presence of similar patterns across both countries shows the need for systematic data smoothing and adjustment procedures prior to mortality estimation.

Figure 4.4 : Reported age distribution of parents alive at the time of survey, Burkina Faso and Malawi

Burkina Faso

Raw and smoothed distribution ***Smoothed distribution***



Malawi

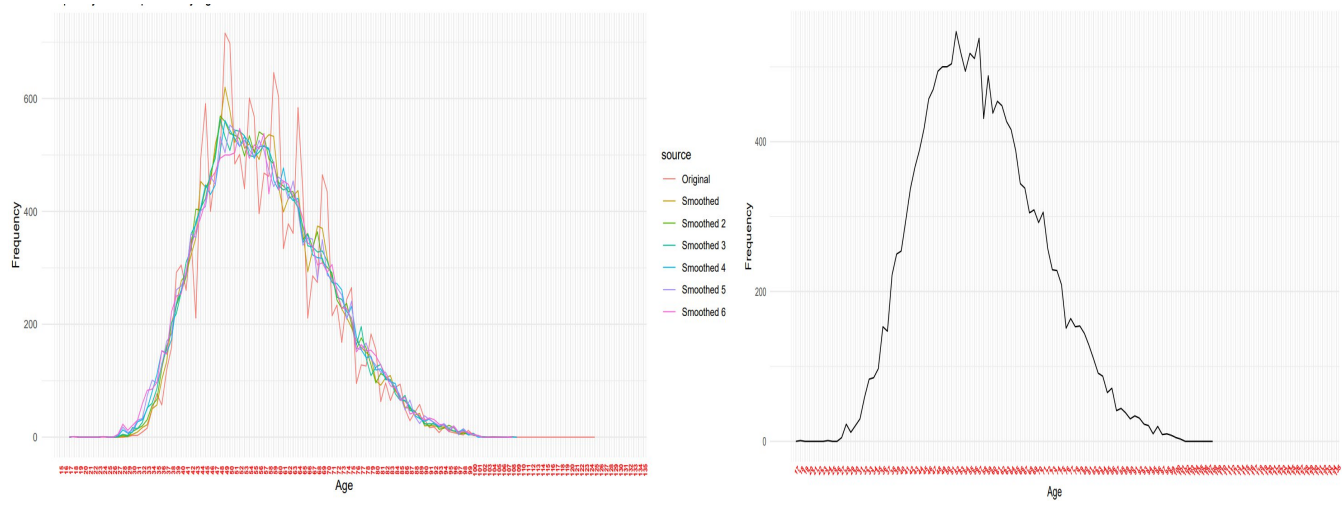
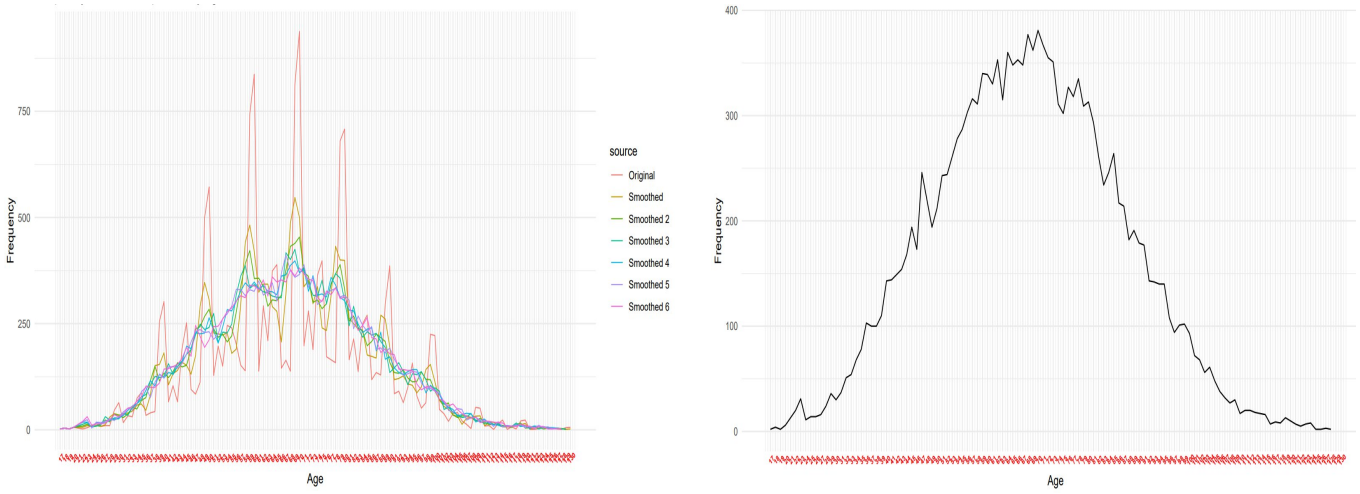


Figure 4.5: Reported age at death of parents, Burkina Faso and Malawi

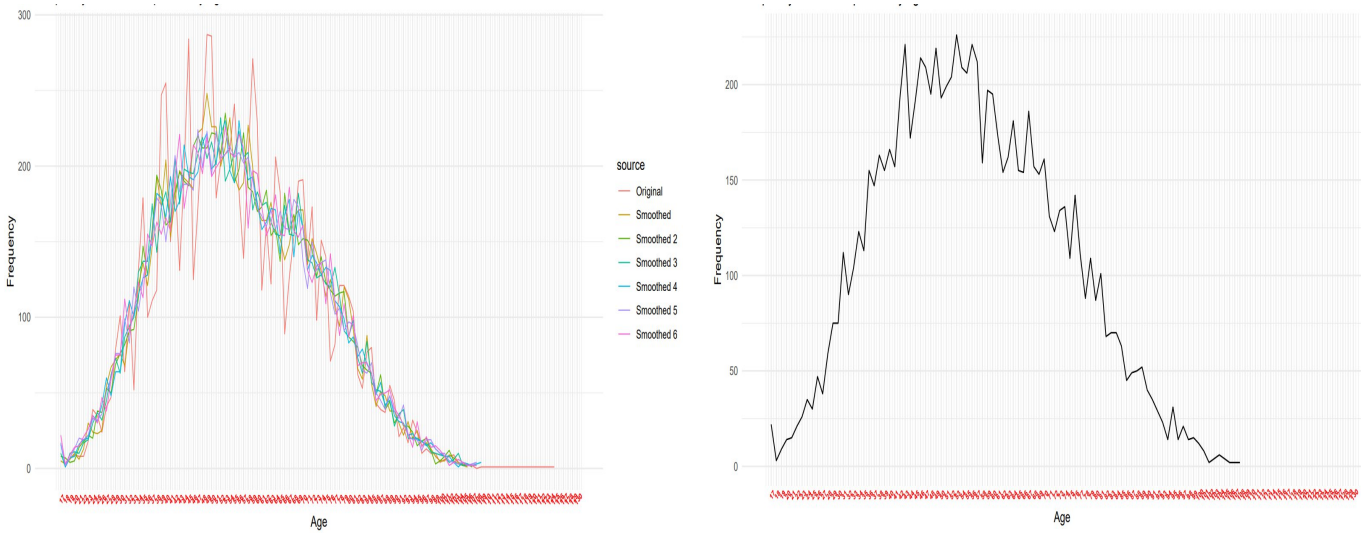
Burkina Faso

Raw and smoothed distribution

Smoothed distribution



Malawi



To address this issue, we applied an age redistribution method inspired by Bendavid and colleagues to correct inconsistencies in reported ages for both living and deceased individuals. This method relies on a symmetrical redistribution of age counts within a predefined range, ensuring a more balanced distribution around the initially declared age (Bendavid et al., 2011).

Individuals were categorized based on their vital status (*alive* or *deceased*), and their ages were uniformly redistributed within a ±2-year range around the originally reported age. The redistribution was applied to the entire dataset six times using a custom algorithm implemented in *R*.

Once the ages were smoothed, we calculated the dates of birth (mm4) and death (mm8) in CMC and performed consistency checks to identify potential inconsistencies (e.g., ensuring that mm8 > v008 and mm8 < mm4, among others) before estimating mortality levels using again direct estimation with the *demogsurv* package. Mortality rates (nqx) were calculated by single-year age for the period 2019–2022.

To assess the consistency of the observed data with the theoretical model and identify potential anomalies in age-specific mortality patterns at older ages, we fitted Gompertz mortality curves separately for males and females. The Gompertz model, an exponential function widely used to model age-related mortality trends, was applied through a nonlinear adjustment on a subsample of individuals aged 30 to 59 years to estimate the model parameters a and b (Gavrilov & Gavrilova, 2022; Micheletti & Villavicencio, 2024). These coefficients were then extrapolated to predict mortality rates for individuals aged 60 to 84 years. Finally, both observed and modeled mortality rates were visualized using a logarithmic scale graph, displaying empirical and fitted curves to illustrate overall mortality trends.

4.2.3 Methods for indirect estimation

4.2.3.1 Indirect estimation of under-5 mortality

Indirect estimation of child mortality is a well-established demographic technique used when full birth history data (i.e., complete birth and death dates for all births) are not available. The method was pioneered by Brass and Coale in the 1960s and relies on SBH, which consist of aggregate information reported by women on the number of children ever born alive and the

number of children who have died grouped by the mother's age (or alternatively by time since first birth or duration of marriage) (Hill, 2014).

The idea is that the *proportion of children dead* among those ever born to women in different age groups reflects patterns of childhood mortality experienced by those cohorts. Younger women's children have shorter exposure to mortality risk, whereas older women's children have longer exposure. These patterns, combined with model life tables that describe typical age patterns of mortality, can be used to convert proportions dead into probabilities of dying by exact ages (denoted nq0) and ultimately into a standard summary measure, the under-5 mortality rate (5q0 , or U5MR) (Hill, 2014).

Key steps in the indirect estimation method include (Hill, 2014):

1. Calculate proportions dead: for each age (or duration) group of women, compute the proportion of children that have died by dividing the number of dead children by the number ever born.
2. Select a model life table family: choose an appropriate model life table (e.g., United Nations or Coale–Demeny families) to represent the age pattern of mortality. This model guides the transformation of proportions dead into life-table probabilities.
3. Estimate age-specific probabilities of dying: using model coefficients and fertility patterns, estimate nq0 for selected age intervals of childhood for each group.
4. Translate to U5MR: convert the age-specific estimates into the common summary index, 5q0 , using relational models or standard life table techniques.
5. Time location: indirect estimation also includes a method to estimate the *reference period* to which each estimate corresponds, allowing construction of a mortality timeline.

The method relies on several assumptions, such as stable fertility and mortality age patterns, absence of selection bias with respect to maternal age, and the notion that the chosen model family adequately reflects the true mortality schedule of the population studied (Hill, 2014).

In this study, we opted for the North pattern of Princeton life tables, as it is relevant for populations experiencing high mortality at young ages, a demographic profile historically observed in many low-income settings, including Burkina Faso (Alkema & You, 2012; Sharrow et al., 2022). The North model is characterized by relatively elevated infant and child mortality in relation to adult mortality, reflecting epidemiological contexts in which infectious diseases,

malnutrition, and early-life health risks play a dominant role, while adult mortality remains comparatively moderate. This mortality pattern is consistent with conditions documented in several Sub-Saharan African countries during the second half of the twentieth century and remains relevant in contemporary contexts where early-age mortality continues to contribute to life expectancy at birth (GBD, 2017; Sharrow et al., 2022).

4.2.3.2 Indirect estimation of adult mortality from reported parental survival: the orphanhood method

The orphanhood method is an indirect demographic technique used to estimate adult mortality based on information reported by survey respondents about the survival status of their parents. The method can be applied whenever at least one population census or household survey includes the questions *"Is your mother alive?"* and *"Is your father alive?"* (Timaeus, 2015).

A key advantage of the orphanhood method is that it allows the estimation of adult mortality without requiring respondents to recall exact dates or ages at death, which are often subject to recall error in retrospective surveys, particularly in LMICs.

To convert observed proportions of surviving parents into formal survival probabilities (i.e., life table survivorship ratios), the method relies on assumptions regarding the average age at childbearing for mothers and fathers. By combining this information with the proportion of respondents reporting that their parents are still alive, it is possible to estimate survivorship ratios of the form

$$l_{b+n}/l_b,$$

where b is a reference age (typically 25 years for mothers and 35 years for fathers) and n corresponds to the average age of respondents. These ratios approximate cohort survival probabilities for the parental generation and can be translated into standard life table quantities (Timaeus, 2015).

An important refinement of the method concerns the temporal localization of mortality estimates. Each estimate is assigned to a specific reference period, calculated as a weighted average of the calendar years during which parents were exposed to the risk of death. These

weights depend on the age distribution of respondents. This feature allows the reconstruction of adult mortality trends over several decades (Timaeus, 2015).

However, the validity of the orphanhood method depends on several strong assumptions:

1. The age pattern of adult mortality follows a standard model life table;
2. Mortality changes over time are smooth and approximately linear relative to this standard;
3. Parental mortality is independent of the number of surviving children, so that survival bias related to fertility differentials is minimal.

In this study, adult mortality was indirectly estimated using the Timaeus (1992) orphanhood method, which was originally developed to estimate the probability that an individual aged 15 or 30 would die before reaching age 60 (i.e., 45q15 and 30q30). Using the alpha parameter of the Brass logit system, we estimated mortality at older ages, specifically the probability that an individual aged 50 would die before age 80.

4.3 Results

4.3.1 Levels and trends in under-5 mortality

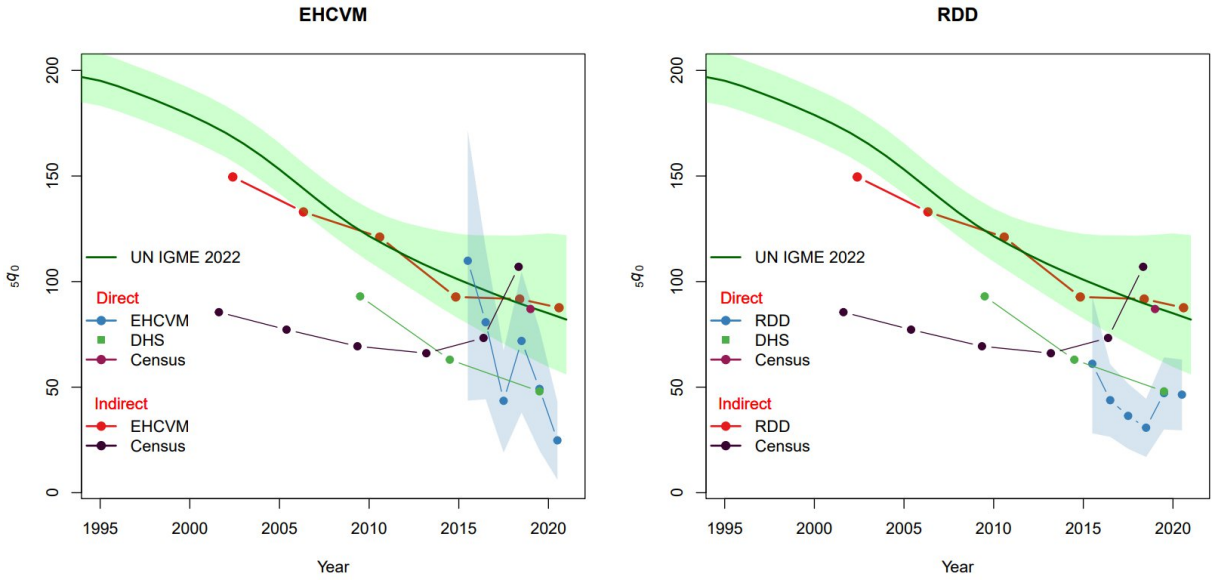
Figure 4.6 illustrates the trends in under-5 mortality, indirectly calculated from the EHCVM and RDD arms for the period 2001–2021, using coefficients from the Coale-Demeny North model (red lines). Direct estimates from truncated birth histories for the period 2015–2021 are also depicted (blue lines), pointing to noticeably lower levels, particularly from the RDD branch. Mortality indicators derived from the MPS are compared to direct estimates calculated from the 2021 DHS for the periods of 0–3, 4–6, and 7–9 completed years before data collection (green lines), under-5 mortality calculated indirectly from the 2019 census (purple lines), and direct estimates of under-5 mortality from recent deaths reported in the 2019 census (violet dots).

There is significant uncertainty surrounding under-5 mortality in Burkina Faso based on these different data sources. Figure 4.6 also includes estimates developed for Burkina Faso by the United Nations Inter-Agency Group for Child Mortality Estimation (UN IGME), obtained by combining various sources (DHS, MICS, etc.). The UN IGME employs a Bayesian model that adjusts for sampling and non-sampling errors (Sharrow et al., 2022). According to these model-

based estimates, out of 1,000 live births, 85 children died before reaching the age of 5 in 2020 (90 UI: 60–123). This aligns with the latest census conducted in 2019, which reported an under-5 mortality rate of 87 per 1,000 in 2019 (INSD, 2019). However, the latest DHS conducted in 2021 suggests that under-5 mortality is much lower (48 per 1,000 deaths over the period 2017–2021). This survey is, however, excluded from the model fitting by UN IGME, due to data quality concerns.

UN IGME estimates show a downward trend in mortality over the entire period, also reflected in RaMMPS's indirect estimates. Under-5 mortality decreased from 152 to 83 deaths per 1,000 live births between 2003 and 2020, representing a 45% decline, according to RaMMPS's indirect estimates (appendix Figure 11.2 at page 343). This percentage varies by survey branch. With the EHCVM branch, child mortality decreased from 158 to 70 deaths per 1,000 live births between 2003 and 2020, indicating a 56% decline, compared to a 41% decline with the RDD branch (150 to 88 deaths per 1,000 live births) over the same period. Although differences exist between RaMMPS indirect estimates and those of UN IGME, these are not significant, as most indirect estimates fall within the 90% uncertainty intervals around UN IGME estimates. In contrast, indirect estimates of under-5 mortality from the 2019 census are much lower, and they indicate an implausible upward trend in child mortality. These indirect estimates are also excluded from the UN IGME curve-fitting procedure due to concerns over data quality.

Figure 4.6. Trends in under-5 mortality according to the RaMMPS survey (EHCVM and RDD arms), the 2021 DHS and 2019–2020 census, and UN IGME 2022 estimates.



The direct estimates from the truncated birth histories collected in RaMMPS for the period 2015–2018 are much lower than the indirect estimates. In the RDD arm, all point estimates fall

below the 90% uncertainty interval around the UN IGME trend. These direct estimates are in line with those of the DHS 2021, but as we indicated earlier, this survey could also be affected by a downward bias.

4.3.2 Levels and trends of adult mortality (35q15)

Table 4.3 presents estimates of the probability of a 15-year-old dying before age 50 ($_{35}q_{15}$) in the past three years by study arm and sex of respondent, as estimated based on sibling data collected in the RaMMPS survey. These estimates are again compared to those extracted from the 2021 DHS survey, based on the full sibling histories (and referring to the period 0–3 years before data collection). A second source of comparison comes from the World Population Prospects (WPP) (United Nations, 2022), based on a wide variety of sources (including sibling survival, but also parental survival, recent household deaths, the relationship between adult and child mortality, etc.). The WPP estimates refer here to the year 2019.

Overall, the MPS led to underestimates of recent adult mortality, when compared to rates extracted from the DHS and the WPP. For 2019, the WPP estimated the probability of a 15-year-old male and female, respectively, dying before their 50th birthday at 178 and 138 deaths per 1,000, compared to an estimate of 81 and 60 per 1,000 with the MPS. This corresponds to a relative difference in the probability $_{35}q_{15}$ of −54% for men and −57% for women. Estimates disaggregated by the respondent's gender show that women provide higher estimates for their sisters (compared to men), while men provide higher estimates for their brothers (compared to women). For male mortality, when the MPS estimates are disaggregated by study arm (EHCVM or RDD) and the gender of the respondent, the downward bias appears particularly pronounced in the reports of women in the EHCVM arm (−67%) and men in the RDD arm (−60%).

Table 4.3. Estimates of the probability $_{35}q_{15}$ over the period 0–3 years before data collection, by source and sex of respondent, with 95% confidence intervals.

Sex of sibling		**Men**		**Women**		**Relative difference with DHS (%)**		**Relative difference with WPP (%)**	
Source	Sex of respondent	$_{35}q_{15}$	95% CI	$_{35}q_{15}$	95% CI	Men	Women	Men	Women
Both arms combined	Female	78	(59–93)	65	(49–80)	-20	-3	−56	−53
	Male	85	(66–103)	58	(42–74)	-12	-13	−52	−58
	Both	81	(68–93)	60	(50–71)	-16	-10	−54	−57
EHCVM	Female	59	(34–83)	58	(31–85)	-39	-13	−67	−58

	Male	101	(70–132)	57	(32–82)	4	-15	−43	−59
	Both	82	(62–101)	55	(38–73)	-15	-18	−54	−60
RDD	Female	88	(63–112)	70	(49–90)	-9	4	-51	-49
	Male	72	(53–90)	58	(40–77)	-26	-13	-60	-58
	Both	79	(64–94)	64	(50–77)	-19	-4	-56	-54
DHS 2021		97	(83–110)	67	(55–80)				
WPP		178	-	- 138	-				

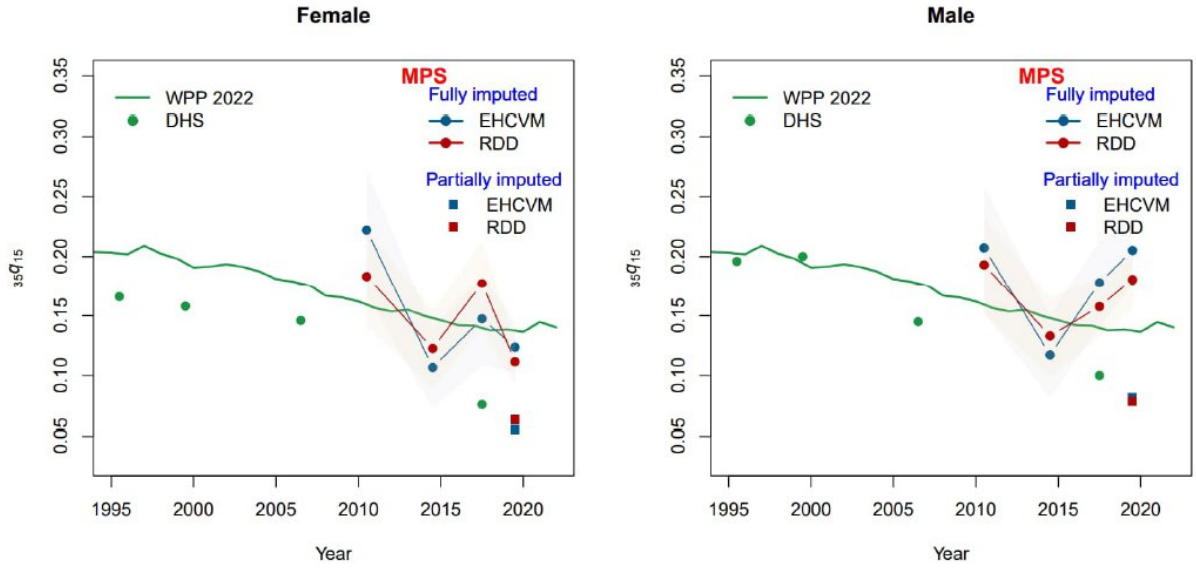
Note: EHCVM: Enquête harmonisée sur les conditions de vie des ménages; RDD: random digit dialing; WPP: World Population Prospects; DHS: Demographic and Health Survey.

Because we used a shortened data collection instrument, such differences observed in adult mortality levels between the MPS and the DHS could be caused by misreporting errors when identifying siblings who died recently, and their age at death. It is possible that some recent deaths were omitted or transferred outside the truncation window (last three years). To detect dating errors, we produced another set of estimates, as indicated above. Instead of imputing dates of birth only for the surviving siblings and those who died recently, and using the available information on the timing of death and ages at death for those who had died in the last three years, we discarded this information entirely and applied our imputation approach to all siblings, including those who died recently. This corresponds to the *complete imputation* detailed above and tested on DHS.

Figure 4.7 presents the resulting estimates of the probability ${}_{35}q_{15}$, again compared to estimates from previous DHS surveys and the WPP. The estimates obtained for the last three years and calculated with partial imputation are displayed using squares, while those obtained by imputing all ages and dates from the previous DHS are displayed using dots, for four reference periods. The WPP estimates are above the estimates derived from sibling survival data in DHS conducted in 1998-1999, 2003, 2010, and 2021, a pattern observed in other West African countries (Masquelier et al., 2014). The direct estimates obtained with partial imputation from the EHCVM and RDD arms, while conspicuously low, are in line with the latest DHS survey. Annual estimates based on recent deaths were calculated but confidence intervals were large around these estimates. We did not observe any significant increase in mortality in this age group over the period 2019–2021 (Appendix Figure 11.3 at page 344). Estimates based on the complete imputation are much higher and more consistent with the estimates from the WPP. This suggests that respondents provided inaccurate information on ages at death and timing of deaths with the shortened sibling survival module. In males, we observe an upward trend in mortality starting from 2015, which coincides with the onset of insecurity in Burkina Faso. In females, trends are more erratic, as the rise from 2015 is followed by a decline. However, it

should be noted that with imputations based on the 2010 sibling survival data, we do not observe this upward trend in mortality levels during the period of insecurity (Appendix Figure 11.4 at page 345).

Figure 4.7. Trends in adult mortality ($_{35}q_{15}$) according to sibling survival histories in the RaMMPS survey or DHS and in the WPP.



Note: EHCVM: Enquête harmonisée sur les conditions de vie des ménages; RDD: random digit dialing; WPP: World Population Prospects; DHS: Demographic and Health Survey.

Building on the detailed analysis of adult mortality levels and trends in Burkina Faso, Box 3 extends the perspective by placing the country's results in a comparative framework. It contrasts the estimated adult mortality patterns observed in Burkina Faso with those derived from similar data and methods in Malawi and the DRC.

Box 3: ***Cross-country comparison of adult mortality levels and trends in Burkina Faso, Malawi, and the Democratic Republic of the Congo***

Adult mortality rates in MPS based on partial imputation

Figure 4.8 presents trends in the synthetic cohort probability that a 15-year-old adolescent dies before reaching age 50 ($_{35}q_{15}$), when using all the data provided by respondents on ages and the timing of death, and imputing only the age of surviving siblings. To put the MPS estimates in perspective, we compare them to those extracted from the most recent DHS. The DHS estimates are based on full sibling histories and are also calculated for the 0-3 year period preceding data collection. We also present estimates from the WPP, using the 2024 Revision. The WPP

estimates are available at the national level only, and to obtain reference adult mortality rates for DRC for the two provinces, we scaled the national adult mortality rates in the WPP according to the ratio of province-specific to national under-five mortality in the latest DHS (see appendix 11.3 for more details). It is worth noting that the WPP estimates are usually higher than estimates from SSH collected in surveys, and this could be due to underestimation of mortality in SSH, or, in some countries, an upward bias in the WPP (Masquelier et al., 2014). Table 11.6 provides the estimates by sex.

Overall, the MPS estimates of adult mortality are lower than those in the latest DHS. As showed earlier, in Burkina Faso, the MPS estimate of $_{35}q_{15}$ (both sexes) is 14% lower. In Malawi, $_{35}q_{15}$ is 25% lower than the estimate extracted from the 2015 DHS. It is, however, possible that adult mortality declined rapidly in-between the two surveys, for example, thanks to the scale-up of antiretroviral therapy. In DRC, the differences with the previous DHS are much larger (-53% in Kinshasa and -68% in North Kivu), but in this country, the comparison is more complicated as estimates refer to subnational areas.

MPS estimates are also considerably lower than those reported in the WPP. In Burkina Faso, for example, the WPP estimate of the probability that a 15-year-old would die before their 50th birthday in 2019 was 178 and 138 per 1,000 for men and women, respectively. In contrast, the MPS yielded estimates of 81 and 60 per 1,000 for men and women. This translates into a downward bias in the $_{35}q_{15}$ probability of 54% for men and 57% for women. The deviations are similar in the Kinshasa province of DRC (-54% for male mortality and -56% for female mortality), and slightly smaller in North Kivu (-31% and -59%, respectively). In Malawi, there is a better agreement across sources, but the $_{35}q_{15}$ estimate for both sexes combined is still 25% lower than the corresponding probability in the WPP.

Annual estimates in the probability $_{35}q_{15}$ are also presented in the appendix (Figure 11.5), showing fluctuations in mortality, but no evidence of a spike in mortality associated with the COVID-19 pandemic.

In Burkina Faso, the sex of the respondent or the sex of siblings does not appear to be systematically associated with deviations from the most recent DHS or WPP. For example, in the RDD arm, male respondents provide lower estimates than female respondents, but the reverse is true in the EHCVM arm (Table 11.6). No systematic pattern emerges in the DRC either. In Malawi, mortality rates extracted from male respondents are 37% higher than those based on female respondents, but the difference is not significant. An earlier study comparing reports on sibling survival according to the sex of respondents in 10 DHS did not detect significant or

systematic differences in mortality estimates obtained from men and women either (Merdad et al., 2013).

Adult mortality rates in MPS based on complete imputation

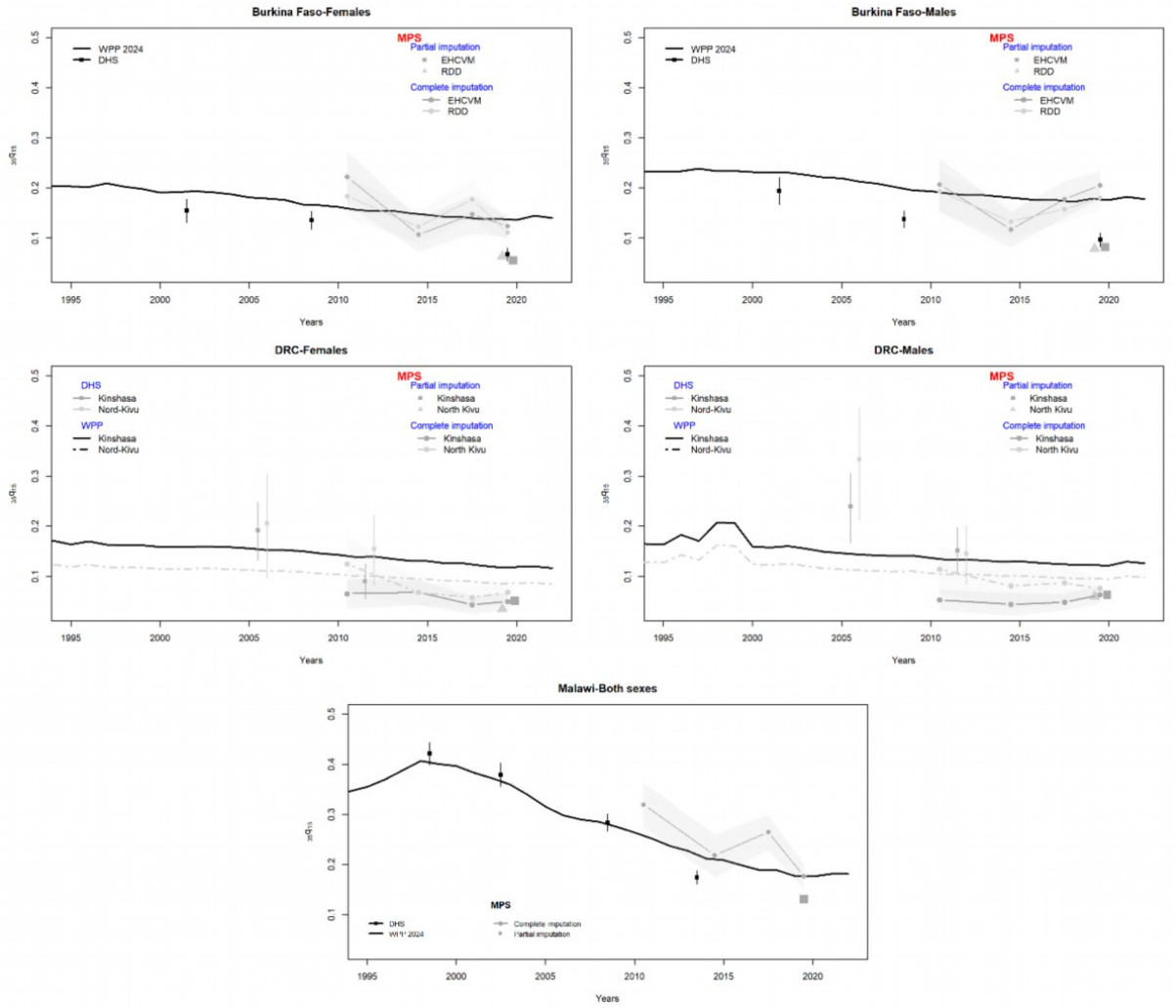
We now resort to the *complete* imputation of all ages and dates of death of siblings and compared the resulting estimates again to the DHS and WPP (Figure 4.8 and Table 11.7).

The MPS estimates obtained after complete imputation are higher than those based on the partially imputed data. In Burkina Faso, the ${}_{35}q_{15}$ estimate from the MPS is now 85% higher than that extracted from the 2021 DHS, while in Malawi, our more recent estimate is virtually the same as the probability estimated from the DHS 2015 (+1%). By contrast, in the DRC, they remain lower than the 2013 DHS, with relative differences exceeding 45%, regardless of the province.

MPS estimates based on complete imputation in Burkina Faso and Malawi closely align with those from the WPP. For instance, in Burkina Faso in 2019, the WPP estimated that, out of 1,000 individuals aged 15, 158 would die before reaching age 50, while the corresponding MPS estimate is 154 per 1,000 (-3% only). In Malawi, the relative difference is only 1% for both sexes combined. In contrast, in the DRC, regardless of the province, MPS estimates are still well below the reference values from the WPP (-20% and -53% for North Kivu and Kinshasa, respectively).

A breakdown by study arm in Burkina Faso shows that the EHCVM provided slightly higher estimates (165‰ [95% CI: 148 – 183]), compared to 148‰ [95% CI: 132 – 163] in the RDD arm (see appendix Table 11.7). A breakdown by the sex of the respondent shows that in Burkina Faso and Malawi, estimates based on the complete imputation are higher when obtained from female respondents than from male respondents, regardless of the gender of the siblings. In the DRC, no systematic pattern emerges according to the sex of respondents.

Figure 4.8: Trends in adult mortality (35q15) from MPS, DHS, and WPP estimates



4.3.3 Trends and levels of old age mortality ($_{30}q_{50}$)

Estimates of the probability of an individual aged 50 years dying before age 80 ($_{30}q_{50}$) are displayed in Table 4.4, for each study arm and sex of respondent, for the period 0–3 years before data collection. These estimates are calculated directly from the full parental survival histories in the EHCVM survey and the RDD survey, and are again compared with the levels obtained from the WPP (United Nations, 2022). Overall, the MPS tend to underestimate the level of mortality among the elderly, regardless of the reference period, when the WPP estimates are

used as a benchmark. The difference between the MPS mortality level and the WPP estimates is smaller for men than that for women (e.g., −23 % vs. −32 %; −17 % vs. −36 %). This underestimation varies by branch of the MPS survey, with a larger underestimation in the RDD arm than in the EHCVM. Mortality estimates also vary according to the sex of the respondent, but with no clear pattern. In the EHCVM branch, mortality levels calculated from male respondents are higher than those estimated from female respondents, while the reverse pattern is observed in the RDD.

Table 4.4. Probabilities of ${}_{30}q_{50}$ over the period 0–3 years before the survey and 95% confidence intervals.

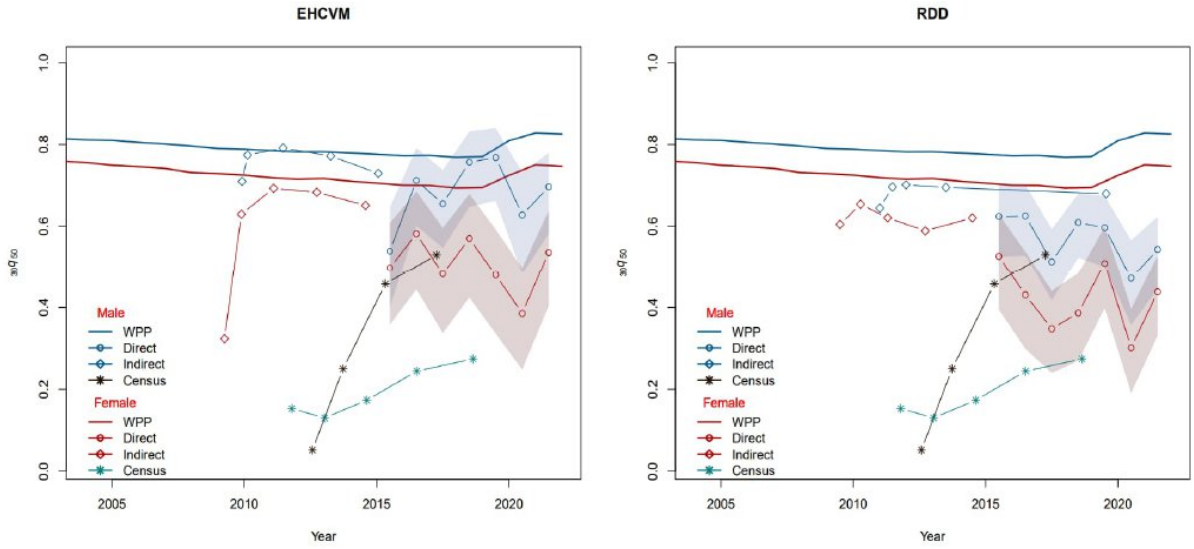
Sex of parents		**Male mortality**		**Female mortality**		**Relative difference with the WPP**	
Source	**Sex of respondent**	**${}_{30}q_{50}$**	**95 % CI**	**${}_{30}q_{50}$**	**95 % CI**	**Male mortality**	**Female mortality**
Both arms combined	Male	591	(537–639)	470	(417–519)	−23	−32
	Female	637	(590–680)	446	(377–508)	−17	−36
	Both	616	(583–647)	457	(415–496)	−20	−34
EHCVM	Male	719	(641–780)	522	(435–595)	−7	−25
	Female	694	(614–757)	431	(324–520)	−10	−38
	Both	708	(653–754)	492	(426–550)	−8	−29
RDD	Male	497	(427–559)	430	(355–497)	−36	−38
	Female	602	(542–653)	449	(361–525)	−22	−35
	Both	554	(510–595)	433	(378–483)	−28	−38
WPP		771	-	695	-	-	-

Note: EHCVM: Enquête harmonisée sur les conditions de vie des ménages; RDD: random digit dialing; WPP: World Population Prospects.

Figure 4.9 shows the trend in old-age mortality probabilities (${}_{50}q_{30}$) from the MPS from 2008 to 2022, calculated directly from parental survival histories, and compares them to WPP estimates. It also presents the trend in the same probability estimated indirectly from the proportion of surviving parents of respondents in each arm of the MPS. Both the direct and indirect estimates from the MPS are lower than the rates from the United Nations. The underestimation is again more pronounced in the RDD arm compared to the EHCVM arm. Indirect estimates from the MPS are plausible (except the latest estimate for females in the EHCVM arm). In contrast, those extracted from the 2019 census seem inconceivably low. In addition, the indirect estimates refer to a relatively distant period and are therefore of little use in tracking recent mortality trends, including possible excess mortality due to COVID-19. The direct estimates calculated for each calendar year show important fluctuations but do not suggest that mortality increased as a result of the COVID-19 pandemic. However, it should be

noted that mortality levels for the elderly are very uncertain in Burkina Faso. A previous study based on recent household deaths reported in a 2008 survey indicated that survival beyond age 60 may be higher than the modeled estimates in the *WPP* (Bendavid et al., 2011).

Figure 4.9. Trends in old-age mortality ($_{30}q_{50}$) according to parental survival in the EHCVM and RDD surveys (direct and indirect methods), the census, and the WPP.



Again, to situate the findings from Burkina Faso within a broader regional context, Box 4 compares adult and old age mortality estimates with those obtained for Malawi using comparable data and methods.

Box 4**: Cross-country comparison of adult and old age mortality levels and trends in Burkina Faso and Malawi from parental histories**

Direct and indirect estimations of adult and old age mortality

A comparative analysis of the probabilities of dying between ages 30 and 60 and ages 60 and 80 in both the weighted and unweighted samples from Burkina Faso and Malawi (Table 4.5) shows that post-stratification weighting adjusts adult mortality estimates (30q30) in both countries but has little impact on old-age mortality estimates (20q60). Regarding adult mortality, the results shown in Table 4 indicates that in Burkina Faso, the weighted probability of dying between ages 30 and 60 among males is 0.3028, compared to an unweighted estimate of 0.2956. Similarly, in Malawi, the weighted probability of dying between ages 30 and 60 among males is 0.4003, while the unweighted probability is 0.3903.

Regarding old-age mortality estimates, the results in Table 4.5 show only slight differences in the probabilities of dying between ages 60 and 80 in both countries. In Burkina Faso, the weighted probability of dying between ages 60 and 80 among males is 0.5389, compared to an unweighted probability of 0.5364. In Malawi, the weighted probability for males is 0.4940,

slightly higher than the unweighted probability of 0.4924. The results presented in Table 4.5 leads to the conclusion that post-stratification has no effect on old age mortality estimates.

Table 4.5 : A comparative analysis of the probability of dying between the weighted and the unweighted sample in Burkina Faso and Malawi

			Weighted			Unweighted		
Country	**Category**	**Gender**	**Est**	**CI lower**	**CI upper**	**Est**	**CI lower**	**CI upper**
Burkina Faso	30q30	Father	0.3028	0.2578	0.3451	0.2956	0.2572	0.3320
		Mother	0.1779	0.1568	0.1984	0.1695	0.1546	0.1841
	20q60	Father	0.5389	0.5105	0.5657	0.5364	0.5179	0.5542
		Mother	0.4040	0.3706	0.4356	0.4087	0.3833	0.4331
Malawi	30q30	Father	0.4003	0.3449	0.4510	0.3903	0.3374	0.4390
		Mother	0.2046	0.1777	0.2305	0.1848	0.1646	0.2045
	20q60	Father	0.4940	0.4565	0.5290	0.4924	0.4628	0.5203
		Mother	0.3502	0.3122	0.3862	0.3366	0.3042	0.3674

Figure 4.10 presents both direct and indirect estimates of adult and old age mortality in Malawi and Burkina Faso from parental histories. The top-left section shows that the probabilities of dying between ages 30 and 60 in Malawi are similar between the direct and indirect estimates, although the indirect estimates are available only up to 2015. When comparing the RaMMPS mortality estimates with those from the United Nations World Population Prospects 2022 (WPP), Malawi Demographic and Health Survey (DHS), and the 2018 Population and Housing Census, the results indicate that the RaMMPS estimates closely align with those from the WPP, DHS, and the census.

In the top-right section, which shows the probability of dying between ages 60 and 80 in Malawi, the results indicate that the RaMMPS direct estimates are lower than those of the WPP, while the indirect estimates are slightly higher than the WPP estimates.

For Burkina Faso, the bottom-left section shows that the indirect estimates for both males and females are lower than the direct estimates. Comparing the RaMMPS estimates with those from the WPP, DHS, and the census, the figure indicates that the RaMMPS estimates are consistent with those of the WPP, DHS, and the census.

Regarding old-age mortality (the probability of dying between ages 60 and 80) in Burkina Faso, the results show that the RaMMPS estimates are lower than the WPP estimates. This difference

in mortality estimates is observed in both direct and indirect estimates, in contrast to Malawi, where only the direct estimates are lower.

Figure 4.10:Direct and indirect estimates of adult and old-age mortality in Malawi and Burkina-Faso

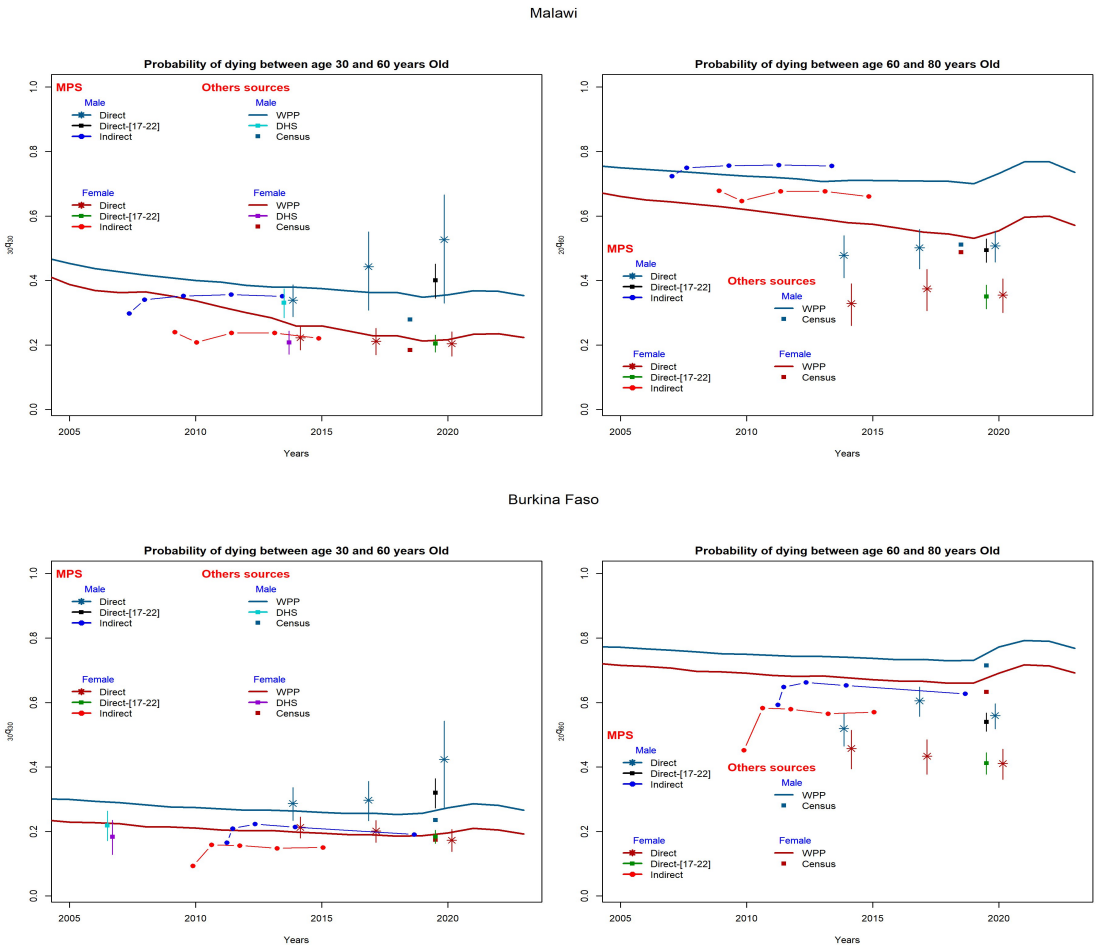


Figure 4.11 and Figure 4.12 compare age-specific mortality rates for adults and older populations in Malawi and Burkina Faso using the Gompertz model, incorporating raw data, smoothed data, and estimates from the World Population Prospects (WPP). The Gompertz model follows an increasing trend that aligns with empirical data, though discrepancies emerge depending on the method used.

Raw data shows significant variability in age-specific mortality rates, especially at older ages and more acutely among males in both countries. These fluctuations are amplified at ages with fewer reported deaths and individuals at risk, making estimates more susceptible to random variation and potential age misreporting. This is particularly relevant given the age heaping observed in parents' reported ages. The smoothing procedure reduces these irregular

fluctuations, especially in Burkina Faso, and preserved the overall increasing age pattern of mortality. This suggests that some variability in the raw data may stem from reporting and sampling, rather than genuine deviations in the underlying mortality schedule. Nevertheless, stronger fluctuations among males indicate that the reliability of age-specific mortality estimates may vary by sex, particularly at older ages with limited observations. However, WPP estimates consistently indicate higher mortality levels beyond age 60, particularly for women, suggesting a potential overestimation of mortality risk compared to other approaches. This pattern is more pronounced in Burkina Faso than in Malawi, where the differences between methods are less substantial.

While the Gompertz model applied to raw or smoothed data provides coherent trends, the divergence from WPP estimates may reflect differences in data sources or underlying assumptions. This discrepancy is more evident in Burkina Faso than in Malawi.

Figure 4.11; Age pattern of adult and old age mortality in Malawi

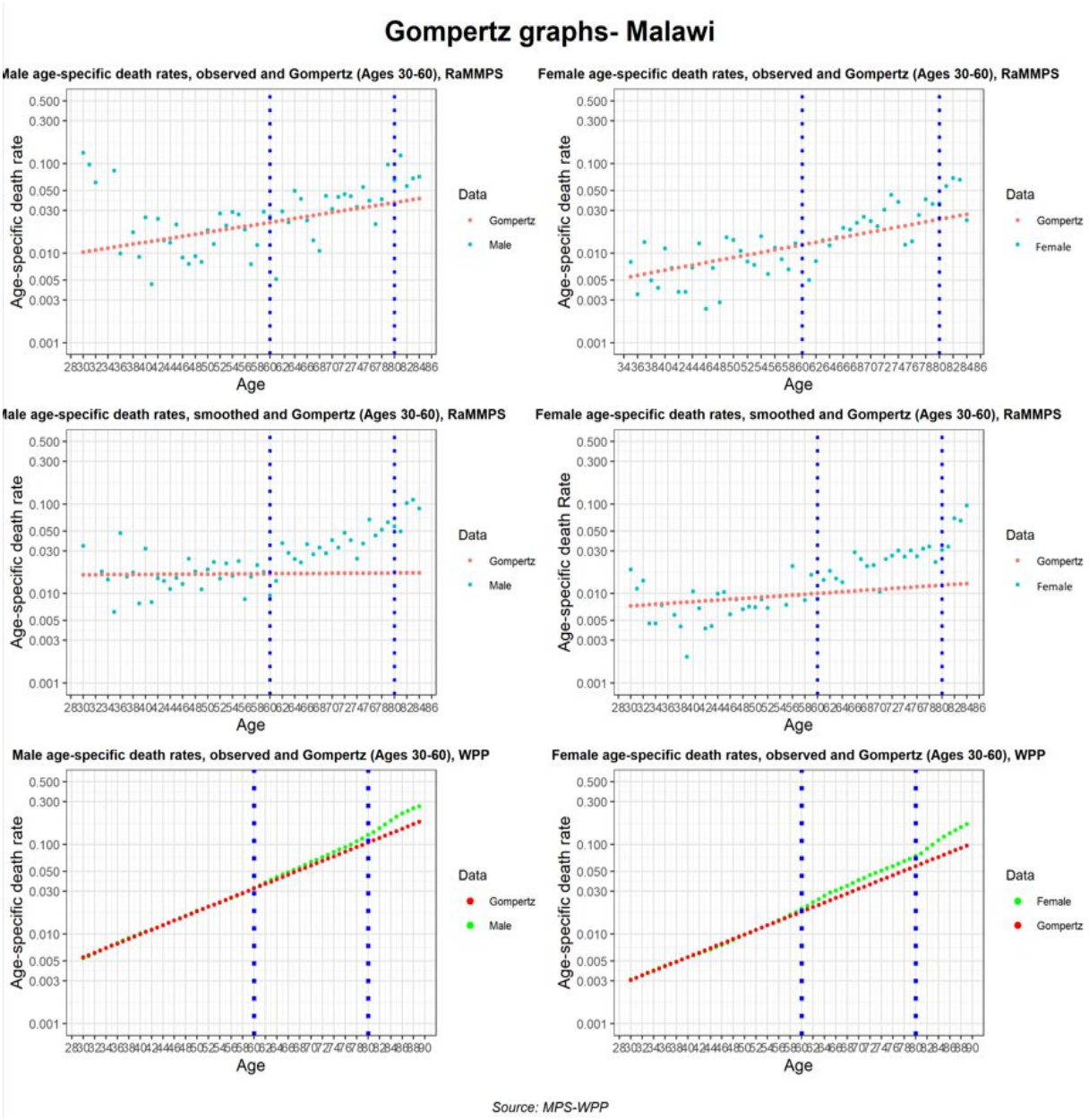


Figure 4.12: Age pattern and old age mortality in Burkina-Faso

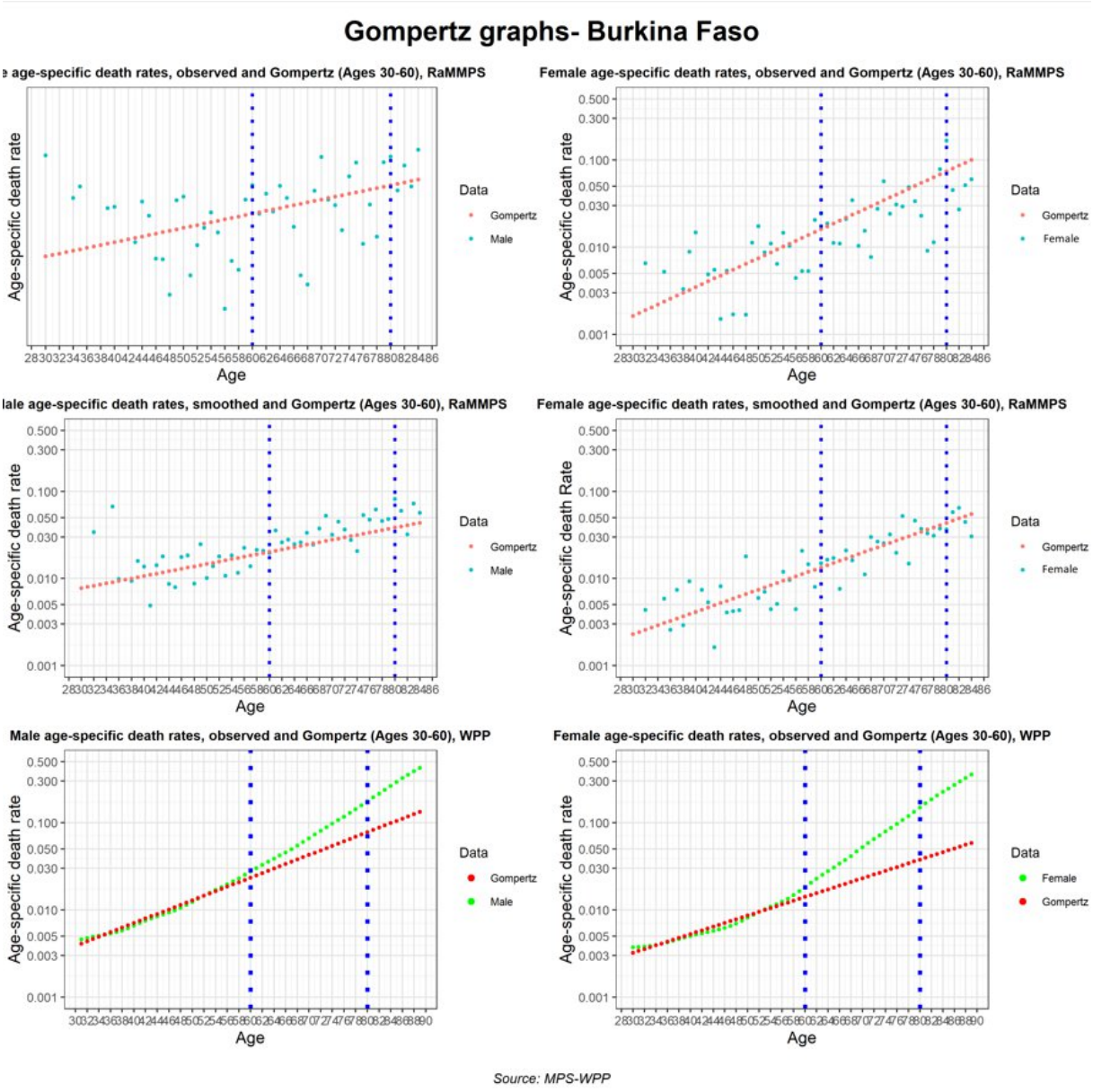


Figure 4.13 and *Figure 4.14* present the reporting of deaths among male and female respondents in Malawi and Burkina Faso, and show variations by gender of the respondent. In Malawi, mortality estimates (30q30 and 20q60) differ between male and female respondents, with women generally reporting higher parental mortality, particularly for mothers. When comparing adult mortality (30q30) with World Population Prospects (WPP) estimates, survey-based (MPS) data suggest higher reported mortality among female respondents and lower mortality among male respondents.

In Burkina Faso, overall reported mortality levels are consistently lower than in Malawi across all categories, with less pronounced differences between male and female respondents. Male

respondents report significantly higher parental mortality, particularly for fathers, compared to female respondents. Similar to Malawi, WPP adult mortality estimates are systematically lower or comparable to those derived from MPS data.

Across both countries, the reported old-age mortality (20q60) from MPS data remains consistently lower than WPP estimates, regardless of respondent gender. However, gender-based reporting patterns differ: in Malawi, female respondents consistently report higher mortality estimates than their male counterparts, whereas in Burkina Faso, the opposite trend is observed.

Figure 4.13: Reporting differences between male and female respondents in Malawi

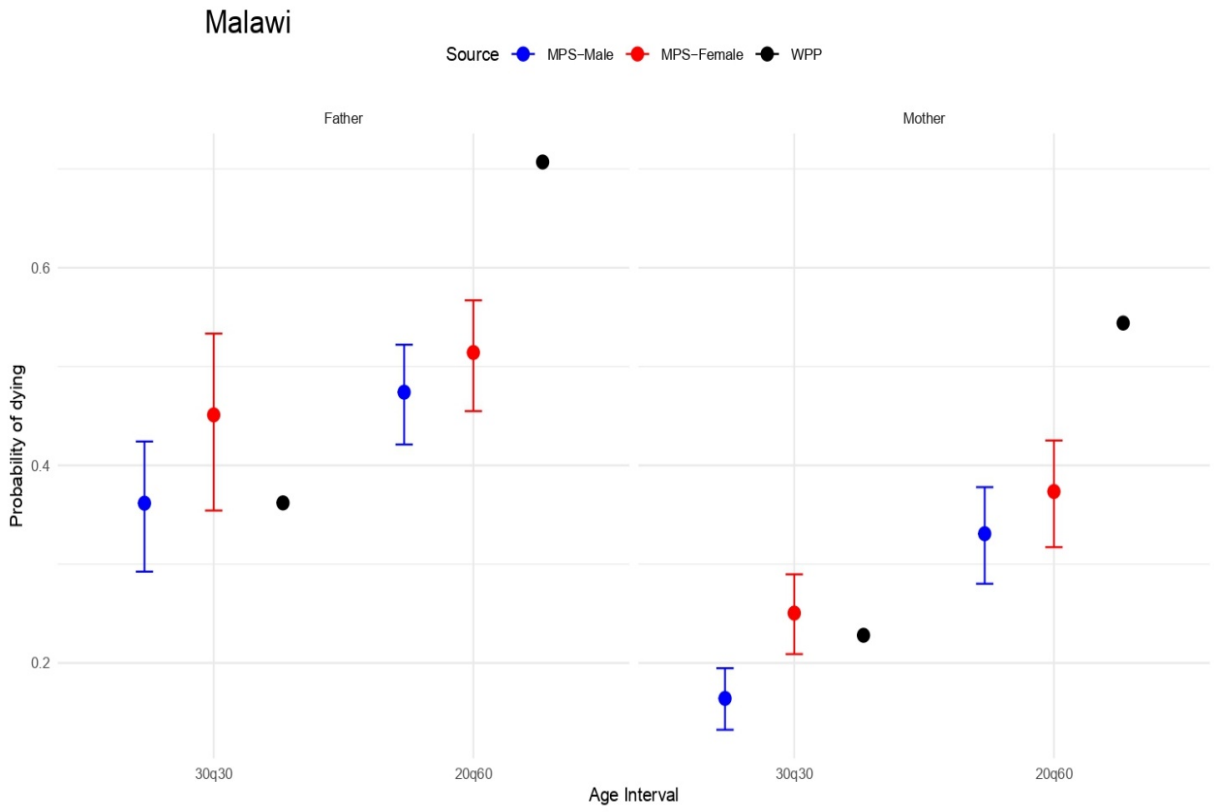
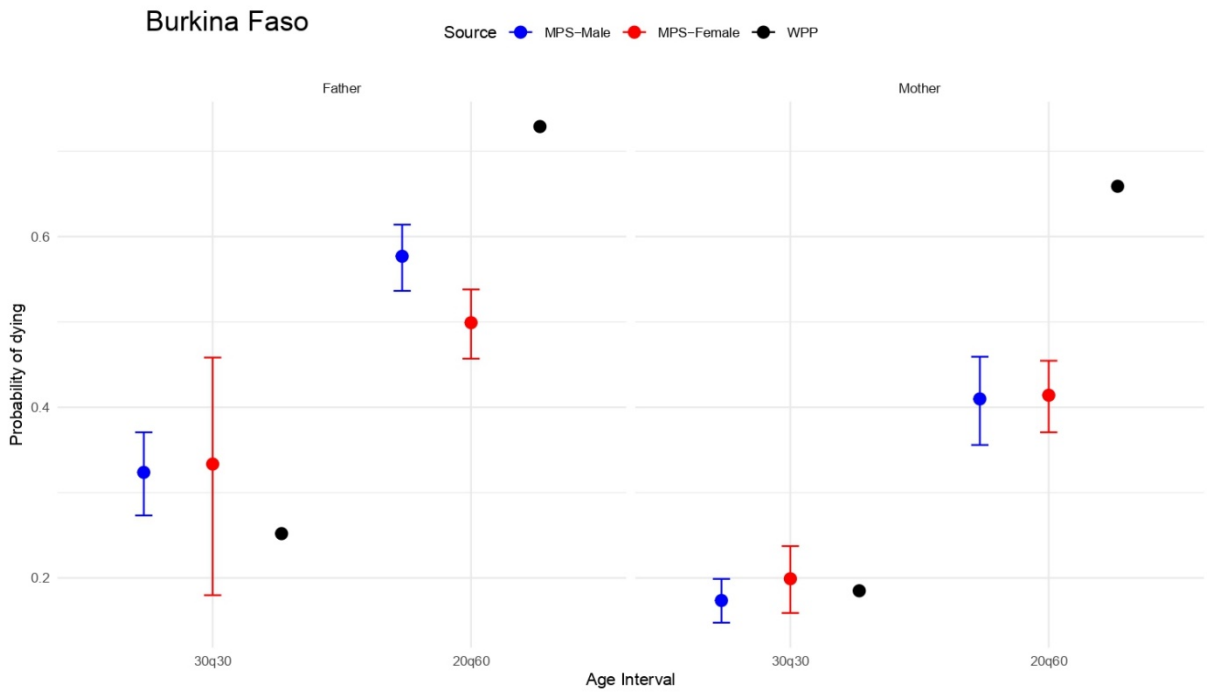


Figure 4.14: Reporting differences between male and female respondents in Burkina-Faso



4.4 Discussion

In this chapter, we used the MPS data from Burkina Faso to estimate under-5, adult, and old-age mortality and compare the resulting estimates with levels and trends from the DHS and mortality estimates from United Nations Population Division and UN IGME. The analyses include both direct and indirect estimation techniques.

Our findings indicate that under-5 mortality estimates from each arm of the MPS are relatively consistent with other estimates derived from F2F surveys and censuses. Indirect estimates from the MPS are closer to UN IGME estimates, whereas direct estimates extracted from truncated birth histories appear to be affected by a downward bias, although they are aligned with the latest DHS estimate. Truncated birth histories may be affected by reporting errors such as the transfer of children (alive or deceased) beyond the reference period (Masquelier et al., 2023). Direct estimates over the past three years align more closely with UN IGME estimates for the EHCVM arm and with the 2021 DHS estimates for the RDD arm. Estimates derived from truncated birth histories are lower for the RDD arm than for the EHCVM arm, despite the fact that the RDD approach allows us to reach respondents who were not included in the F2F survey

sample, such as people who are mobile due to insecurity. It is likely that data collected via RDD is affected by higher reporting errors, as indicated in the previous chapter.

MPS estimates of adult mortality from summary sibling data are considerably lower than those of the WPP. There is more uncertainty around expected mortality levels in adults (compared to children), as illustrated by the difference between DHS-based estimates and United Nations estimates, and overestimation in the WPP estimates cannot be ruled out (Masquelier et al., 2014). However, the estimates from the RaMMPS survey seem particularly low, especially when using the reported ages and dates. It is possible that the summary sibling survival histories (without detailed information on ages at interview or ages at death and time since death) are subject to greater error than full sibling survival histories typically used in F2F surveys. Indeed, when considering the sibship sizes and proportions of surviving siblings, we observed only small differences between the MPS and the DHS. In addition, the estimates of adult mortality ($_{35}q_{15}$) obtained after imputing dates of birth and dates of death for all deaths were closer to those expected from the WPP than those calculated with the reported ages and dates. It is also possible that some deaths were transferred prior to the reference period (2019–2022) in the MPS. For brothers and sisters who had died since 2019, additional details on the date and circumstances of death were collected. Shifting deaths to an earlier period would reduce the workload of interviewers (Schoumaker, 2015). The magnitude of the downward bias did not vary clearly by study arm in the case of sibling reports.

For mortality among the elderly, the MPS survey produced estimates that were also lower than those of the United Nations, but much higher than indirect estimates derived from the last census. Mortality levels were again higher in the EHCVM branch as compared to the RDD, irrespective of the estimation method used. Yet, in this age group, we are lacking a robust reference to compare our estimates with, as old-age mortality is still subject to a high degree of uncertainty in Burkina Faso, as in other countries in SSA (Ouedraogo, 2020).

In summary, while the MPS is a promising method for collecting mortality data when F2F data collection is not possible, the approach has some important limitations. First, the absence of detailed information on the sociodemographic characteristics of the customers of the different mobile telephone networks in Burkina Faso leads to uncertainties as to the representativeness of the sample for the entire national population. From existing DHS data, we know that mobile phone owners are more likely to reside in urban areas, have a higher level of educational attainment, be younger, and be better off in terms of household equipment (Sánchez-Páez, Masquelier, Menashe Oren, et al., 2023). Pre- and post-stratification methods may alleviate some of the biases resulting from the selection of respondents in the ensuing mortality

estimates, but further work is required to assess whether this applies to all estimates, particularly for adult mortality. In terms of sampling strategy, we observed that the discrepancies between the MPS and UN estimates were generally larger in the RDD arm, and this could reflect a stronger selectivity of respondents, although they could also be less engaged. Additionally, the fact that child mortality is usually estimated from maternal reports may exacerbate selection biases from MPS, as women tend to have lower rates of phone ownership compared to men. Therefore, when conducting MPS, particularly those focused on women's health or related topics, it is essential to consider and address these gender-specific challenges to ensure the reliability and validity of the data collected. Second, the respondents' location when they participate in the interview could influence the quality of data collected from MPS. Mobile phone respondents may find themselves in situations where participation in the survey is difficult or not possible or the connection is not adequate. The literature is divergent at this level, as some studies have shown that the use of mobile phone to collect data does not significantly influence data quality (Pew Research Center, 2012), while other studies show otherwise (Jäckle et al., 2010; Triga, 2019). Third, MPS often involve the use of shortened questionnaires to reduce respondent fatigue and limit interruptions due to network loss, and these revised instruments need to be further evaluated. Shorter interview times could also result in less probing and cross-checking of answers, also affecting data quality. A recent analysis of six MPS conducted in the context of the RaMMPS project suggests that age heaping in data collected over the phone is much more pronounced than in household surveys and censuses conducted F2F (Helleringer et al., 2023). Another study showed that truncating birth histories results in downward biases in mortality estimates (Masquelier et al., 2023). Here we have also shown that the summary instrument we used for sibling reports may have introduced confusion or encouraged the displacement of deaths outside the reference period. There is thus a need to pilot full birth histories and full sibling histories in MPS, as shortened instruments appear to generate more reporting errors.

Despite these limitations, our study shows under-5 mortality trends derived from the MPS in Burkina Faso were in relatively good agreement with other estimates from F2F surveys and censuses, especially when considering indirect estimates. For the mortality of the elderly, the MPS survey produced estimates close to those of the United Nations for men, when estimated indirectly. By contrast, the MPS underestimated the level of mortality in adults aged 15–49, when based on the shortened sibling survival module.

5 Results from the validation study conducted in the Ouagadougou Health and Demographic Surveillance System.

In this chapter, I aim to quantify the impact of errors related to age, dating of events, and omissions in mortality rates from MPS, using the validation study conducted in the Ouagadougou Health and Demographic Surveillance System (OHDSS), in which I was involved. In this validation study, we interviewed adults over the phone, for whom we had high-quality data on the survival of their children, siblings, and parents from the OHDSS. Individual records were matched, and we assessed the sensitivity and accuracy of mobile phone interviews in recording vital events, ages and dates.

5.1 Introduction

As discussed in the previous chapters, MPS can be quite different to F2F surveys, especially when it comes to monitoring mortality trends in LMICs. The quality of mortality estimates may vary according to survey mode because of differing interviewer effects, survey environment and technicalities, response rates, representativeness, and respondent characteristics. In F2F surveys, socio-economic status, race, ethnicity and gender of the interviewer have been found to bias results (Antoine, 2013; Benstead, 2010; Davis et al., 2010). However, when local, or "insider" interviewers are used, superior data are collected in F2F surveys (Weinreb et al., 2018). In MPS, some of these interviewer characteristics become irrelevant, as ethnicity or wealth status are less obvious without visual cues. Moreover, social desirability has been found to be more pronounced in F2F surveys than in MPS (Berzelak & Vehovar, 2018). Responses to sensitive questions in particular, such as on abortion, can have strong interviewer effects (Leone et al., 2021). However, recent evidence suggests that potentially sensitive mortality-related questions asked during MPS did not appear to affect respondents (Souza et al., 2024).
F2F surveys are advantageous in controlling the environment in which the interview is conducted, something MPS are not able to do, as they may also reach respondents in a range of places: at work, at the market, travelling etc. (De Leeuw & Desiree, 1992). Moreover, respondents may be in areas with poor reception, or have low batteries, and thus the potential for interruption of the interview is high. Some regions may have weak or no cellular network

coverage, making it impossible to reach populations in such regions. As discussed in Chapter 3, the representativeness of MPS is of particular concern in LMICs. The “type” of respondent may also differ by survey mode. Typically, in F2F surveys that collect mortality data, it is the household head who is approached and interviewed. In contrast, in MPS, it is the phone holder who is contacted and is the easiest to interview, though sometimes it is possible to ask the owner of the phone to pass the phone to another household member. Thus, details collected from a report on the same death may differ according to who is interviewed. Finally, mortality estimates from MPS may differ from those obtained through F2F surveys, as we have seen in the previous chapter. This difference may partly arise because MPS questionnaires are often shorter and less detailed, which can affect the completeness of mortality reporting (Holbrook et al., 2003). In both cases, mortality estimates typically rely on retrospective questions about the survival of close relatives (parents, siblings, and children) or recent household deaths collected through surveys or censuses (Hill, 2014). These inquiries typically face two primary challenges: omission errors and reporting errors, which can distort or bias mortality estimates. For example, omissions of deaths tend to bias mortality estimates downward, while age misreporting and errors in event dating can distort age-specific mortality patterns and aggregate indicators. In another validation study conducted in the Niakhar HDSS in Senegal, respondents to a questionnaire on sibling survival were found to underestimate the ages of living siblings and the time since the death of deceased siblings, leading to biased estimates of adult mortality (Masquelier et al., 2021). By contrast, a validation study of the household death questionnaire (used in censuses) conducted in the Nouna HDSS in Burkina Faso suggests that age misreporting plays a relatively modest role, while underreporting of deaths is the primary driver of mortality underestimation (Lankoandé et al., 2022). Complementary evidence from Manicaland in Zimbabwe, based on longitudinal census data reveals misreporting of parental survival status, particularly for mothers, with foster mothers often reported as biological mothers, which contributes to the overestimation of maternal orphanhood in model-based estimates compared with survey data (Robertson et al., 2008). While numerous studies have analyzed the impact of age, dating, and omission errors on mortality estimation in F2F surveys (Helleringer et al., 2014; Lankoandé et al., 2022; Masquelier et al., 2021), there is a gap in research specifically assessing the quality of individual-level data from MPS or examining the impact of age, dating, or omission errors in these surveys on the estimation of mortality across all ages. One short study suggests that age data in MPS in Africa may be noisier (Helleringer et al., 2023).

This chapter examines the validity of MPS in estimating mortality in Burkina Faso, within the framework of the RaMMPS project. It draws on a validation survey conducted in the OHDSS area, which was designed to replicate the mortality-related questions used in the national 2021–2022 RaMMPS survey at the local level. The validation study collected new data on truncated birth histories, sibling survival, and parental survival among a stratified random sample of OHDSS residents. These data allow for an assessment of age reporting accuracy, death omissions, and their combined effect on mortality estimates.

5.2 Data and methods

5.2.1 Data

5.2.1.1 Reference data set

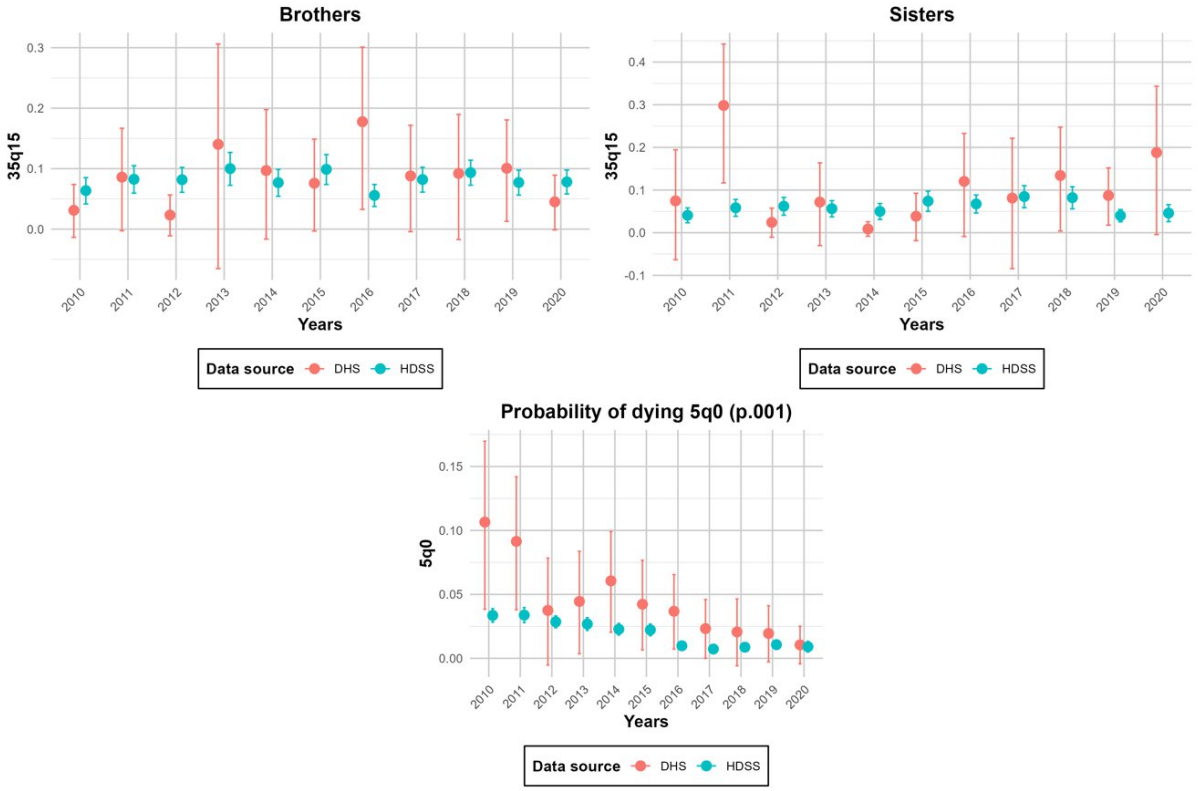
The validation survey was conducted in the Ouagadougou HDSS, an open cohort that has been monitoring populations in five neighborhoods in the northern part of Ouagadougou since 2009 (Rossier et al., 2012). The areas covered by the HDSS are located on the northern outskirts of the city center and include more than 90,000 inhabitants. Each year, fieldworkers visit every household at least once to record vital events such as births, deaths, migrations, and pregnancies, and to document their outcomes (e.g., stillbirth or live birth). They also conduct verbal autopsies for individuals who died within the HDSS area. Additionally, the HDSS continuously registers new households, such as those established following the construction of new housing.

In Figure 5.1, we present the trends in under-five mortality rates (5q0) and adult mortality rates (35q15) from 2010 to 2020 in the five neighborhoods covered by the HDSS. We also show the mortality trends for the entire city of Ouagadougou over the same period, as estimated from data derived from the 2021 DHS. These estimates are based on full pregnancy histories (FPH) and sibling survival histories (SSH) data collected in 2021 to estimate child mortality (5q0) and adult mortality (35q15), respectively. The results for adults indicate no significant difference between the mortality levels derived from the OHDSS data and those obtained from the 2021 DHS. In contrast, among children, the differences are more pronounced, although they tend to narrow over time. This convergence may be explained by the implementation of various health policies introduced after 2016, as well as by a gradual reduction in inequalities in access to healthcare services between neighborhoods within and around Ouagadougou (Yaogo & Zerbo, 2022).

We used the OHDSS data as a reference to evaluate child survival, sibling survival, and parental survival data collected from RaMMPS validation study. The HDSS in Ouagadougou has rigorous protocols for tracking vital events (births, deaths, migrations, etc.), as it is based on annual household visits to detect and monitor changes (Rossier et al., 2012). However, despite their high quality, HDSS data cannot be considered the gold standard for mortality measurement. Certain pregnancies might not be detected during annual household visits, and some stillbirths might be misclassified as neonatal deaths, or vice versa. In addition, parental deaths might be misclassified due to child fostering or adoption, and sibling survival might go undetected since the HDSS only records siblings residing within the HDSS area.

It is important to note that validation studies like this can only be conducted in contexts where demographic surveillance has been in place for several years. Indeed, when a woman of reproductive age first becomes a resident in the HDSS, she is typically only questioned about the total number of births, and the children still living or deceased. Therefore, no additional information such as birth and/or death dates of the living or deceased children are collected. These limitations on the information also make it difficult to reconstruct sibling survival histories. Migration is another factor to consider. The analysis included only continuous residents in the HDSS area from the start of the OHDSS in 2009, or immigrants who arrived before 2015 and have resided continuously in the area since their arrival. This approach differs from standard practices in population-based mortality analysis. (Note that migrations between zones within the DSS area do not pose a problem due to the use of unique identification numbers.) In addition, the results may have been affected by data truncation, as only children born after 2015 were included in both datasets. In addition, the results may have been affected by data truncation, as only children born after 2015 were included in both datasets. This restriction may have introduced mismatches between survey and HDSS records when dates of birth were reported differently in the two sources. For instance, a child reported in the survey as born after 2015 could have been recorded in the HDSS with an earlier date of birth, resulting in the child appearing younger in the survey than in the HDSS record. However, discrepancies in reported dates of birth may occur in either direction, and the truncation itself does not provide a basis for assuming that younger ages were systematically over- or under-reported in the survey.

Figure 5.1 : Trends in child (5q0) and adult (35q15) mortality rate in Ouagadougou



5.2.1.2 Sample method and information collected

The main RaMMPS survey datasets did not includes any individual identifiers. As a result, it was not possible to validate the data on truncated birth histories (TBH), sibling survival, and parental survival collected during the 2021-2022 RaMMPS survey in Burkina Faso by linking them with HDSS or DHS data. Instead, we collected new data on the TBH of women of childbearing age, sibling survival, and parental survival among the HDSS population sample.

A stratified random sample of women aged 18–49 and men aged 18–64 was drawn from HDSS resident lists, restricted to individuals or households with available phone numbers. The target sample size was 2,500 households, with stratification by sex, age group, and prior experience of deaths, and oversampling of individuals who had experienced recent child, sibling, or parental deaths to ensure sufficient events for validation analyses. Participants included individuals who had resided continuously within the OHDSS area since its establishment, as well as immigrants who had moved to the area sufficiently long ago to meet the criteria for permanent residency. Data were collected using selected modules from the 2021–22 RaMMPS survey in Burkina Faso, covering sociodemographic characteristics, household composition

and recent deaths, as well as child, sibling, and parental survival histories, with detailed information collected on the timing and circumstances of deaths occurring since 2019. Further methodological details are provided in Chapter 2.

We selected interviewers who had previously worked on the 2021–22 RaMMPS survey and had demonstrated good performance and best practices. They had extensive experience in conducting phone-based data collection, particularly on sensitive topics such as the survival of close relatives. The interviewers did not have access to HDSS data, so they were unaware of whether the respondents they interviewed had experienced births, or deaths of children, siblings, or parents during the relevant period. We developed an electronic data collection tool that offered several features for managing and monitoring interviewers. The interviews were conducted via phone calls, and the data were recorded using SurveyCTO on Android tablets. In line with protocol from the RaMMPS surveys, we incorporated data consistency checks to alert interviewers to potential errors, and to avoid language issues, we selected interviewers based on the languages spoken by the respondents (available in the HDSS database). This criterion was also used for work distribution to ensure that interviews were conducted in the respondent's most fluent language. Language considerations were also incorporated into interviewer training, with translation of questions and role-playing during training sessions in the relevant languages.

5.2.2 Data analysis

We first described the composition of the study sample, including reasons for nonparticipation. We investigated the selectivity of the study sample by comparing the HDSS records of the women who participated in the validation study with those of women who were selected but could not be interviewed. This comparison focused on maternal characteristics, household assets, and characteristics associated with the stratification variables used to assign respondents to the sampling strata described earlier.

Maternal characteristics include age at the time of the survey (in five-year age groups), educational level, ethnic group, relationship to household head, marital status, religion and place of residence. We also considered several variables in HDSS datasets that denote the socioeconomic status of participant’s households, including binary variables describing the roofing material, access to electricity, and the type of toilet facility. Information on recent birth,

sibling or parental history of potential participants they experienced over the past five years was also collected.

Some of these variables have a small number of observations in certain categories (e.g., $n < 10$). We thus used Fisher's exact test (Agresti, 1992) to assess differences in the distribution of these variables between women who were interviewed and those who were not.

5.2.2.1 Record linkage

For individual-level analysis, we conducted manual data matching to match cases across data sources. Each sampled individual was linked to key identifiers, including their unique ID in the Ouagadougou HDSS (OPO), full name, age, sex, place of residence, phone number, household head's name, and the names and phone numbers of all household members. These details were carefully verified during data collection to confirm that the same individual was being tracked throughout the study. Additional precautions were taken to ensure that phone numbers had not been reassigned, that respondents had not changed their place of residence, and that their eligibility remained unchanged.

To compare self-reported data across survey modes, we used the unique identifier available in both the RaMMPS and OHDSS databases. This identifier allowed us to match individuals across datasets.

For verifying the parental information provided by respondents in both MPS and F2F interviews, we created two separate databases for each data collection mode, containing only parental details, names, ages, ages at death, place, and circumstances of death. Matching of respondents was performed using the unique identifier, followed by a manual verification of name consistency across both datasets (HDSS (F2F) data and data from the new MPS). A similar approach was applied for matching information on siblings and children of women of reproductive age. Importantly, only names and surnames were used for matching, and no additional variables were considered to avoid introducing biases and allow the analysis of reports on ages, for example.

5.2.2.2 Assessment of the accuracy of reported survival histories

We evaluated the accuracy of information collected on relatives' survival

by cross-tabulating data from the RaMMPS validation survey with reference data from the Ouagadougou Health and Demographic Surveillance System (OHDSS). The OHDSS database, last updated in 2020, did not fully cover demographic events that occurred between its last update and the RaMMPS validation survey in December 2022. Specifically, deaths occurring after 2020 might not have been recorded in the OHDSS. Therefore, we treated the OHDSS as a reference source rather than a perfect gold standard.

Separate analyses were conducted for children, siblings, and parents.

Sensitivity was defined as the proportion of respondents who reported a death (of a child, sibling, or parent) in the RaMMPS validation survey that was also recorded in the OHDSS. We investigated whether the sensitivity of the validation survey in capturing child, adult, and elderly deaths varied by factors such as time since death, respondent's sex, place of residence, education level, and the location from which the respondent answered the call. To do this, we calculated the time since death by subtracting the death date from the phone survey date. Deaths were then categorized into two groups: those occurring within the previous five years and those occurring five or more years earlier. We then recalculated the sensitivity of child, sibling, and parent survival data for each time interval.

Specificity in the RaMMPS validation survey was defined as the proportion of respondents who did not report a death (of a child, adult, or elderly person) in the validation survey and for whom no such death was recorded in the OHDSS within the past five years. We also examined whether specificity in capturing deaths varied according to the same sociodemographic characteristics of respondents.

Because the OHDSS data were not updated after 2020, deaths reported in the RaMMPS validation survey that occurred after the last OHDSS update could not always be verified against the reference database. Such cases may have been incorrectly classified as false positives, even if the reported death was genuine. This limitation is particularly relevant when interpreting specificity and false-positive rates for deaths occurring close to the time of the validation survey. Consequently, we interpret discrepancies between the two sources as differences in reported and recorded mortality, rather than assuming that all discrepancies necessarily reflect errors in the mobile phone survey.

5.2.2.3 Assessment of the impact of reporting errors on mortality estimates

To assess the potential impact of reporting errors and omissions on mortality estimates, we used a probabilistic simulation approach based on the reporting errors observed in the RaMMPS

validation survey. The objective was not to identify or estimate reporting errors in the DHS or in the National RaMMPS survey. Rather, we used the empirical error patterns identified by comparing the validation survey with the OHDSS as plausible error scenarios and artificially introduced these errors into otherwise unmodified datasets. This allowed us to assess how mortality estimates from face-to-face surveys and from the National RaMMPS survey might change if they were affected by reporting errors similar to those observed in the mobile phone validation survey.

Reporting errors were first identified by comparing dates of birth (DoB) and, where applicable, dates of death (DoD) reported during the RaMMPS validation survey with the corresponding dates recorded in the OHDSS. Errors were characterized separately according to sex and survival status, and empirical probability distributions were constructed for each group. These distributions describe the magnitude and direction of the discrepancies observed between mobile phone reports and OHDSS records. The resulting probabilities were normalized to sum to one and were subsequently used to generate random reporting errors in the simulation.

The imputation was therefore conducted by transferring the error patterns observed in the RaMMPS validation survey to the reference datasets. For each individual in the dataset to which the errors were applied, a reporting error was randomly drawn from the corresponding empirical distribution according to the individual's sex and survival status. For individuals who were alive, an error was drawn for the date of birth from the distribution observed among surviving individuals. For deceased individuals, an error was drawn for the date of birth from the distribution observed among deceased individuals, and a separate error was drawn for the date of death. The simulated dates were then obtained by adding these randomly selected errors to the original dates in the reference dataset. In this way, the underlying mortality experience in the reference data was kept unchanged, while the dates were modified to reproduce the types and magnitudes of reporting errors observed in the RaMMPS validation survey.

This error-injection procedure was applied to the DHS data used for child and adult mortality analyses and to the National RaMMPS data used to estimate mortality above age 30 ($_{50}q_{30}$). For each dataset, mortality estimates obtained from the original, unmodified data ("Standard") were compared with estimates obtained after introducing the RaMMPS-derived reporting errors ("MPS"). The difference between these two estimates therefore represents the potential effect of reporting errors of the magnitude and distribution observed in the RaMMPS validation survey on mortality measurement.

To assess the potential contribution of omissions, we additionally introduced random deletions into the reference datasets at the estimated omission rate. Individuals were randomly removed

from the data according to the omission rate observed in the validation study, allowing us to assess the potential effect of both date misreporting and omissions on mortality estimates.
For children and siblings, we also compared the empirical distributions of reporting errors observed in the RaMMPS validation survey with those observed in the two most recent DHS surveys. This comparison was used to assess whether the magnitude and direction of the reporting discrepancies observed in the mobile phone survey were broadly consistent with patterns documented in large-scale face-to-face surveys. The DHS was used here as a comparative source for characterizing reporting-error patterns, rather than as a source from which errors were transferred or independently validated. In contrast, the OHDSS provided the individual-level reference records needed to identify discrepancies between reported and recorded dates in the RaMMPS validation survey. However, because the OHDSS does not contain the complete birth and sibling histories required to evaluate the effect of reporting errors on mortality estimates in the same way as the DHS, it was not used for the error-injection analysis. For older-adult mortality, for which no comparable face-to-face source was available to directly estimate mortality levels, we applied the same error-injection approach to parental survival histories from the National RaMMPS survey.

Mortality rates were estimated using the *calc_nqx()* function from the *demogsurv* package, which calculates age-specific probabilities of death over specified periods. For each data source, we compared estimates based on the original data ("Standard") with those obtained after introducing the reporting errors and, where applicable, omissions observed in the RaMMPS validation survey ("MPS"). This comparison provided an empirical assessment of the extent to which the reporting errors observed in mobile phone interviews could affect mortality estimates when propagated to otherwise comparable mortality data

5.3 Results

5.3.1 Flow chart of the study enrollment process

Based on residency criteria within the HDSS at the time of the RaMMPS validation survey, we identified a total of 50,018 individuals aged 18–64 years. From this population, a sample of 3,517 individuals was drawn, including 2,254 women aged 18–49 years, 89 women aged 50–64 years, and 1,174 men aged 18–64 years (Figure 5.2). As indicated earlier, the sample allocation

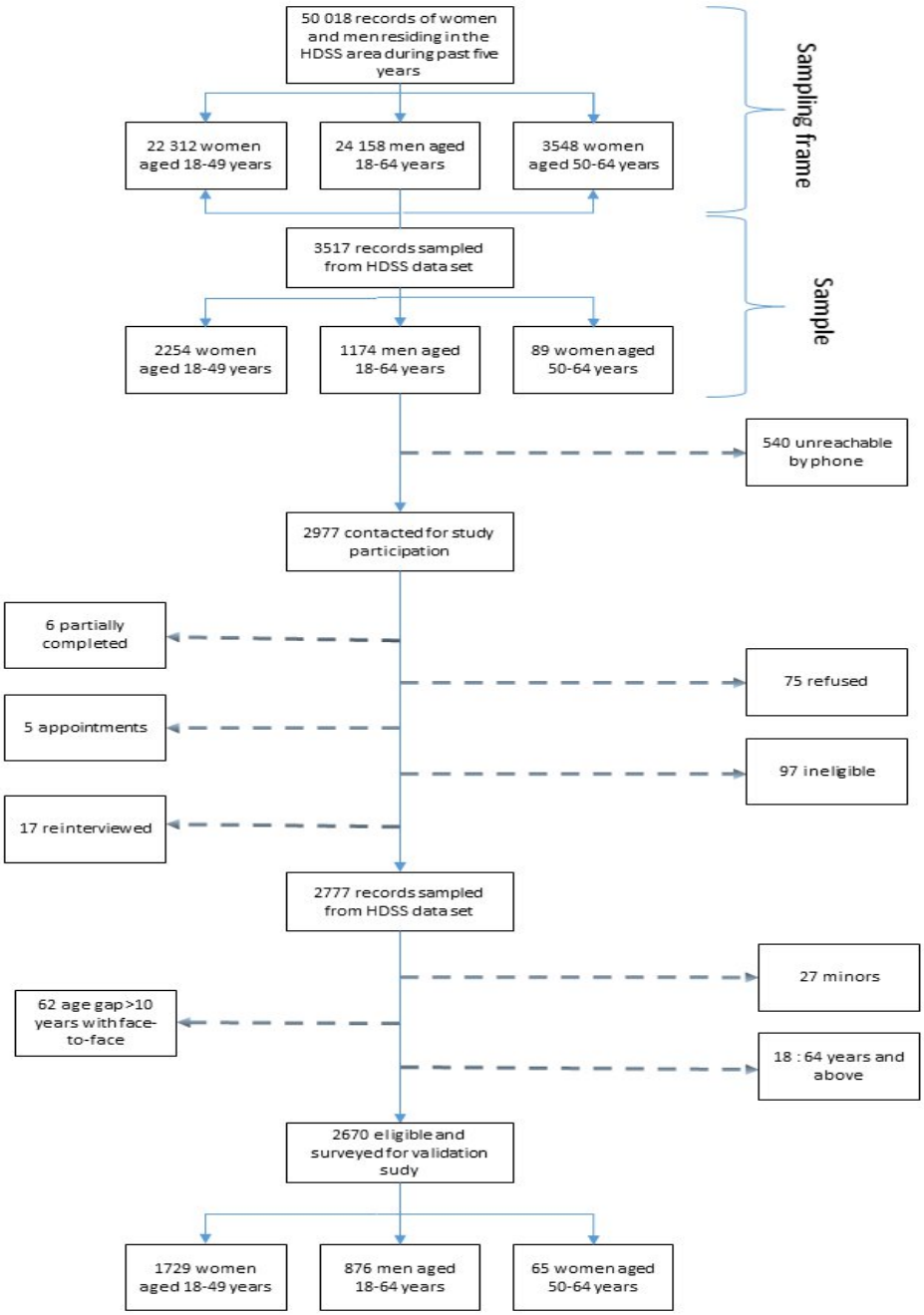
followed a predefined quota table designed to account for oversampling criteria based on respondents' past experiences (see Table 2.3 at page 43).
A total of 3,989 calls were made, successfully reaching 2,977 individuals, while 540 were unreachable. In total, 200 participants did not complete the interviews, resulting in a participation rate of 93%. We recorded 75 refusals (2.5%), 6 partially completed interviews, 5 scheduled appointments that could not be fulfilled before the end of the survey period, 97 ineligible cases, and 17 re-interviews. Among the 2,777 individuals who agreed to participate, 2,670 met the eligibility criteria for inclusion in our analysis.
The majority of exclusions were due to age-related criteria: 27 individuals were minors, 18 were older than 64 years, and 62 had discrepancies exceeding 10 years between their reported age in the HDSS and the MPS. The final analytical sample of 2,670 respondents was distributed as follows: 1,729 women aged 18–49 years, 65 women aged 50–64 years, and 876 men aged 18–64 years.

Among women of reproductive age (18–49 years), a total of 2,254 women were sampled, and 1,729 were successfully contacted. Seventeen women were excluded due to age criteria, and eight were removed due to misclassification of sex, resulting in a final eligible sample of 1,704 women (Figure 11.6 in appendix page 350). Of these, 401 women had never given birth, while 1,303 had experienced at least one childbirth. In addition, 520 women in our analytical sample had experienced the death of a child under the age of five (Figure 11.6 in appendix page 350).

Based on the established quota criteria, 158 individuals who had experienced the death of at least one sibling recorded in the HDSS were sampled. Among them, 125 were successfully interviewed, corresponding to a participation rate of 79%. Of those 125 respondents, 112 reported at least one sibling death, and 54 of them reported a sibling death that occurred within the last three years (see Figure 11.7 in appendix page 350).

A total of 859 selected respondents had parental identifiers, which provided access to information on their parents, including their names, survival status, and age. Detailed parental information was available only for respondents whose parents were registered as residents of the OHDSS surveillance area. Parents who resided outside the OHDSS catchment area were not included in the HDSS database; consequently, no information beyond their survival status was available for them. Among them, 448 respondents had lost at least one parent, with 44 parental deaths occurring within the last three years (see Figure 11.8 in appendix page 351).

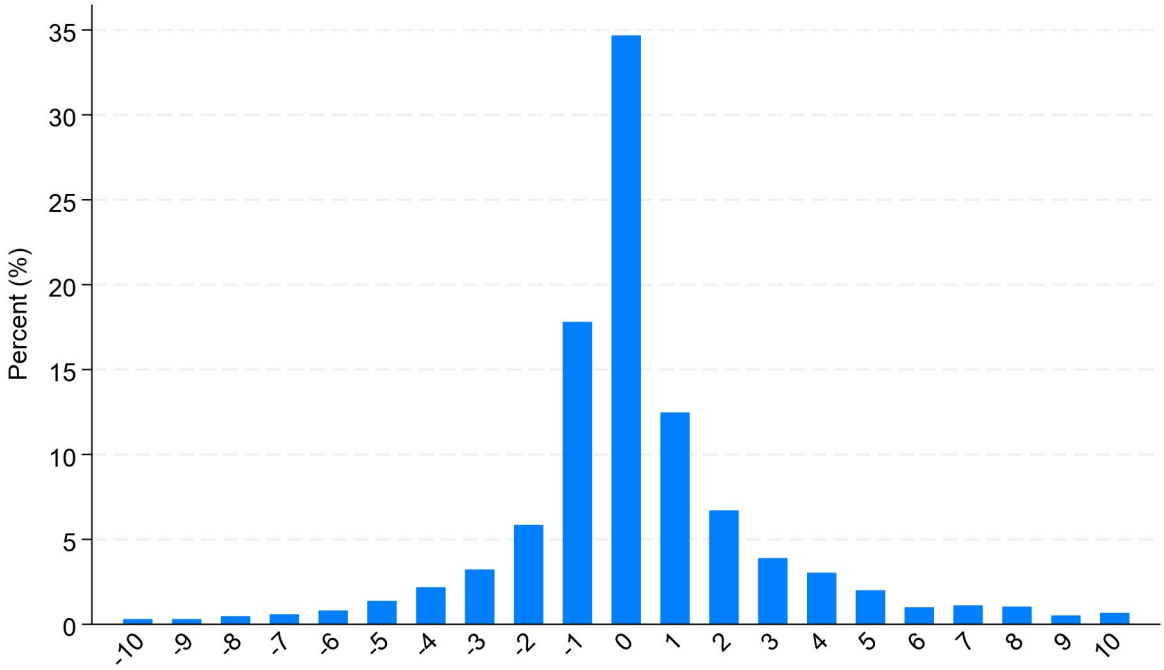
Figure 5.2 : Flow chart of the study enrollment process



5.3.2 Exploring factors linked to variations in answers between the mobile phone study and the reference HDSS data

Figure 5.3 displays the distribution of differences in the respondent's reported age between the MPS dataset and the F2F HDSS dataset. Overall, discrepancies are minor: less than one in ten respondents reported an age differing by more than two years across the two data sources. Figure 11.10 and Figure 11.11 in appendix page 352 present the predictors associated with reporting inaccurate ages (Figure 11.10) and overestimating age (Figure 11.11), among respondents interviewed through the MPS. Two key factors emerge: the respondent's level of education and the location from where they participated in the mobile phone interview. Unsurprisingly, more educated individuals are less likely to provide incorrect age information, while respondents who took part in the interview outside the home are more likely to report inaccurate or overestimated ages.

Figure 5.3 **:** *Differences in current age of respondents between the MPS data and HDSS data*



5.3.3 Selectivity of the study sample and characteristics of participants, according to HDSS data

Table 5.1 compares the characteristics of individuals selected for the validation survey who were successfully interviewed with those who could not be interviewed, including individuals who could not be reached, refused to participate, or were otherwise unavailable during the

survey period. Compared to interviewees, non-participants tend to be younger, single with a primary level of education, and reside in formal urban areas. Results indicate that participation in the validation survey is associated with age, marital and household position, educational attainment, residential context, and selected indicators of household living conditions.

In terms of age structure, non-interviewed individuals are disproportionately younger than interviewees ($p < 0.001$). Individuals aged 18–19 account for nearly one-third of non-participants (31.0%), compared to 18.0% among interviewees, while older age groups (30 years and above) are underrepresented among non-interviewed individuals. Gender composition, however, does not differ significantly between the two groups. Furthermore, non-interviewed individuals are less likely to be household heads or spouses and more likely to be sons or daughters (41.9% versus 29.4% among interviewees). Consistently, a majority of non-participants have never been married (55.2%), compared to 34.8% among interviewees, whereas married individuals are substantially more represented among interviewees (62.7% versus 41.4%; $p < 0.001$). In terms of educational attainment, non-interviewed individuals are more likely to have only primary education and less likely to have reached secondary or higher levels of schooling. Regarding place of residence, non-interviewed individuals are more likely to reside in planned (formal) urban areas (45.2%) compared to interviewees (38.1%), while interviewees are more concentrated in informal settlements.

Indeed, household-level indicators suggest that non-interviewed individuals tend to live in more disadvantaged environments. A larger proportion of non-participants reside in households lacking improved sanitation facilities according to MDG standards (28.4% versus 23.7%; $p = 0.007$) and in dwellings with low-quality wall materials (51.5% versus 46.1%; $p = 0.008$). Differences are also observed for roofing materials and access to improved cooking fuel, indicating overall poorer housing conditions among non-interviewed individuals. By contrast, differences in access to drinking water, electricity, and asset ownership are smaller and, in some cases, not statistically significant.

With respect to eligibility for mortality-related sampling strata, non-interviewed individuals are generally less likely to belong to specific target strata than interviewees. An exception concerns recent parental death: approximately 60.7% of non-interviewed individuals reported the death of a parent within the last five years, compared to 55.8% among interviewees, although this difference is not statistically significant. For other mortality strata, such as sibling deaths or combined sibling and parental deaths, the proportion of non-interviewed individuals is lower than among interviewees.

Table 5.1: Selectivity of the study sample and characteristics of participants in the validation study, according to data contained in the HDSS database

	Not interviewed		**Interviewed**		**Total**		**p-value**
	%	No.	%	No.	%	No.	
Respondents age group							0.000
18-19	31.0	243.0	18.0	492.0	20.9	735.0	
20-24	15.8	124.0	15.5	423.0	15.6	547.0	
25-29	12.9	101.0	15.3	419.0	14.8	520.0	
30-34	13.2	104.0	16.7	456.0	15.9	560.0	
35-39	10.6	83.0	14.9	408.0	14.0	491.0	
40-44	8.2	64.0	10.2	278.0	9.7	342.0	
45-49	3.4	27.0	5.1	138.0	4.7	165.0	
50-54	1.9	15.0	1.9	53.0	1.9	68.0	
55-59	1.8	14.0	1.7	46.0	1.7	60.0	
60-64	1.3	10.0	0.7	19.0	0.8	29.0	
Gender							0.123
Male	35.7	280.0	32.7	894.0	33.4	1,174.0	
Female	64.3	505.0	67.3	1,838.0	66.6	2,343.0	
Relationship							0.000
Head	13.6	107.0	20.8	568.0	19.2	675.0	
Spouse	25.0	196.0	35.8	978.0	33.4	1,174.0	
Son/Daughter	41.9	329.0	29.4	803.0	32.2	1,132.0	
Brother/Sister	4.7	37.0	3.1	85.0	3.5	122.0	
Father/Mother	0.3	2.0	0.3	9.0	0.3	11.0	
Other family	13.1	103.0	9.4	258.0	10.3	361.0	
Non-family	1.4	11.0	1.1	31.0	1.2	42.0	
Marital status							0.000
Never married	55.2	433.0	34.8	950.0	39.3	1,383.0	
Married	41.4	325.0	62.7	1,712.0	57.9	2,037.0	
Divorced	1.0	8.0	0.7	19.0	0.8	27.0	
Widowed	1.0	8.0	1.1	30.0	1.1	38.0	
DK	1.4	11.0	0.8	21.0	0.9	32.0	
Education							0.000
None	21.8	171.0	24.2	660.0	23.6	831.0	
Primary	26.5	208.0	23.6	644.0	24.2	852.0	
Some Secondary	33.2	261.0	35.5	971.0	35.0	1,232.0	
Secondary Completed	2.9	23.0	3.5	96.0	3.4	119.0	
Some Tertiary	3.7	29.0	4.6	125.0	4.4	154.0	
DK	11.8	93.0	8.6	236.0	9.4	329.0	

Neighborhood							0.001
KILWIN	24.7	194.0	18.0	491.0	19.5	685.0	
NIOKO2	17.8	140.0	19.7	539.0	19.3	679.0	
NONGHIN	30.6	240.0	35.2	963.0	34.2	1,203.0	
POLESGO	6.4	50.0	6.9	188.0	6.8	238.0	
TANGHIN	20.5	161.0	20.2	551.0	20.2	712.0	
Place of residence							0.000
Formal	45.2	355.0	38.1	1,042.0	39.7	1,397.0	
Informal	54.8	430.0	61.9	1,690.0	60.3	2,120.0	
Ethnic group							0.207
Mossi	90.6	711.0	92.0	2,513.0	91.7	3,224.0	
Others	9.4	74.0	8.0	219.0	8.3	293.0	
Religion							0.684
Muslims	62.7	492.0	61.2	1,673.0	61.6	2,165.0	
Christians	24.7	194.0	26.2	717.0	25.9	911.0	
Others	12.6	99.0	12.5	342.0	12.5	441.0	
Male 18-64 and Female 50-64							
Sibling death in last 5 years							0.126
No	94.7	287.0	92.1	886.0	92.7	1,173.0	
Yes	5.3	16.0	7.9	76.0	7.3	92.0	
Parent death in last 5 years							0.133
No	39.3	119.0	44.2	425.0	43.0	544.0	
Yes	60.7	184.0	55.8	537.0	57.0	721.0	
Sibling and Parent death in last 5 years							0.017
No	98.0	297.0	99.5	957.0	99.1	1,254.0	
Yes	2.0	6.0	0.5	5.0	0.9	11.0	
No sibling or parent death							0.233
No	68.0	206.0	64.2	618.0	65.1	824.0	
Yes	32.0	97.0	35.8	344.0	34.9	441.0	
Female 18-49							
U5 child death in last 10 years							0.000
No	88.2	425.0	80.6	1,427.0	82.2	1,852.0	
Yes	11.8	57.0	19.4	343.0	17.8	400.0	
Child and parent death							0.331
No	99.6	480.0	99.2	1,755.0	99.2	2,235.0	

Yes	0.4	2.0	0.8	15.0	0.8	17.0	
No child or sibling death							0.028
No	88.0	424.0	83.9	1,485.0	84.8	1,909.0	
Yes	12.0	58.0	16.1	285.0	15.2	343.0	
Parent death in last 5 years							0.000
No	26.6	128.0	38.8	687.0	36.2	815.0	
Yes	73.4	354.0	61.2	1,083.0	63.8	1,437.0	
Sib death in last 5 years							0.965
No	97.7	471.0	97.7	1,729.0	97.7	2,200.0	
Yes	2.3	11.0	2.3	41.0	2.3	52.0	
Household has electricity							0.031
No	73.4	576.0	77.1	2,106.0	76.3	2,682.0	
Yes	26.6	209.0	22.9	626.0	23.7	835.0	
Household has improved sanitation with MDG Standards							0.007
No	28.4	223.0	23.7	647.0	24.7	870.0	
Yes	71.6	562.0	76.3	2,085.0	75.3	2,647.0	
Household has drinking water with MDG standards							0.259
No	19.0	149.0	17.2	471.0	17.6	620.0	
Yes	81.0	636.0	82.8	2,261.0	82.4	2,897.0	
Household has floor that it is earth/sand/dung							0.307
No	9.0	71.0	10.3	281.0	10.0	352.0	
Yes	91.0	714.0	89.7	2,451.0	90.0	3,165.0	
Household has wall that it is of low quality materials							0.008
No	51.5	404.0	46.1	1,259.0	47.3	1,663.0	
Yes	48.5	381.0	53.9	1,473.0	52.7	1,854.0	
Household has roof that it is of low quality materials							0.018
No	92.2	724.0	94.5	2,582.0	94.0	3,306.0	

Yes	7.8	61.0	5.5	150.0	6.0	211.0	
Household has cooking fuel by MDG standards							0.028
No	37.6	295.0	41.9	1,146.0	41.0	1,441.0	
Yes	62.4	490.0	58.1	1,586.0	59.0	2,076.0	
Household Asset Ownership: HH has car or more than 1 small assets incl computer							0.834
No	7.1	52.0	6.9	179.0	7.0	231.0	
Yes	92.9	676.0	93.1	2,408.0	93.0	3,084.0	
Television							0.218
0	40.7	296.0	36.5	945.0	37.4	1,241.0	
1 *or more*	59.3	432.0	63.5	1642.0	62.6	2074.0	

Table 5.2 presents the characteristics of respondents from the RaMMPS validation survey alongside their corresponding characteristics in the HDSS. Our findings reveal some differences in respondents' reported attributes between the two data sources, particularly in terms of educational attainment, marital status, and household size. Quite surprisingly, RaMMPS respondents reported lower levels of education, a higher likelihood of being in a union, and residence in larger households compared to what is recorded in the HDSS. Some of these discrepancies could be attributed to the time gap between the last HDSS household visit and the RaMMPS phone interviews. Unlike the HDSS, RaMMPS did not collect information on migration or the timing of events beyond the survival status of relatives. Therefore, it is challenging to determine when household size increased or when a marital union took place.

Table 5.2: Characteristics of respondents from the RaMMPS validation survey alongside their corresponding characteristics in the HDSS

	HDSS	**MPS**	**Freq**	**p-value**
Age group				0.000
15-19 yrs	7.7	7.2	200	
20-24 yrs	17.7	17.4	483	
25-29 yrs	14.3	14.4	401	
30-34 yrs	15.3	17.4	484	
35-39 yrs	17.1	15.7	437	
40-44 yrs	13.5	12.5	346	
45-49 yrs	7.3	6.9	192	

50-54 yrs	3.5	4.1	115	
55-59 yrs	2.0	1.9	52	
60-64 yrs	1.7	1.8	49	
Education				0.000
None	24.1	35.0	972	
Primary	23.9	22.9	636	
Some Secondary	38.9	34.1	946	
Some Tertiary	4.6	8.0	223	
DK	8.6			
Marital status				0.000
Married	62.1	68.6	1,905	
Widowed	1.3	3.0	82	
Divorced	0.7	0.4	11	
separated	0.8	1.0	28	
Never married	35.2	27.0	751	
Relationship				0.000
Head	20.8	25.7	715	
Spouse	35.4	44.8	1,243	
Son/Daughter	29.5	17.9	497	
Brother/Sister	3.1	1.9	52	
Father/Mother	0.3	6.8	190	
Other family	9.7	2.8	19	
Non-family	1.2	0.1	2	
HH size				0.000
Less than 5	36.1	19.2	534	
5-9	51.2	61.3	1,701	
10 and more	12.7	19.5	542	

5.3.4 Results of the record linkage process

For fathers, a total of 714 cases were examined, among which 690 (96.6%) were successfully matched based on the names provided in both data sources (Table 5.3). However, among the matched cases, 24 fathers (3.4%) had names that did not correspond exactly between the two sources. This discrepancy could be attributed to variations in spelling, errors in recall, or differences in the way names were recorded across datasets. Similarly, for mothers, 921 cases were reviewed, and 858 (93.2%) were successfully matched. However, 63 cases (6.8%) presented inconsistencies in the names between the RaMMPS database and the OHDSS database.

Among 1111 children**,** 1021 (91.9%) were successfully matched, while 90 cases (8.1%) did not have a corresponding record. For siblings, the matching rate was lower compared to other groups. Out of **77** recorded siblings**,** only 51 (66.2%) were successfully matched, leaving 26

cases (33.8%) without a direct correspondence. The lower matching rate for siblings is primarily driven by the structure of the HDSS data itself, as only siblings who were ever resident within the HDSS surveillance area can be identified and linked; siblings living outside the HDSS at the time of data collection or who never resided there cannot be matched by design.

Table 5.3: Matching rates across different respondent categories

	Children	**Siblings**	**Fathers**	**Mothers**
Total number	1111	77	714	921
Matched	1021 (91.9)	51 (66.2)	690 (96.6)	858 (93.2)
Not matched	90 (8.1)	26 (33.8)	24 (3.4)	63 (6.8)

5.3.5 Mother's sociodemographic characteristics associated to child omission

Table 5.4 presents the rates of omission of children in birth histories, by comparing children successfully matched between the HDSS and the MPS with those reported only in the HDSS, using row percentages. In this study, "child omission" refers to children born after 2015 who are recorded in the Ouagadougou HDSS but were not reported by their mothers during the MPS. Overall, child omission remains limited, with 8.1% of children reported in the HDSS not found in the MPS. Omission is substantially lower in formal settlements, where only 2.4% of children are omitted, compared with 9.4% in informal settlements ($p<0.001$). Living in formal areas may play an important role in the completeness of child reporting, potentially through higher levels of educational attainment. The proportions of omission are the lowest when interviews are conducted at home (7.6%) and highest when respondents are interviewed in public places (14.6%) or at the office (9.7%) ($p<0000$). The results indicate that interviews held outside the home may be more susceptible to omissions, potentially because of less privacy or time limitations. The child's survival status is associated with omission. Deceased children are significantly more likely to be omitted (21.7%) than living children (5.9%). This observation is regularly made in F2F surveys as well (Helleringer et al., 2020; Nareeba et al., 2021; Sharma et al., 2024). When examining child age at death, omission remain high across ages, particularly at infancy (22.1% at age 0), but no clear monotonic pattern emerges with increasing age at death. While child death is associated with a higher likelihood of omission, the child's age at death does not appear to systematically affect this likelihood. Certain maternal characteristics also correlate with omission: younger mothers tend to have higher omission rates, which decrease as mothers enter middle age, before increasing again among older mothers. Regarding education, omission rates are the highest among mothers with no formal education (9.6%) and

lowest among those with primary (5.6 %) or secondary education (6.4%), with no omission observed among highly educated mothers. Finally, differences by marital status are relatively modest, although higher omission rates are observed among separated and divorced women.

Logistic regression analysis (see Figure 11.9 in the appendix page 351) shows that three key factors are associated with omission errors in MPS: the mother's level of education, marital status, and age group. Educated women were approximately 30% less likely to omit a child compared to those with no formal education (OR = 0.76; 95% CI: 0.66–0.88). Women aged 30 or older were more than three times as likely to omit a child compared to younger women (OR = 3.67; 95% CI: 3.02–4.45). In addition, women who were not married were significantly more likely to omit children than married women (OR = 1.53; 95% CI: 1.15–2.03).

Table 5.4: Maternal characteristics by omission status of children in the MPS

	Matched	**Matched**	**Only HDSS**	**Only HDSS**	**Total**	**Total**	
	%	No.	%	No.	%	No.	
Place of residence							0.001
Formal	97.6	203.0	2.4	5.0	100.0	208.0	
Informal	90.6	815.0	9.4	85.0	100.0	900.0	
Place of response							0.279
Home	92.4	780.0	7.6	64.0	100.0	844.0	
Office	90.3	112.0	9.7	12.0	100.0	124.0	
Public	85.4	35.0	14.6	6.0	100.0	41.0	
Not at home	96.2	78.0	3.8	3.0	100.0	80.0	
Survival status							0.000
Alive	94.1	902.0	5.9	57.0	100.0	959.0	
Died	78.3	119.0	21.7	33.0	100.0	152.0	
Child age at death							0.971
0	77.9	95.0	22.1	27.0	100.0	122.0	
1	85.7	12.0	14.3	2.0	100.0	14.0	
2	75.0	6.0	25.0	2.0	100.0	8.0	
3	66.7	4.0	33.3	2.0	100.0	6.0	
4	100.0	2.0	0.0	0.0	100.0	2.0	
Mother age group							0.195
15-19	66.7	2.0	33.3	1.0	100.0	3.0	
20-24	91.8	78.0	8.2	7.0	100.0	85.0	

25-29	94.0	235.0	6.0	15.0	100.0	250.0	
30-34	93.4	323.0	6.6	23.0	100.0	346.0	
35-39	89.6	241.0	10.4	28.0	100.0	269.0	
40-44	90.7	117.0	9.3	12.0	100.0	129.0	
45-49	85.7	24.0	14.3	4.0	100.0	28.0	
Mother education							0.132
None	90.4	517.0	9.6	55.0	100.0	572.0	
Primary	94.4	271.0	5.6	16.0	100.0	287.0	
Secondary	93.6	205.0	6.4	14.0	100.0	219.0	
High	100.0	12.0	0.0	0.0	100.0	12.0	
Mother marital status							0.338
Married	92.4	966.0	7.6	79.0	100.0	1,045.0	
Widowed	90.0	9.0	10.0	1.0	100.0	10.0	
Divorced	85.7	6.0	14.3	1.0	100.0	7.0	
Separete	71.4	5.0	28.6	2.0	100.0	7.0	
Single	90.5	19.0	9.5	2.0	100.0	21.0	
Total	91,9	1021	8,1	90	100.0	1111	

5.3.6 Sensitivity and specificity in recording events

Table 5.5 presents the sensitivity and specificity of summary questions regarding reported deaths. The objective at this stage is to assess the consistency between death information recorded in the sample and that reported through the phone survey, without any limitations in terms of period of occurrence of the death. Sensitivity is defined here as the proportion of individuals who lost a child, sibling or parent according to the HDSS sample and also reported the loss in the MPS. More specifically, the aim here is to assess the completeness of responses to the following questions during the mobile phone interviews:

(i) *Is your biological mother (father) still alive?* (ii) *Do you have any sisters or brothers who are no longer alive because they have passed away?* (iii) *Have you ever given birth to a live-born child who subsequently died before reaching five years of age?*

Overall, sensitivity remains high across most categories, exceeding 85% for under-5 deaths, sibling deaths, and parental deaths. In contrast, specificity shows greater variability across types of relatives, with lower values for sibling deaths (58.6%). Among parents, specificity is higher for maternal deaths (91.3%) than for paternal deaths (74.2%). Disaggregation by

respondent characteristics shows systematic differentials in reporting accuracy. Men display higher specificity than women in reporting paternal deaths (80.1% versus 71.3%), while sensitivity remains comparable. Across age groups, both sensitivity and specificity are highest among younger respondents (18–19 years), particularly for under-5 and parental deaths, and decline progressively with respondent age, most markedly for specificity in sibling death reporting. Among respondents aged 45 years and older, specificity for sibling deaths falls below 25%, while sensitivity remains close to 100%. Respondents with some tertiary education show the highest specificity, notably for under-5 deaths (93.3%) and parental deaths, whereas respondents with no education present lower specificity, especially for sibling deaths (31.3%). Sensitivity remains high across education groups, with less pronounced variation than specificity. By place of residence, respondents living in formal areas show higher specificity across all categories compared to those in informal settlements, particularly for sibling and paternal deaths, while sensitivity remains similar between the two groups. The lower specificity observed for some types of deaths should be interpreted with caution, as it may partly reflect incompleteness in the OHDSS records rather than inaccurate reporting in the mobile phone survey. In particular, deaths that occurred after the last update of the OHDSS or that were not captured by the surveillance system may have been classified as false positives in the validation analysis.

Table 5.5: Sensitivity and specificity in the reporting of relative deaths, by selected respondent characteristics

	Under 5 deaths		**Sibling deaths**		**Parental deaths**			
					Father		**Mother**	
	Sensitivity	**Specificity**	**Sensitivity**	**Specificity**	**Sensitivity**	**Specificity**	**Sensitivity**	**Specificity**
Overall	**93.2**	**76.8**	**89.6**	**58.6**	**87.48**	**74.17**	**75.74**	**91.30**
Gender								
Male	-	-	87.5	43.2	90.3	80.1	80.6	92.8
Female	-	-	93.3	39.4	86.1	71.3	73.2	90.6
Age group								
18-19	100.0	95.24	94.1	61.0	75.6	93.4	66.7	96.6
20-24	91.3	87.0	87.9	53.3	81.1	88.0	68.3	95.3
25-29	93.3	83.2	57.1	41.2	89.5	75.3	71.6	94.8
30-34	96.2	78.6	100.0	37.6	88.5	71.2	72.9	88.5
35-39	90.0	72.9	100.0	30.6	92.9	54.8	81.75	89.7
40-44	95.9	59.6	100.0	26.0	92.0	53.3	76.5	85.5
45-49	88.9	45.0	100.0	23.7	92.9	40.0	80.6	77.5

50-54	-	-	100.0	19.2	100.0	42.9	88.2	68.4
55-59	-	-	100.0	17.8	97.3	12.5	89.7	64.7
60-64	-	-	-	-	_	100.0	100.0	16.7
Education								
None	96.0	69.7	80.0	31.3	90.4	57.2	72.8	88.6
Primary	89.7	77.1	92.0	33.6	87.9	71.9	76.4	87.0
Some Secondary	93.5	84.0	92.1	51.3	85.0	83.9	77.9	94.5
Secondary Completed	100.0	80.9	71.4	38.2	86.8	78.6	72.7	93.2
Some Tertiary	100.0	93.3	81.8	55.3	92.6	81.8	76.2	96.4
DK	100.0	80.0	100.0	37.9	85.3	76.9	76.6	93.0
Place of residece								
Formal	89.8	81.8	87.5	45.4	86.8	80.5	79.3	92.6
Informal	94.2	74.9	92.5	37.8	87.9	70.6	73.6	90.5

5.3.7 Specificity and sensitivity in reporting summary birth histories between MPS and HDSS

Table 5.6 presents the sensitivity and specificity of reported child deaths across respondent characteristics, including age, education level, place of residence, marital status, and survey location. The analysis assesses the extent to which women of reproductive age reported child deaths during the mobile phone interviews that correspond to information recorded in the OHDSS. Sensitivity is defined as the proportion of women who experienced the death of a child under five according to the HDSS records and who also reported such a death during the mobile phone interview. Specificity is the proportion of women for whom no under-five child death is recorded in the HDSS and who also reported no such death in the mobile phone survey. This assessment does not distinguish deaths according to their timing or the age of the child at death. The information collected through this question, together with the reported numbers of children ever born and surviving children, is used to construct indirect estimates of child mortality.

The results show very high sensitivity (99.46%), indicating that almost all child deaths recorded in the HDSS were also reported in the mobile phone survey. Specificity is lower (79.43%). However, this result should be interpreted with caution. A positive report of a child death in the mobile phone survey when no corresponding death appears in the HDSS records does not necessarily indicate a false positive. The OHDSS may provide less complete information for older reproductive histories, particularly for births and deaths that occurred before the longitudinal follow-up of women and their children in the surveillance area. Some deaths reported by respondents may therefore not be present in the HDSS records used as the reference.

The observed specificity may consequently reflect both reporting differences in the mobile phone survey and incompleteness of the HDSS reference data.

Specificity also varies across respondent age groups. Among the youngest respondents (18–19 years), specificity reaches 100%, whereas it falls substantially among older respondents, with a value of 0% among respondents aged 45–49 years. This pattern should not be interpreted solely as evidence that older women have greater difficulty recalling the deaths of their children. One possible explanation is that the children of younger mothers are more likely to have been born and followed within the OHDSS period, whereas some births and deaths reported by older mothers may have occurred before the longitudinal follow-up began. The completeness of the reference information may therefore differ according to respondent age. The observed age gradient may thus reflect, at least in part, differences in the coverage of reproductive histories in the HDSS rather than differences in respondents' reporting accuracy alone. The available data do not allow us to disentangle these two mechanisms.

Specificity is higher among respondents with higher education (94.12%) than among those with no education (45.21%). Although differences in reporting accuracy may contribute to this pattern, the results should also be interpreted in light of possible differences in the completeness of the HDSS records across respondent characteristics. We therefore do not interpret the association between education and specificity as evidence of a direct effect of education on the accuracy of mortality reporting.

Specificity is higher among respondents living in formal settlements (82.80%) than among those living in informal settlements (75.70%), while sensitivity remains high in both groups. Single respondents have the highest specificity (93.60%), whereas respondents who are widowed, divorced, or separated have the lowest (16.67%). These differences may reflect differences in the completeness of the OHDSS records across population groups, as well as differences in reporting. In particular, respondent characteristics may be associated with residence, migration histories, or the period during which individuals and their children entered the surveillance system. The observed differences in specificity should therefore not be interpreted solely as differences in the quality of respondents' reports.

Finally, specificity varies somewhat according to the location from which the respondent answered the survey, while sensitivity remains at 100% across all locations. Specificity is highest among respondents interviewed at home (80.05%) and lowest among those interviewed

in an office setting (74.26%). These differences should be interpreted cautiously. The location of the interview may be correlated with respondent characteristics, place of residence, or other factors that also affect the completeness of OHDSS records. It is therefore not possible from these results to conclude that the interview setting itself affected reporting accuracy. Rather, the observed variation may partly reflect differences in the characteristics and coverage of the populations represented across survey locations.

Table 5.6: Sensitivity and specificity of reported child deaths across different respondent characteristics

	Sensitivity	Specificity
Total	99.46	79.43
Age group		
18-19	50.0	100.00
20-24	97.01	91.01
25-29	99.47	76.40
30-34	99.66	45.16
35-39	100.00	26.92
40-44	100.00	29.17
45-49	98.86	0.00
Education		
None	99.47	45.21
Primary	99.66	67.44
Secondary	99.13	85.46
Higher	100.00	94.12
Place of residence		
Formal	99.27	82.80
Informal	99.52	75.70
Marital status		
Married	99.70	57.82
Wid/div/sep	100.00	16.67
Single	92.68	93.60
Survey place		
Home	100.00	80.05
Office	100.00	74.26
Others	100.00	82.72

5.3.8 Specificity and sensitivity in reporting parental survival histories between MPS and HDSS

Table 5.7 reports the sensitivity and specificity of parental death reporting for cases in which record linkage was successfully achieved. Overall, sensitivity in reporting parental deaths is

high, with variation by the sex of the deceased parent. Sensitivity is higher for fathers (82.5%) than for mothers (71.9%). By contrast, specificity is higher for mothers (84.7%) than for fathers (58.8%), indicating more accurate identification of surviving mothers than surviving fathers. These differences are consistent with gender-related patterns in family structure and residence, including differential parental presence and child fostering arrangements.

Table 5.7: Sensitivity and specificity of parental death reporting (matched cases)

	HDSS	MPS	
		Yes	No
Father	Yes	58.80	41.20
	No	17.45	82.55
Mother	Yes	84.69	15.31
	No	28.07	71.93

5.3.9 Accuracy on reporting summary information

5.3.9.1 Accuracy on reporting truncated birth histories in MPS

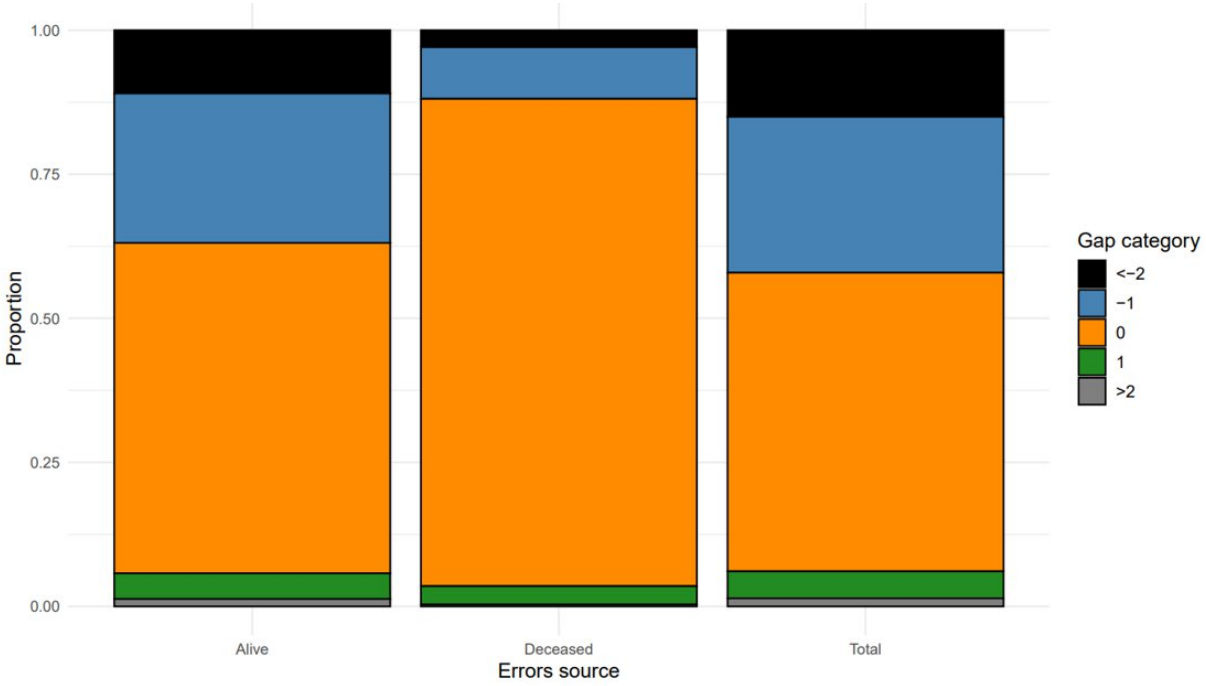
In this section, we assess the accuracy of respondents' reports on their birth history. In large-scale national surveys, women who report having had children are typically asked to provide a summary of their total number of children, specifying whether they are alive or deceased, and disaggregated by sex. These data are later used in indirect mortality estimation techniques to calculate under-five mortality rates. This section aims to evaluate the accuracy of such reports in the RaMMPS validation survey compared to HDSS records.

Figure 5.4 below presents the differences in the total number of children (alive or deceased) reported by women in the HDSS and RaMMPS validation surveys. These differences are categorized into three groups: no difference, a difference of one child, and a difference of two or more children. Negative values indicate cases where women reported more children in the RaMMPS validation survey than in the HDSS.

Overall, the results indicate high consistency across sources. However, we also observe that women tend to report a higher number of total children in RaMMPS validation survey compared to the HDSS, both for living and deceased children. It is important to note, however, that women interviewed by phone may have had additional births after the HDSS fieldworkers conducted their F2F interviews. As a result, some discrepancies between the two data sources may reflect

real changes in parity rather than reporting errors. These discrepancies vary according to respondents' sociodemographic characteristics.

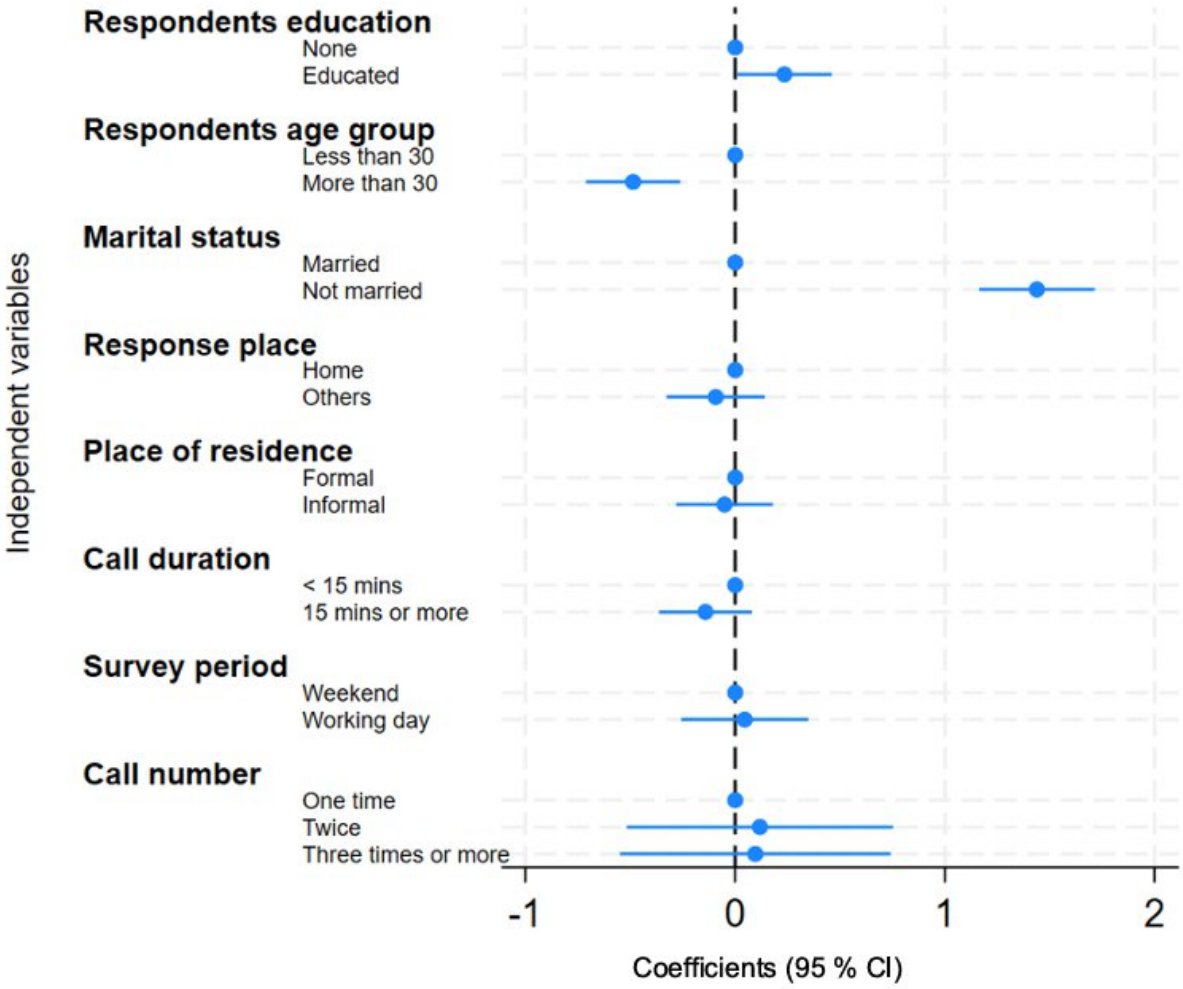
Figure 5.4: Proportions of gap on total number of children, alive and deceased



The multivariable analysis presented in Figure 5.5 below identifies the factors associated with differences in reporting the total number of children ever born, as captured in the SBH questions. The model includes a set of sociodemographic and contextual variables, and results are expressed as log-odds with 95% confidence intervals. Women with formal education were significantly less likely to omit a child in their reporting (OR = 1.26; 95% CI: 1.01–1.58; $p < 0.05$). Women over 30 were more likely to omit a child compared to younger women (OR = 0.61; 95% CI: 0.49–0.76; $p < 0.001$). This trend may indicate increased recall bias associated with the time elapsed since a child's birth or death, particularly in cases of early-life deaths. Conversely, unmarried women were found to be much less likely to omit a child (OR = 4.21; 95% CI: 3.19–5.55; $p < 0.001$). Other factors, such as interview location, day of the interview (weekday vs. weekend), interview duration, and number of call attempts, did not show statistical significance.

The results of the comparative analysis presented in Figure 11.12 in the appendix on page 353 show that age group of respondents is a significant factor contributing to the overestimation of the total number of children in the MPS.

Figure 5.5: Coefficients of a logistic regression identifying factors associated with accurate reporting of children ever born in SBH module



5.3.9.2 Accuracy on reporting summary sibling survival histories in the MPS

Table 5.8, Table 5.9 and Table 5.10 document the discrepancies between the MPS and HDSS reports on sibling survival, disaggregated by respondent characteristics. Table 5.8 compares the total number of siblings reported from the same biological mother, Table 5.9 focuses on the number of deceased siblings, and Table 5.10 summarizes misreporting of total and recent sibling deaths by age and gender.

In Table 5.8, agreement between MPS and HDSS reports (difference equal to ±1 sibling) is observed for 60.5% of respondents, while 35.5% report fewer siblings in MPS than in HDSS by more than one sibling, and 4.0% report more siblings in MPS than in HDSS. Discrepancies increase with respondent age. Among respondents aged 15–19 years, 19.2% underreport siblings by more than two in MPS relative to HDSS, compared to 59.4% among those aged

35–39 years and over 80% among respondents aged 45 years and older (82.6% at ages 45–49; 85.7% at ages 50–54; 100% at ages 55–59). Correspondingly, agreement declines from 76.3% at ages 15–19 to 17.4% at ages 45–49. In terms of education, underreporting by more than two siblings reaches 71.3% among respondents with no education, compared to 42.0% among those with primary education, 32.1% among those with secondary education, and 18.9% among respondents with higher education. Agreement increases monotonically with education, from 26.4% among those with no education to 75.5% among respondents with higher education. Women report higher agreement than men (65.4% vs 55.0%), while underreporting of more than two siblings affects 42.3% of men and 29.5% of women. Differences by place of residence are more modest, with underreporting affecting 37.1% of respondents in formal areas and 32.9% in informal areas. Variation by interview location remains limited, with underreporting ranging from 26.0% in public places to 50.0% in traffic settings, although sample sizes in some categories are small.

In Table 5.9, overall, 84.3% of respondents report agreement (difference equal to ±1 sibling), while 14.9% underreport deceased siblings by more than two, and less than 1% overreport deaths. Underreporting of deceased siblings increases from 7.1% at ages 15–19 to 26.6% at ages 35–39, and exceeds 35% among respondents aged 40 years and older (36.1% at ages 40–44; 39.1% at ages 45–49; 66.7% at ages 55–59). Likewise, agreement declines from above 90% among respondents under 25 years to 33.3% among those aged 55–59. Educational differentials are again substantial. Underreporting affects 35.6% of respondents with no education, compared to 19.6% among those with primary education, 11.7% among those with secondary education, and 8.4% among respondents with higher education. Agreement ranges from 62.1% among respondents with no education to over 90% among those with higher education. Differences by sex are limited: agreement reaches 85.6% among women compared to 82.8% among men. Respondents living in informal areas show higher agreement (89.1%) than those in formal areas (81.4%). Variations by interview location are small, with agreement ranging from 82.0% to 87.5% across settings.

Table 5.10 summarizes misreporting for total and recent sibling deaths. For total sibling deaths, correct reporting reaches 86.3% overall, with higher accuracy among female respondents aged 15–49 years (83.9%) compared to other respondents (88.2%). For recent sibling deaths, agreement is lower overall (62.9%), with similar levels observed among women aged 15–49 years (65.0%) and other respondents (62.0%).

Table 5.8: Discrepancies in the total number of siblings from the same biological mother between MPS and HDSS, by respondent characteristics

(HDSS-MPS)	**- [>2]**	**[1-1]**	**[>2]**	**Total**
	%	%	%	
Age group				
15-19 yrs	19.2	76.3	4.5	156
20-24 yrs	28.2	66.8	5.0	301
25-29 yrs	32.1	64.8	3.1	159
30-34 yrs	36.4	56.6	7.1	99
35-39 yrs	59.4	40.6	0.0	64
40-44 yrs	75.0	25.0	0.0	36
45-49 yrs	82.6	17.4	0.0	23
50-54 yrs	85.7	14.3	0.0	7
55-59 yrs	100.0	0.0	0.0	9
60-64 yrs	80.0	20.0	0.0	5
Women				
No	42.3	54.6	3.1	416
Yes	29.1	66.1	4.7	443
Sex				
Men	42.3	55.0	2.7	402
Women	29.5	65.4	5.0	457
Place of residence				
Formal	37.1	58.7	4.3	537
Informal	32.9	63.7	3.4	322
Education				
None	71.3	26.4	2.3	87
Primary	42.0	53.8	4.2	143
Secondary	32.1	64.2	3.7	486
Tertiary	18.9	75.5	5.6	143
Interview place				
Home	34.8	60.6	4.6	500
Office	38.7	58.2	3.1	225
Public place	26.0	70.0	4.0	50
Traffic	50.0	50.0	0.0	8
Others	35.5	61.8	2.6	76
Total	35.5	60.5	4.0	859

Table 5.9: Discrepancies in the total number of deceased siblings from the same biological mother between MPS and HDSS, by respondent characteristics

(HDSS-MPS)	**-[>2]**	**[1-1]**	**[>2]**	**Total**
	%	%	%	
Age group				
15-19 yrs	7.1	91.7	1.3	156
20-24 yrs	10.3	89.0	0.7	301
25-29 yrs	11.9	88.1	0.0	159
30-34 yrs	16.2	80.8	3.0	99
35-39 yrs	26.6	73.4	0.0	64
40-44 yrs	36.1	63.9	0.0	36
45-49 yrs	39.1	60.9	0.0	23
50-54 yrs	42.9	57.1	0.0	7
55-59 yrs	66.7	33.3	0.0	9
60-64 yrs	60.0	40.0	0.0	5
Women				
No	16.8	82.2	1.0	416
Yes	13.1	86.2	0.7	443
Sex				
Men	16.2	82.8	1.0	402
Women	13.8	85.6	0.7	457
Place of residence				
Formal	17.9	81.4	0.7	537
Informal	9.9	89.1	0.9	322
Education				
None	35.6	62.1	2.3	87
Primary	19.6	79.7	0.7	143
Secondary	11.7	87.7	0.6	486
Tertiary	8.4	90.9	0.7	143
Interview place				
Home	15.0	84.0	1.0	500
Office	13.8	85.8	0.4	225
Public place	16.0	82.0	2.0	50
Traffic	12.5	87.5	0.0	8
Others	17.1	82.9	0.0	76
Total	14.9	84.3	0.8	859

Table 5.10: Misreporting of total and recent sibling deaths between MPS and HDSS, by respondent age and gender

	Others	**F-15-49**	**Total**
Total death	88.18	83.91	86.29
Recents death	62.00	65.00	62.86

5.3.10 Source of errors in vitals events

5.3.10.1 Inaccuracies in the reporting of detailed ages, birth and death dates for children, siblings and parents

5.3.10.1.1 For children

Figure 5.6 presents scatter plots of children's ages as reported by their mothers during the RaMMPS validation survey and the HDSS database, along with the correlation coefficient between the two variables. These results are displayed separately for surviving and deceased children. We find a very strong correlation ($r > 0.90$) of age reported between the two data sources, regardless of child survival status.

Figure 5.7 illustrates the accuracy of reported birth months, years, or both across the two survey methods. Overall, dates of birth, including both months and years, are reported with good accuracy in both modes of data collection. When discrepancies in date precision occur, they rarely exceed one year. In addition, underestimation and overestimation occur in similar proportions, which suggests the presence of random reporting errors rather than systematic biases in date reporting.

Figure 5.6: Correlation of children's current age and age at death between HDSS and MPS

Alive **Deceased**

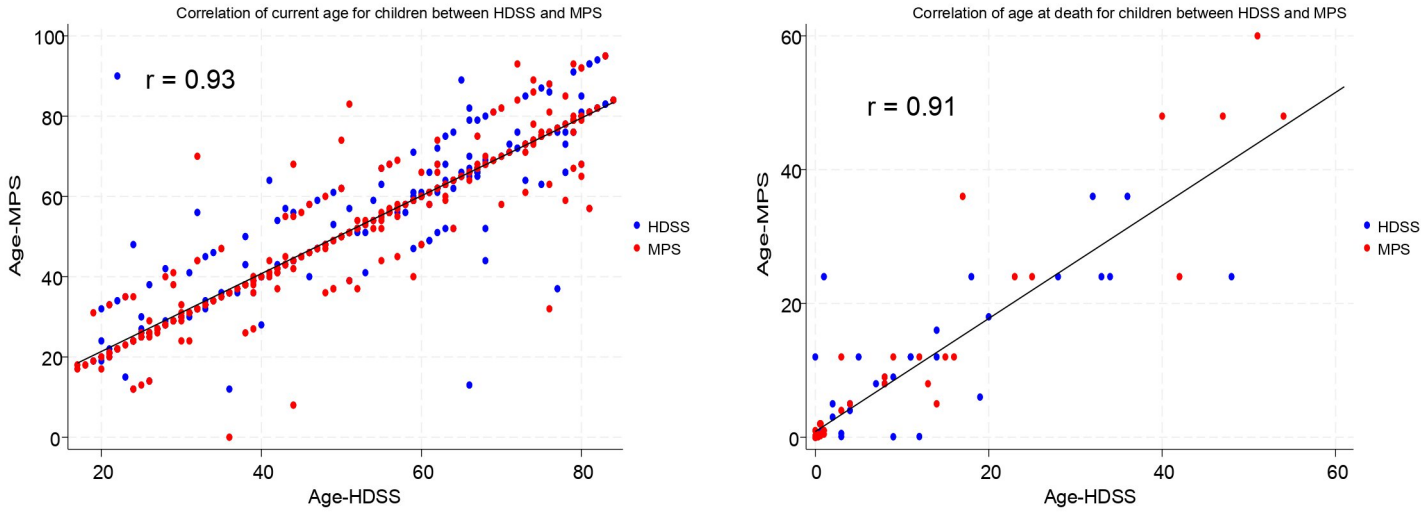
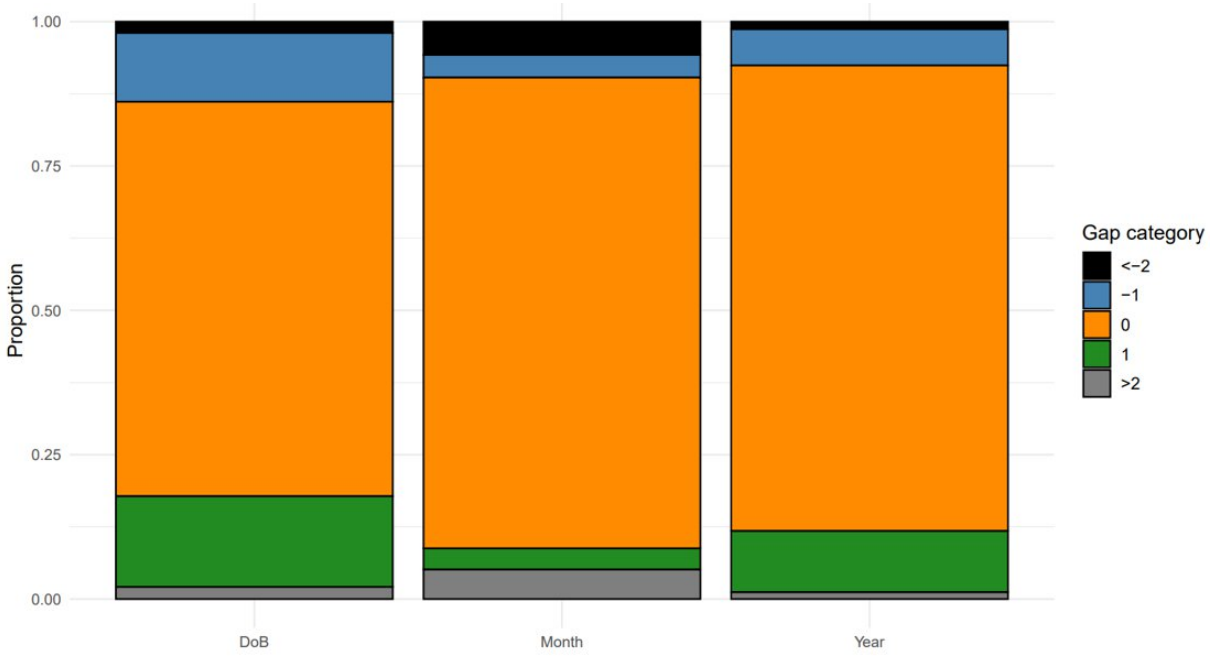


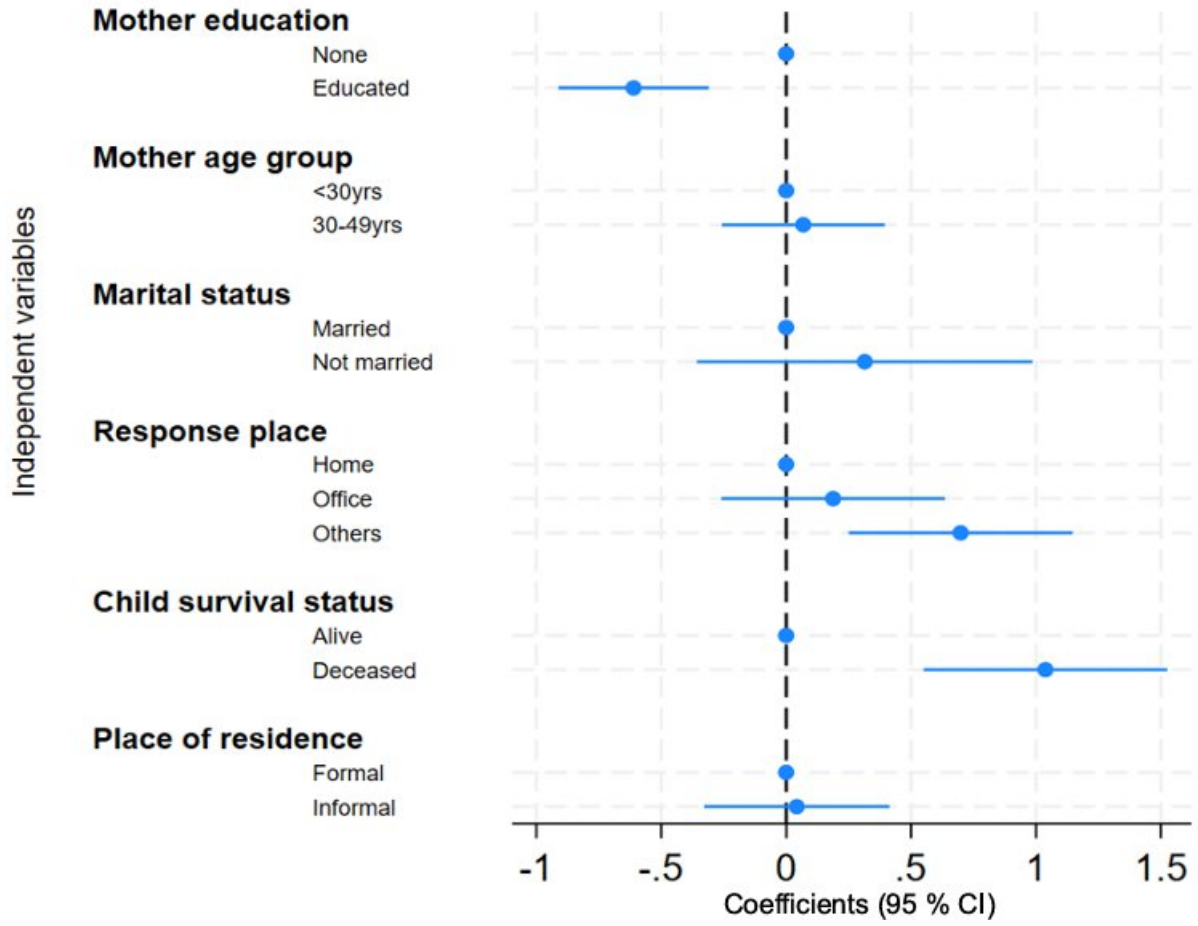
Figure 5.7: Accuracy of birth date reporting in MPS for children



The logistic regression results presented in Figure 5.8 quantify associations between selected covariates and the displacement of reported dates of birth. Statistically significant associations are observed for education level, child survival status, and interview location. Respondents with formal education have lower odds of date displacement than those without formal education (OR = 0.54; 95% CI: 0.40–0.73; $p < 0.001$). In contrast, reports concerning deceased children are associated with higher odds of date displacement relative to reports concerning living children (OR = 2.83; 95% CI: 1.73–4.58; $p < 0.001$). Interviews conducted in locations classified as "other" show higher odds of displacement compared to interviews conducted at home or in office settings (OR = 2.01; 95% CI: 1.28–3.16; $p < 0.01$). No statistically significant associations are observed for other covariates included in the model, including respondent age, marital status, and interview place, as their confidence intervals include unity.

Analyses presented in Figure 11.13 and Figure 11.14 in appendix page 354 do not identify statistically significant associations for the displacement of reported dates of death, or for the combined reporting of dates of birth and death, which is consistent with the limited statistical power associated with smaller sample sizes in these subsamples.

Figure 5.8: Coefficients from logistic regression: factors associated with any displacement in child DoB



Accuracy of parental ages and ages at death are examined in Figure 5.9, Figure 5.10, Figure 5.11, Figure 5.12 and Figure 5.13 where scatterplots and correlation coefficients comparing parental ages (both current and at death) as recorded in the HDSS and the MPS are presented. The analysis is stratified by the respondent's gender and, in the case of deceased parents, by the time elapsed since death.

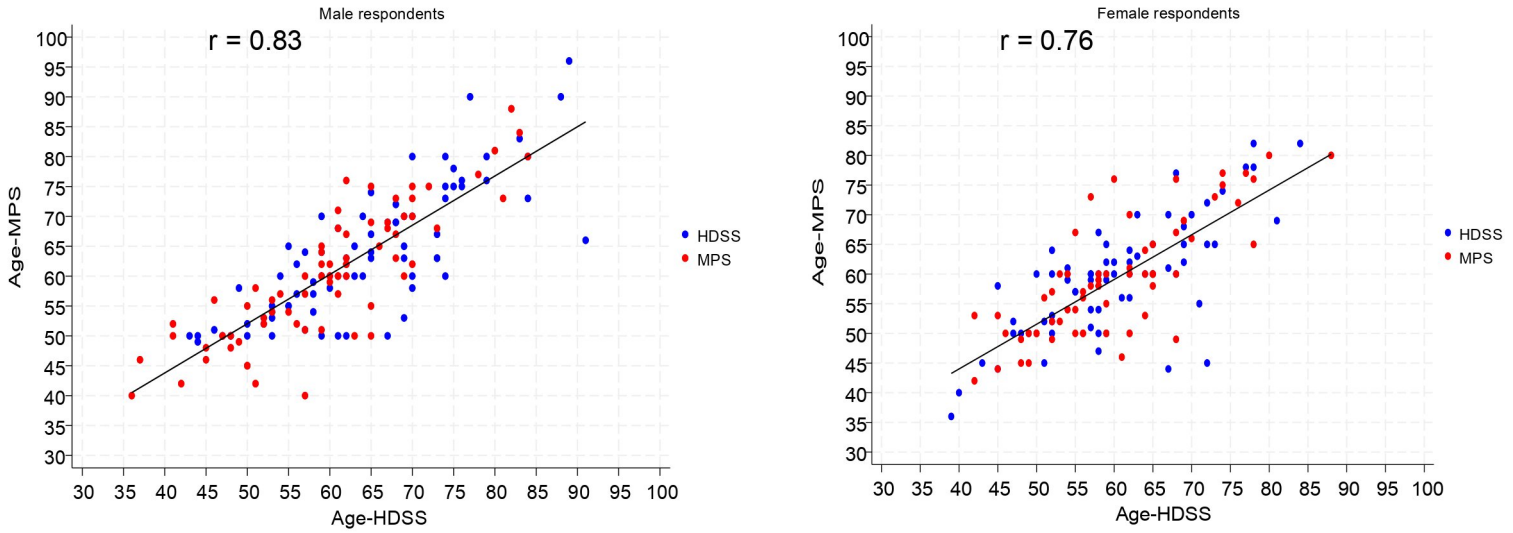
Figure 5.9 shows the correlation between the reported current ages of fathers and mothers in both data sources, distinguishing responses from male and female respondents (Figure 5.10). Overall, the correlations indicate a strong alignment between MPS and HDSS data (r=0.80 for fathers and 0.83 for mothers). However, some variability is observed, particularly among female respondents, who tend to report parental ages with greater dispersion (r=0.83 for mother's vs 0.76 for fathers, while the reverse is true for male respondents: 0.83 for father's vs 0.79 for mothers).

The second set of figures (Figure 5.11, Figure 5.12 and Figure 5.13) explore the correlation between parents' ages at death, comparing MPS and HDSS data. While the overall correlation remains high (0.73 for father's vs 0.84 for mother's), discrepancies emerge, particularly for mothers. Male respondents tend to report fathers' ages at death with greater (r=78) accuracy than female respondents (r=0.65), same trend is observed for mothers' ages at death, with female respondents providing less consistent estimates (r=0.92 for male respondent's vs r=0.55 for female).

The final set of figures (Figure 5.13) investigates the correlation between parental ages at death as a function of time elapsed since death. As expected, the correlation weakens as the time since death increases (varing from r=0.80 to r=0.57 for fathers, and from 0.90 to 0.69 for mothers), indicating higher recall errors for deaths that occurred further in the past. This effect is more pronounced for mothers though few observations, suggesting that maternal ages at death may be more prone to misreporting over time. The decline in correlation is also noticeable among male respondents.

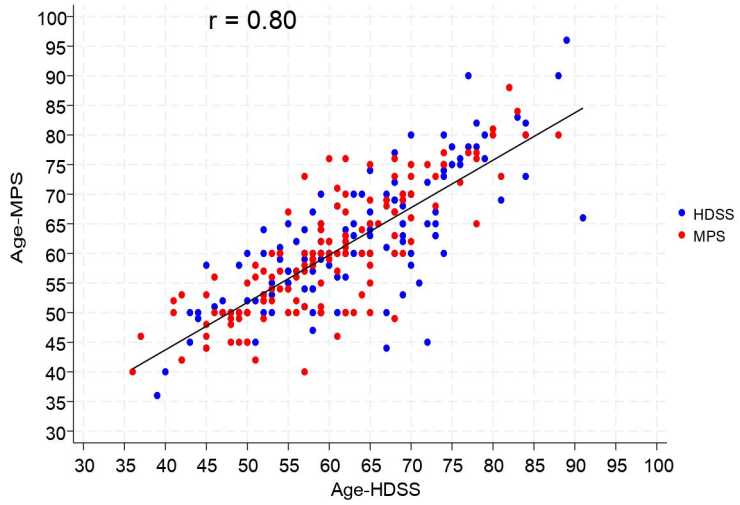
Figure 5.9: Correlation of paternal or maternal current age between HDSS and MPS

Father



Mother

Father



Mother

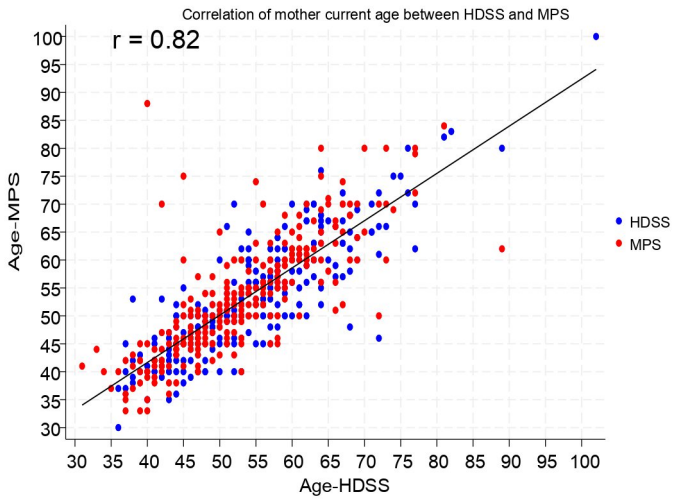


Figure 5.10: Correlation of maternal or paternal current age between HDSS and MPS by sex of respondents

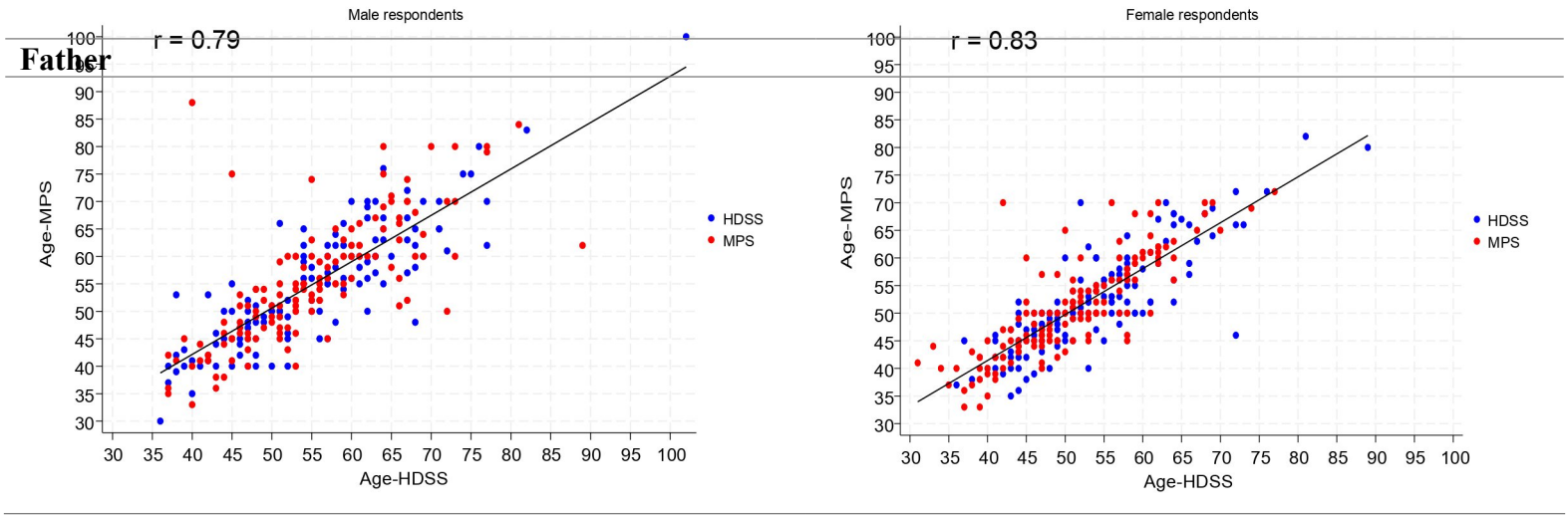


Figure 5.11: Correlation of father and mother age at death between HDSS and MPS

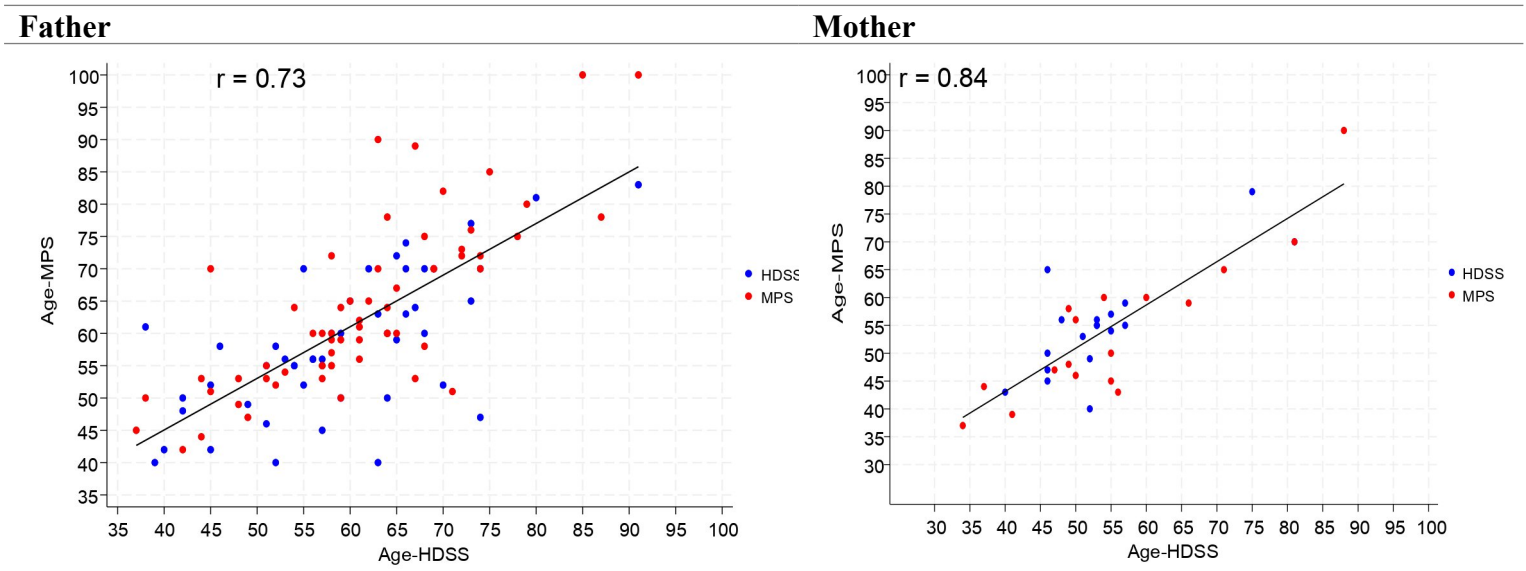
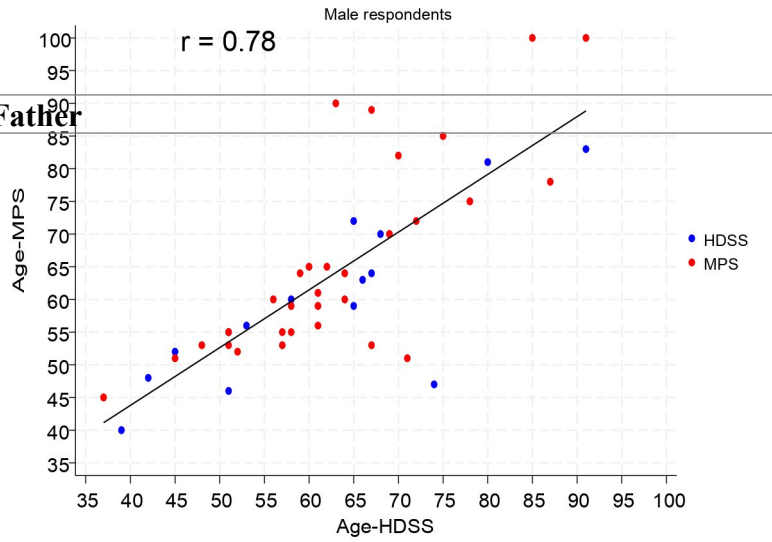
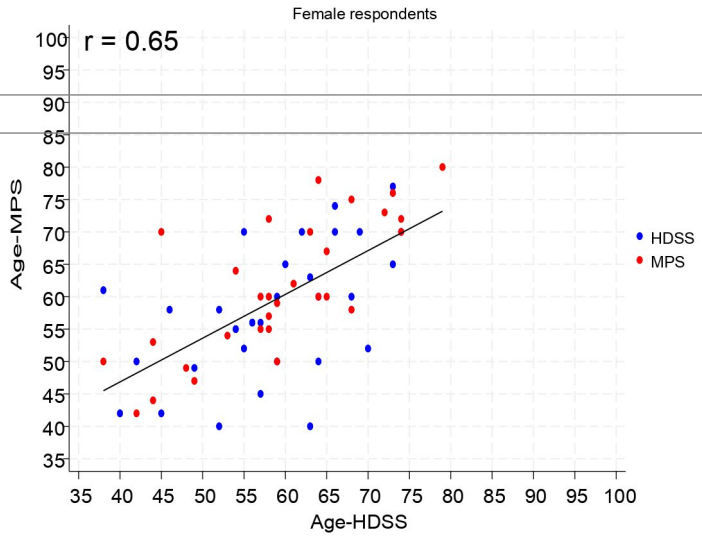


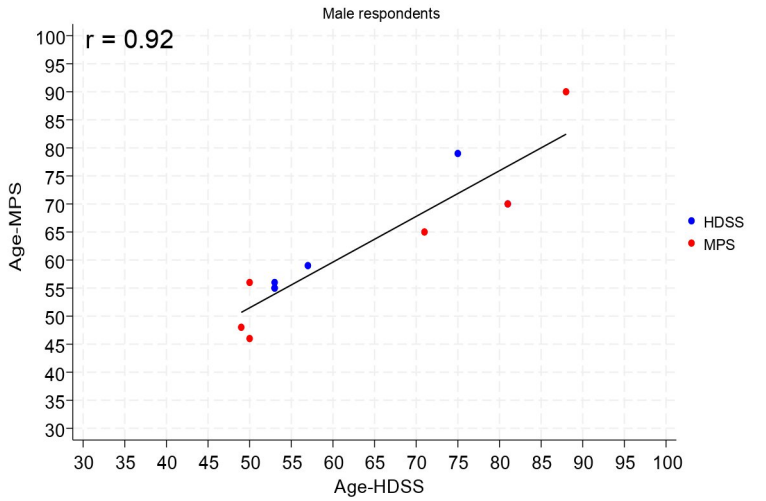
Figure 5.12: Correlation of father or mother age at death between HDSS and MPS by sex of respondents

Father





Mother



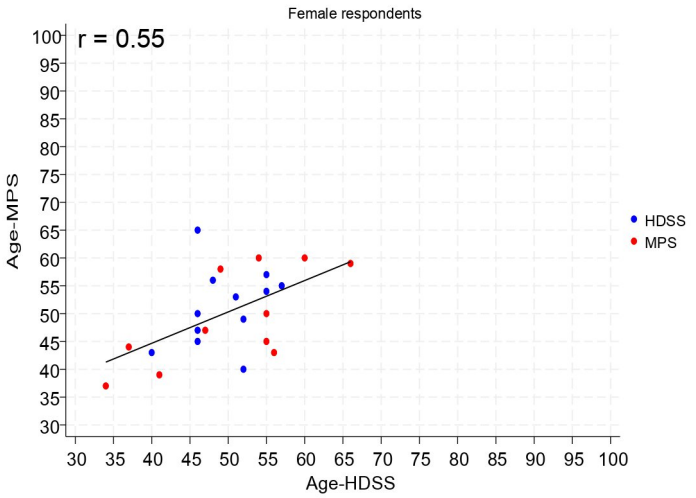
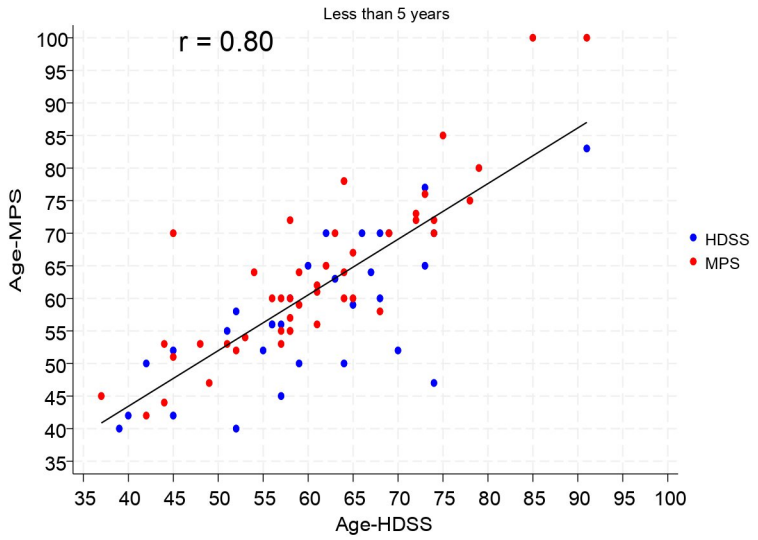
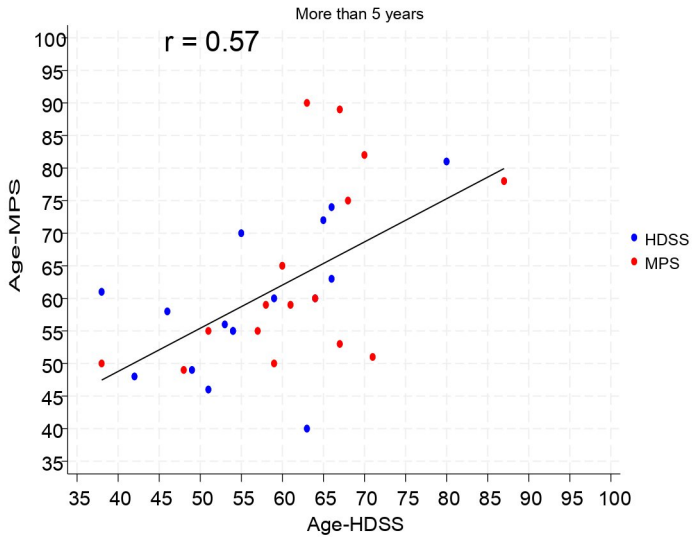
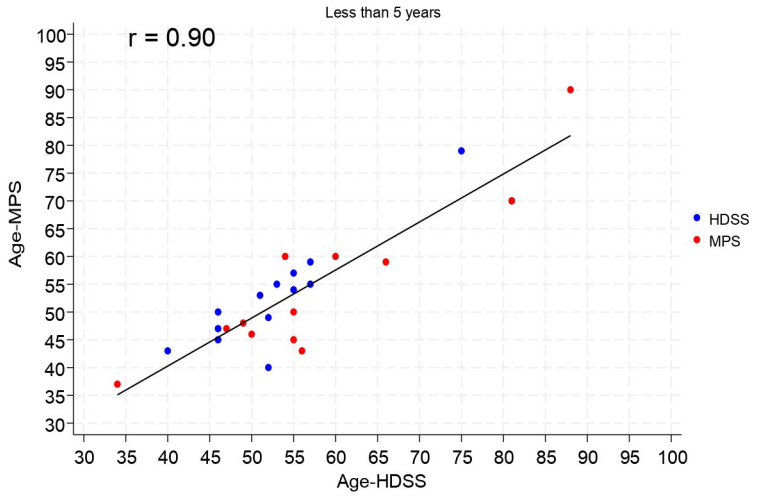


Figure 5.13: Correlation of paternal and maternal age at death between HDSS and MPS by time since death of parents


Less than 5 years
r = 0.80
Age-MPS
Age-HDSS
HDSS
MPS


More than 5 years
r = 0.57
Age-MPS
Age-HDSS
HDSS
MPS

Mother


Less than 5 years
r = 0.90
Age-MPS
Age-HDSS
HDSS
MPS

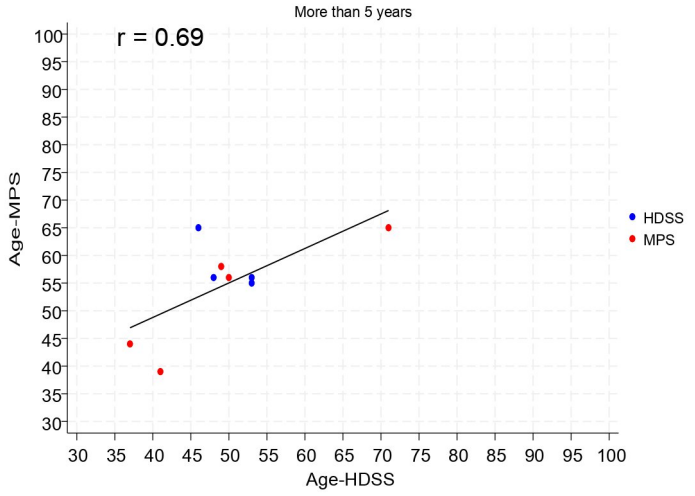

More than 5 years
r = 0.69
Age-MPS
Age-HDSS
HDSS
MPS

Figure 5.14 presents the proportion of discrepancies in the reported month, year, and complete date of parental death between MPS data and F2F HDSS interviews, disaggregated by the sex of the deceased parent. Discrepancies differ across the components of the date (months, years and full date). Across all components, the proportion of discrepancies is higher for maternal deaths than for paternal deaths. This pattern holds for discrepancies in the reported month, year, and full date of death.

Figure 5.14: Proportions of gap in date, year and month of death by gender of parents

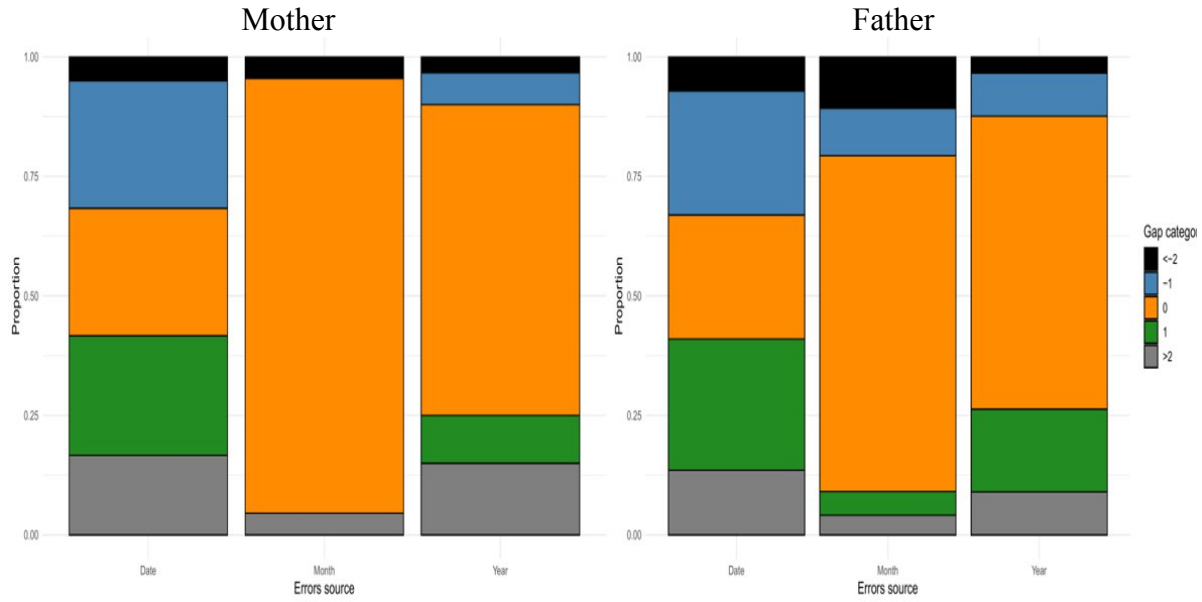


Figure 5.15 displays the distribution of discrepancies in the reported year of parental death between MPS and HDSS data, stratified by time elapsed since death and grouped into three categories: early reporting (more than one year earlier than the HDSS date), accurate reporting (within ±1 year), and late reporting (more than one year later). For deaths occurring within the last five years, accurate reporting exceeds 75% for both fathers and mothers. When the death occurred more than six years prior to the survey, the proportion of accurate reports declines to approximately 72% for fathers and only 64% for mothers.

Late reporting increases with the length of time since death, with higher proportions observed for maternal deaths than for paternal deaths in older time intervals. Early reporting remains uncommon across all periods but is more frequent for deaths occurring more than six years prior, reaching 7.7% for paternal deaths.

Figure 5.15: Distribution of year-of-death reporting errors in the MPS by time since death (HDSS reference)

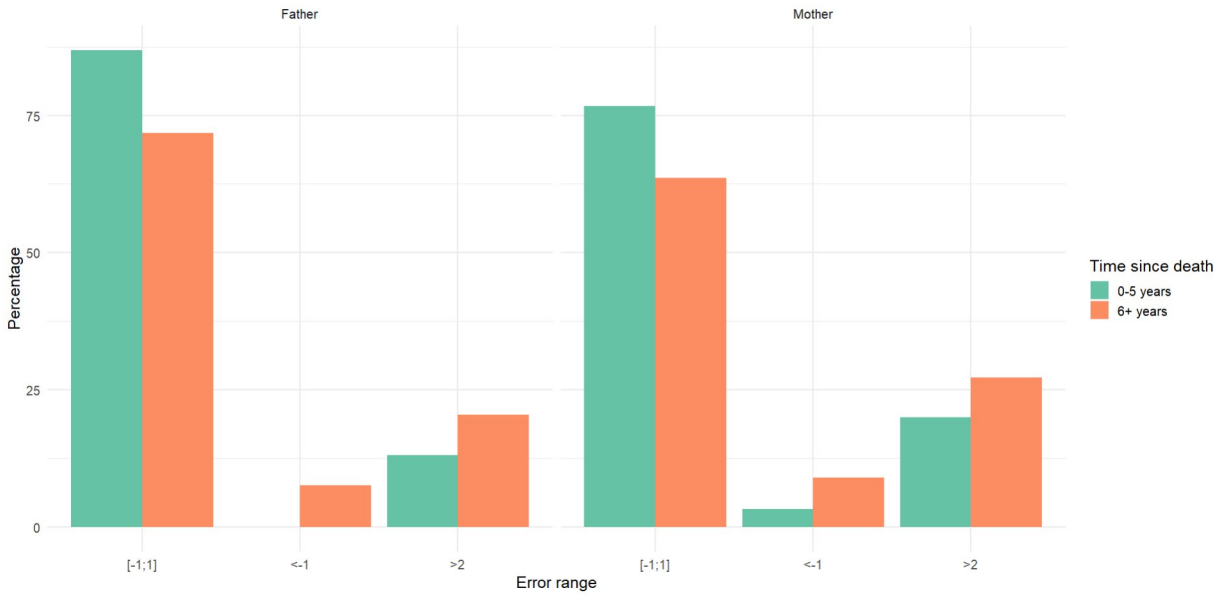


Figure 5.16 presents the results of a logistic regression examining associations between selected individual-level characteristics and the misreporting of parental age at death in the MPS. The outcome variable captures the presence of a displacement in the reported age at death of the father and/or the mother.

Across all covariates included in the model, no statistically significant associations are observed at conventional significance levels (5%). For respondents aged over 30 years, the estimated coefficient is positive (b = 0.64), with a 95% confidence interval ranging from −1.16 to 2.44, which includes zero. Being unmarried is associated with a positive coefficient (b = 0.87), with a 95% confidence interval of −0.28 to 2.02. Other variables included in the model—such as interview context, employment sector, and interview timing—do not display statistically significant associations with misreporting of parental age at death, as their estimated coefficients are small and their confidence intervals include zero. Results remain consistent when models are estimated separately by the sex of the deceased parent (Figure 11.15, Appendix page 355).

Overall, within the limits of the sample size (n = 140), the regression results do not identify covariates that are statistically associated with displacement in reported parental age at death.

Figure 5.16: Coefficients from logistic regression: factors associated with any displacement in parent's age at death

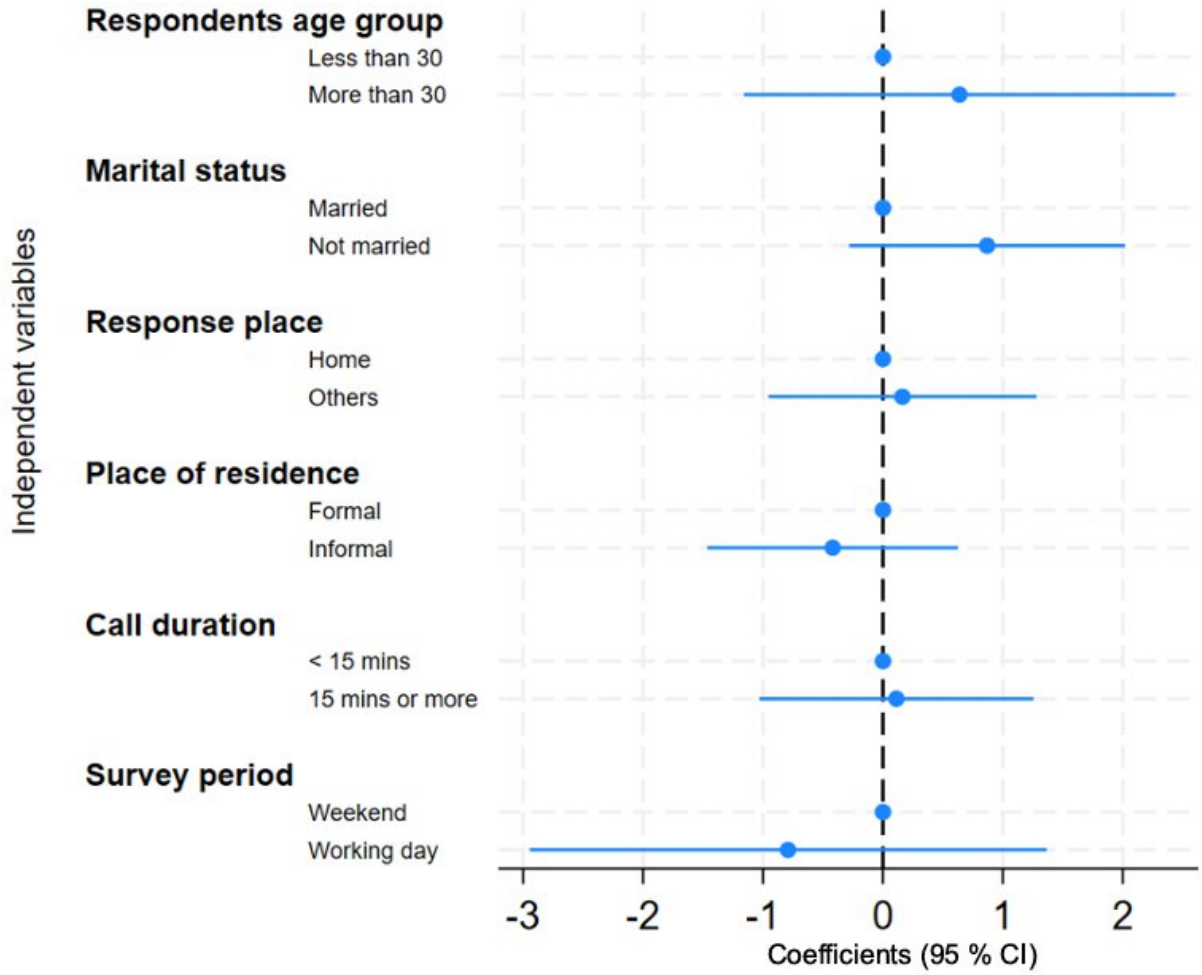
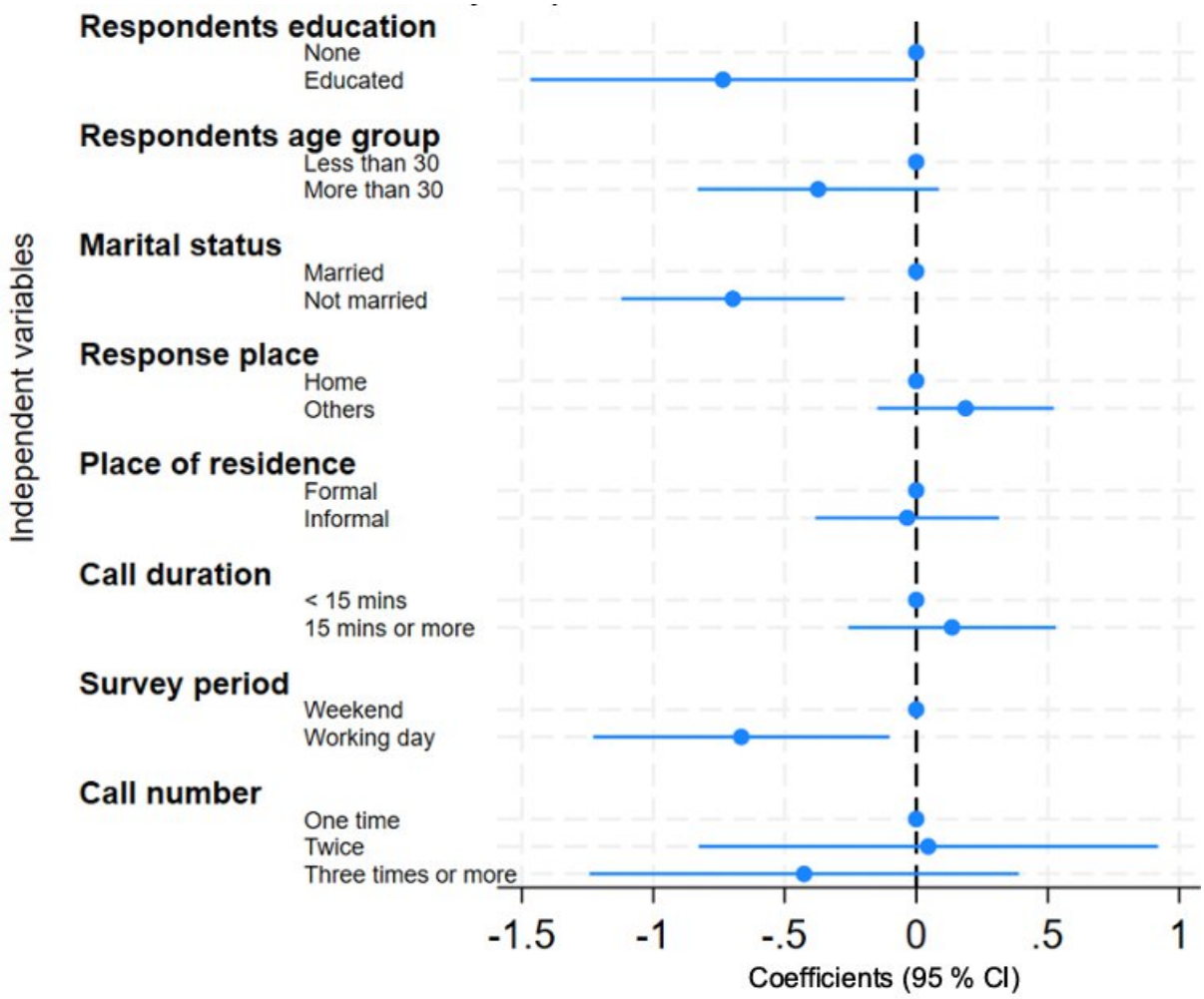


Figure 5.17 presents the results of a logistic regression examining associations between selected respondent characteristics and misreporting of the current age of living parents (father and/or mother) in the MPS. The outcome variable indicates the presence of a displacement between the reported parental age and the HDSS reference. A comparative analysis by sex of the parent is provided in Appendix Figure 11.16 page 355.

Several covariates display statistically significant associations with age misreporting. Respondents with at least some level of education show lower odds of displacement compared to those with no education (coefficient b = −0.74; 95% CI: −1.47 to −0.00). Marital status is also associated with reporting accuracy, with unmarried respondents showing lower odds of misreporting than married respondents (b = −0.70; 95% CI: −1.12 to −0.27). Interview timing is also associated with displacement, as interviews conducted on working days show lower odds of reporting errors compared to those conducted on weekends (b = −0.67; 95% CI: −1.23 to −0.10).

Other variables included in the model, such as respondent age group, interview location, employment sector, and frequency of follow-up calls, do not present statistically significant associations, as their confidence intervals include zero. The pattern of results remains consistent when models are estimated separately by the sex of the parent (Appendix Figure 11.16 page 355).

Figure 5.17: Coefficients from logistic regression: factors associated with any displacement in parent's current age



5.3.10.1.2 Accuracy of data collected on siblings

Figure 5.18 examines the correlation between the reported age at death of matched siblings in both MPS and HDSS data, disaggregated by gender of the respondent. The second figure shows the extent of discrepancies in the reported month, year, and exact date of sibling death between MPS and HDSS.

The correlation analysis reveals strong agreement between MPS and HDSS in reported age at death (r=0.96), but with deviations among certain respondent groups. Male respondents generally show higher (r=97) consistency in their reports compared to female respondents (r=92). Figure 5.19 presents discrepancies in the month, year, and full date of sibling death, with greater variation observed for month and exact date compared to the year. This suggests that respondents may recall broad timeframes (year of death) more accurately than specific details (month and exact date). These variations could also be influenced by interview mode effects, as MPS relies on short interactions that may not allow respondents to recall precise dates as effectively as interviews made during HDSS rounds.

Figure 5.18: Correlation between reported age at death of siblings in MPS and HDSS, by respondent gender

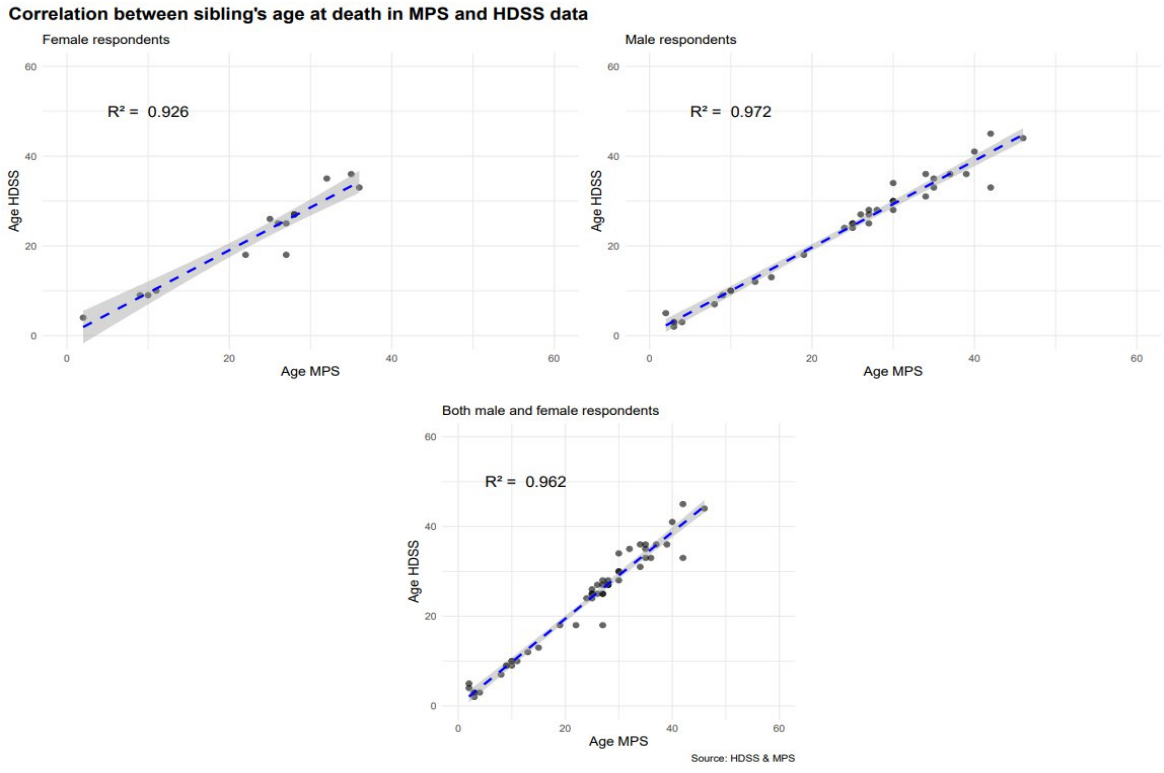
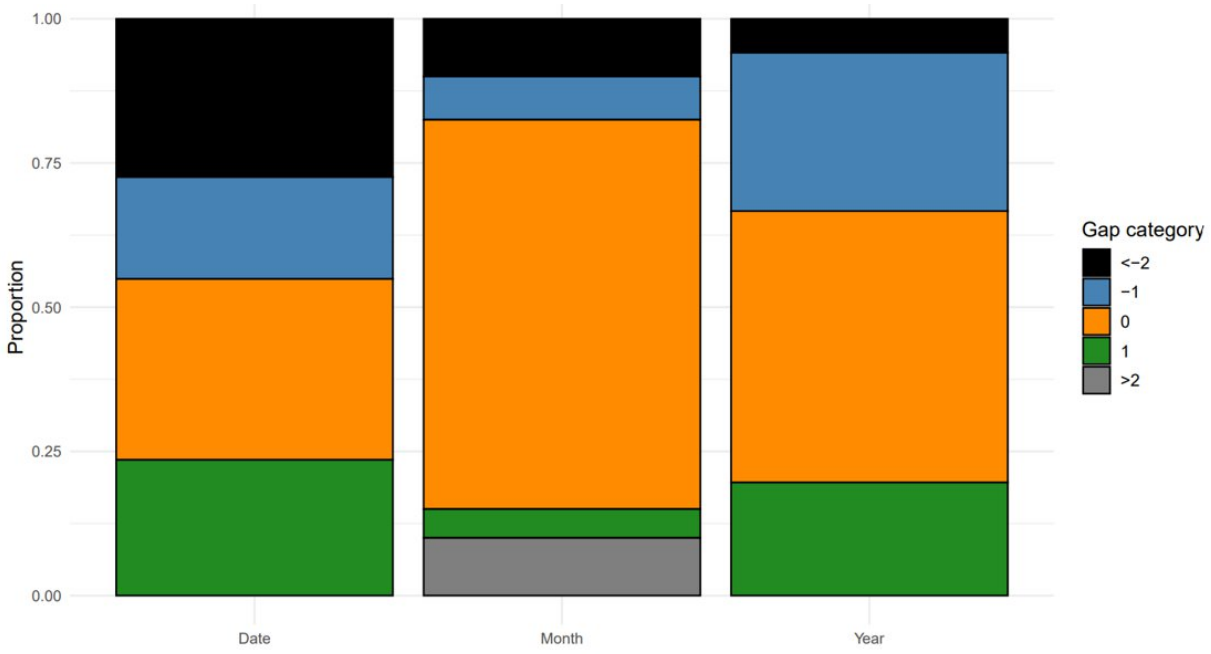


Figure 5.19: Discrepancies in the reported month, year, and date of sibling death between MPS and HDSS



5.3.11 Effects of reporting errors on mortality estimates

5.3.11.1 Infant, child and under-5 mortality

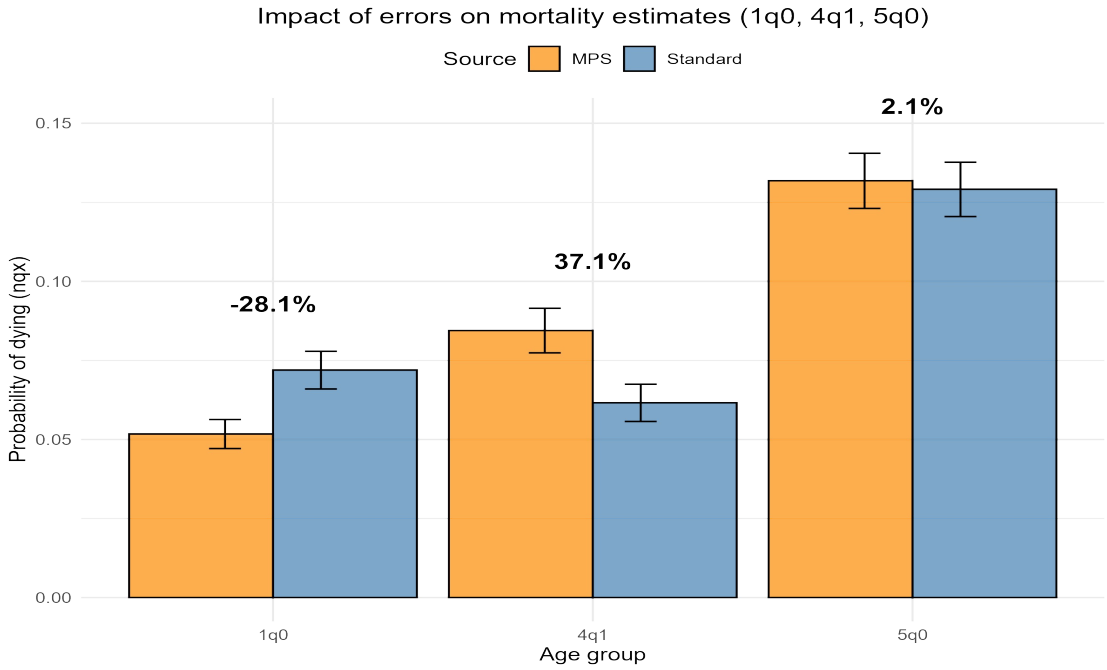
At this stage of the analysis, the error-reporting patterns identified above are applied to data from DHS. The reporting error profiles observed in the MPS are transposed onto DHS birth histories in order to assess, under empirical conditions, the potential impact of age and date misreporting, as well as omissions of child deaths, on estimated levels and trends in infant and under-five mortality. We acknowledge that the 2021 DHS data may themselves be affected by reporting errors and omissions. However, these potential errors are not assessed or corrected in this simulation. We therefore treat the mortality estimates obtained from the original DHS data as the reference estimates ("Standard"), representing the mortality levels in the absence of the additional reporting errors introduced through our simulation.

Figure 5.20 compares child mortality estimates derived from unadjusted data ("Standard") with estimates obtained after applying an imputation procedure based on reporting errors observed in the MPS. The imputation procedure accounts for errors in reported ages and dates and incorporates simulated omissions of child deaths through proportional random deletions based on estimated omission rates. Mortality estimates are presented by age group and calendar year.

Differences between mortality levels derived from unadjusted data and those obtained after adding extra errors are observed across age groups and years. For infants, mortality estimates obtained with additional errors are consistently lower than those derived from unadjusted data, whereas for children aged 1-4, estimates with errors are generally higher than the corresponding unadjusted estimates. For under-five mortality overall, differences between the two series are small, indicating that underestimation among infants and overestimation among children aged 1–4 tend to compensate, resulting in limited net effects on 5q0.

The differences between unadjusted and estimates with additional errors vary by calendar year. Discrepancies are more pronounced in earlier periods and narrower in more recent years across age groups (see Figure 11.17 Figure 11.18 and Figure 11.19 in appendix page 356).

Figure 5.20: Comparison of infant, child and under-5 mortality levels obtained from raw data (Standard) with those estimated after adding extra errors based on patterns from MPS into the original dataset



5.3.11.2 Adult mortality

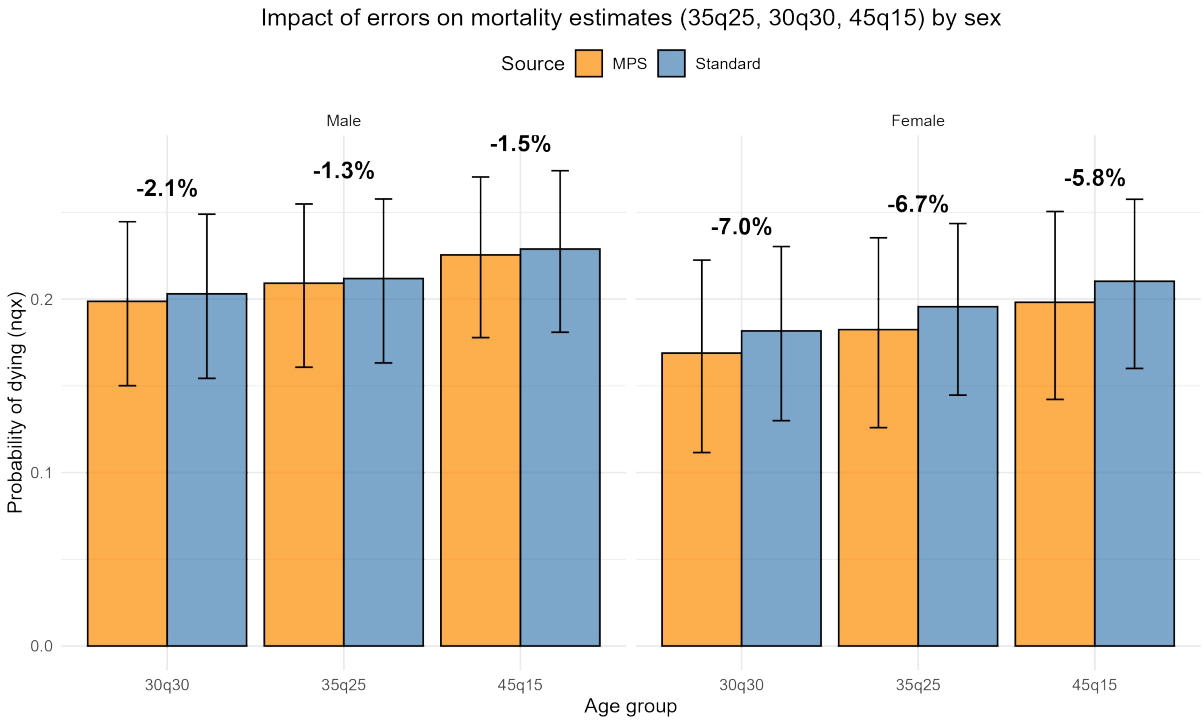
In this section, the error-reporting profiles observed in MPS are here transposed to SSH from the 2021 DHS to evaluate their effects on adult mortality estimates.

Figure 5.21 compares adult mortality estimates derived from unadjusted data with estimates obtained after applying an imputation procedure based on reporting errors observed in MPS. Mortality levels are presented by age group, sex, and calendar year. Across age groups below 60 years, differences between raw estimates and those with extra errors are limited. For both

men and women, raw estimates estimates are generally higher than those with extra errors, with relative differences remaining below 10%. These differences are larger among women than among men. When restricting the analysis to mortality before age 50, discrepancies between the two series are small for both sexes and remain below 2% across all years.

Differences between raw and estimates with additional errors vary across calendar years. Larger discrepancies are observed in earlier periods, while estimates converge in more recent years across age groups and sexes (Figure 11.20 Figure 11.21 and Figure 11.22 in appendix page 358).

Figure 5.21: Comparison of adult mortality (35q25, 30q30 and 45q15) levels obtained from raw data (Standard) with those estimated with additional errors based on patterns from MPS by sex



5.3.11.3 Old age mortality

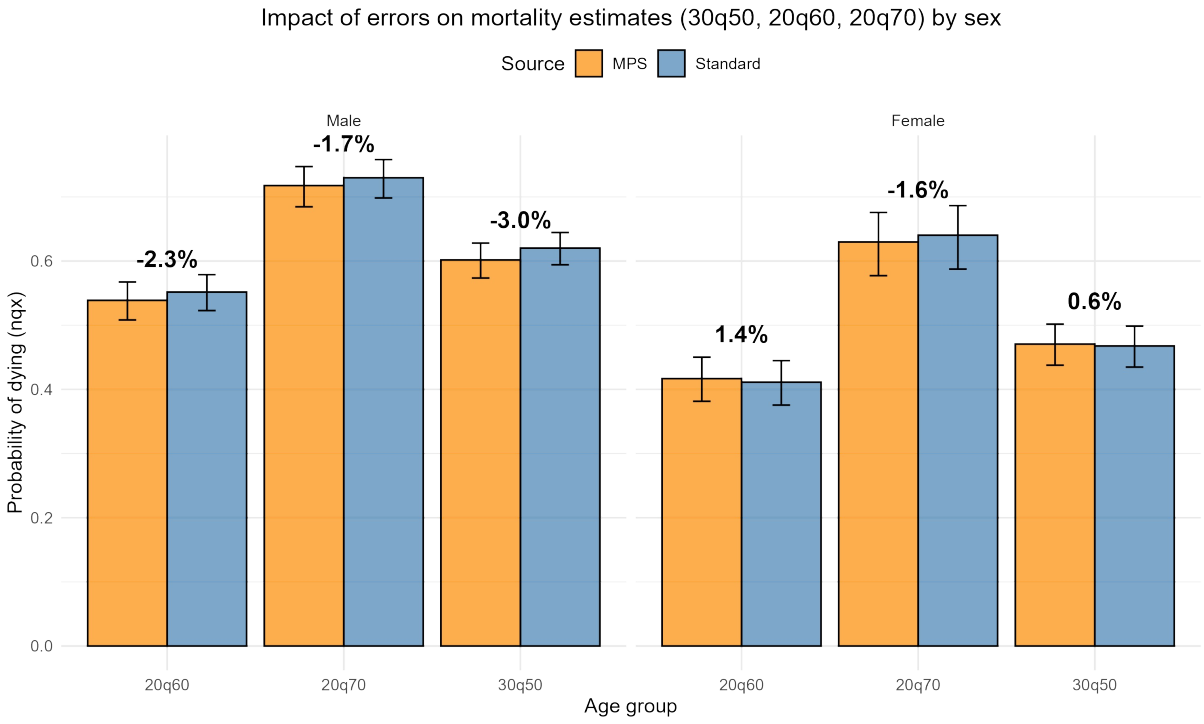
In this analysis, the imputation procedure based on reporting errors observed in MPS is applied to main RaMMPS data. This choice is motivated by the absence of alternative F2F data sources that collect information on parental survival, making RaMMPS the only available empirical basis for assessing the impact of reporting errors on parental mortality estimates.

Figure 5.22 presents a comparison of parental mortality estimates derived from unadjusted data and from data adjusted through the MPS-based imputation procedure. Estimates are disaggregated by age group, sex, and calendar year.

Differences between raw and those with extra errors are larger for parental mortality than for mortality at younger adult ages. Unadjusted estimates are generally higher than estimates with extra errors, with larger relative differences observed for men than for women. For the probability of dying between ages 70 and 90, differences between unadjusted and estimates with extra errors are similar for men and women. In the 50–80 age range, unadjusted estimates are lower than estimates with extra errors for women, while differences remain small for men. Across all age groups, confidence intervals overlap between the two series of estimates.

Across calendar years, no consistent pattern of increasing or decreasing differences between the two series (Figure 11.23 and Figure 11.24 in the appendix on page 359).

Figure 5.22: Comparison of old age mortality (20q60, 30q50 and 20q70) levels obtained from raw data (Standard) with those estimated with additional errors based on patterns from MPS by sex



5.4 Discussion

This chapter, based on data collected within the OHDSS in Burkina Faso, aims to shed light on several methodological challenges associated with using MPS to collect data to measure mortality levels and trends. The analysis is based on a validation survey carried out among a stratified sample of 3,517 adults from the OHDSS, selected according to sex, age, and recent experience with vital events (such as the death of a child, parent, or sibling).

Survey participation and potential errors in MPS implementation

Out of the 3,517 individuals aged 18 to 64 selected for this study, 2,977 were successfully reached, yielding a participation rate of 84%. Among those contacted, only 75 individuals declined to participate, resulting in a high response rate of 97%. The sample design followed a pre-established distribution that incorporated oversampling criteria based on respondents' past experiences. This level of participation surpasses that reported by Greenleaf et al. (2020) in a similar study conducted in Ouagadougou (Greenleaf et al., 2020) and results reported in Chapter 3 (showing participation/cooperation rates of 84% for RDD and 91% for EHCVM). One potential explanation for the high response rate is that the selected individuals were familiar with being interviewed through the routine activities of the HDSS. The analytical sample included 1,729 women aged 18–49, 65 women aged 50–64, and 876 men aged 18–64.

Participants and non-participants differed across several characteristics, including educational attainment, place of residence, age, and the respondent's relationship to the household head. Non-participants were generally younger and were less likely to be household heads or spouses of household heads. These characteristics may influence both availability and willingness to take part in a phone survey, as documented in previous research on remote survey participation (Ellis & Krosnick, 1999; Mulder & Bruijne, 2019). Analysis of sociodemographic profiles also indicate that non-participants were more likely to be single, have only primary education, and reside in formal urban areas a trend consistent with findings from other studies on nonresponse bias in MPS (Ellis & Krosnick, 1999). Analysis of living conditions further suggest a relationship between socioeconomic vulnerability and survey nonresponse. Households of non-respondents were more likely to face limited access to basic infrastructure, potentially affecting both their availability and access to communication technologies, as noted by Groves & Couper (1998) and Lynn & Kaminska (2013) (Groves & Couper, 1998; Lynn & Kaminska, 2013). Interestingly, although non-participants were generally underrepresented across the

stratification criteria, they were more likely to have recently experienced the death of a parent. This aligns with findings from studies on the impact of recent family events on survey participation, where bereavement may either reduce respondents' availability or motivate them to engage depending on the survey topic (Lyberg et al., 2014; Tourangeau et al., 2014).

Respondent characteristics and the age misreporting

Regarding differences in respondents' age reporting by survey mode, our results indicate that the accuracy of self-reported age during MPS is generally satisfactory, despite the presence of some errors. Age is generally recalled accurately, even in remote interviews, with fewer than 10% of respondents showing discrepancies of more than two years between the two modes of data collection. Multivariate analyses reveal two structural factors that influence reporting accuracy: education level and the place where the interview took place. On the one hand, a higher level of education is associated with more accurate reporting. On the other hand, interviews conducted outside the respondent's home are more likely to result in errors, possibly due to reduced concentration, external distractions, or the absence of memory aids (such as ID cards, documents, or help from others). Previous research on age misreporting in LMICs where vital registration systems remain weak has shown that individuals are more likely to report inaccurate ages if they live in rural areas, are male, older, less educated, poorer, and lack a birth certificate (Borkotoky & Unisa, 2014; James & Rajan, 2004; Rosenzweig, 2021). Other studies have also documented the role of interview conditions in shaping data quality (Mathiowetz et al., 2002).

Omission and data consistency

We found high concordance for fathers, mothers, and children, with respective match rates of 96.6%, 93.2%, and 91.9%. Information on parents and children is consistent across data sources, despite some discrepancies likely due to transcription errors, spelling variations, or differences in name-recording practices. The lower match rate for siblings (66.2%) may be explained by the fact that the routine HDSS survey only includes children residing in, born from women residing in, or who have in-migrated into the HDSS catchment area. Specifically, the system does not capture a complete birth history of women prior to their entry into the HDSS. Moreover, at the time of the validation survey, the HDSS had been in operation for 12 years, limiting its retrospective coverage. Furthermore, the fact that many siblings do not reside within the HDSS catchment area complicates comparisons, as the HDSS only includes data on

permanent residents. These discrepancies may also reflect variations in how family information is reported, influenced by complex household structures such as child fostering, which may lead a child to report the wife of a guardian as their biological mother in the HDSS survey. Previous research has shown that child fostering is a widespread practice in Burkina Faso and tends to increase during periods of economic hardship (Ba, 2021; Younoussi, 2007). Moreover, the results show the influence of certain respondent characteristics on the accuracy of matching. Older and unmarried women were more likely to omit children during phone interviews, complicating the matching process between phone and HDSS data. In contrast, children whose mothers were educated were more likely to be accurately matched. This aligns with previous research showing that socio-economic conditions and residential stability impact the quality of survey data (Groves & Couper, 1998; P. Lavrakas & Dutwin, 2016). Conversely, our findings indicate that neither the respondent's type of residence (formal or informal) nor the interview setting had a significant effect on the accuracy of child reporting.

Validity of death reporting and misreporting errors

One of the main limitations of MPS identified in this study lies in the misreporting of deaths of children, parents, and siblings. While the overall sensitivity of phone-based surveys in detecting deaths is high (>85%) particularly for child deaths (99.46%) specificity is more variable, with low specificity for sibling deaths (58.6%). To date, we have found very few studies that compare MPS and F2F survey results at the individual level, particularly regarding information on the survival status of close relatives. A phone-based study on the validity of family planning data collection similarly found high sensitivity but lower specificity (Pattnaik et al., 2020). Although limited in number, several F2F survey studies have explored the effectiveness of different data collection modules in detecting specific types of deaths, especially neonatal deaths in Guinea-Bissau and in Bangladesh (Espeut & Becker, 2015; Helleringer et al., 2020). In our case, the low specificity for sibling death reporting can be partly attributed to the data collection method used in the OHDSS. Specifically, the system does not capture a complete birth history of women prior to their entry into the HDSS. Moreover, at the time of the validation survey, the HDSS had been in operation for 12 years, limiting its retrospective coverage. Furthermore, the fact that many siblings do not reside within the HDSS catchment area complicates comparisons, as the HDSS only includes data on permanent residents. Disaggregated by sociodemographic characteristics, men show higher specificity than women, and younger respondents (18–19), those with higher education, and individuals in formal urban areas generally show higher sensitivity and specificity.

When disaggregated by sociodemographic characteristics, some differences in sensitivity and specificity are observed, including by respondent age, sex, education, and place of residence. However, given the limitations of the OHDSS reference data for reconstructing sibling histories, these differences should not be interpreted as evidence of systematic effects of these characteristics on the accuracy of sibling death reporting. Beyond the variation observed by age, the available data provide limited evidence for drawing firm conclusions about the factors underlying differences in reporting accuracy.

Validity of reporting of ages and date of death

Maternal recall is a reliable way to report a child's age and date of birth, and this reliability holds true across various data collection settings. We found a high correlation coefficient ($r > 0.90$) between the age of the child reported by women with MPS and the HDSS database. Furthermore, we also found consistency in reporting the month and year of birth across both data sources. The fact that the inaccuracies in dates rarely exceed one year indicates that most reporting errors fall within an acceptable margin for demographic analysis. It is also noteworthy that underreporting and overreporting errors tend to cancel each other out, indicating that despite minor discrepancies, aggregate mortality estimates likely remain reliable. These findings corroborate the study by Nareeba et al. (2021), which compared the FBH and FPH modules in several HDSSs and found that mothers have more accurate recollections of the exact dates of birth or death of their children, particularly those with higher educational levels or living in wealthier households (Lau et al., 2025; Nareeba et al., 2021).

An examination of the correlations between parental ages reported in the MPS and HDSS datasets indicates contrasting patterns by sex of respondents and sex of parents. For current parental age, the correlation between the two sources is high overall. Nevertheless, greater dispersion appears among reports provided by female respondents. This dispersion may reflect differences in knowledge of parental ages or in recall accuracy, possibly related to patterns of interaction with parents. In addition, correlations are consistently higher for paternal ages than for maternal ages. For age at death, correlations between MPS and HDSS reports also remain high, although larger discrepancies are observed for mothers. Male respondents report fathers' ages at death more accurately than female respondents, whereas female respondents provide more consistent reports for mothers. This pattern suggests closer familiarity with the deceased parent of the same sex, potentially shaped by cultural or familial norms. In Burkina Faso, research has shown that elderly parents, particularly those living in rural areas and facing loss of autonomy or health issues, tend to migrate to their sons' homes rather than their daughters'

(Konaté et al., 2019). This strategy results in greater residential and relational proximity to sons (Niamba et al., 2019; Sawadogo et al., 2019). This increased proximity could explain why male respondents provide more accurate information on their parents' ages than female respondents. Furthermore, correlations decrease as time since death increases, indicating more frequent recall errors for more distant deaths. This effect is more pronounced for maternal deaths and male respondents. Several studies have explored the impact of time elapsed since an event on recall accuracy, particularly regarding women's reports of their children's death dates, and found that time since death influences the accuracy of the information provided (Jensen et al., 2025; Nareeba et al., 2021). Finally, the analysis reveals discrepancies between the death dates reported by MPS and those obtained through F2F interviews in HDSS. These discrepancies are more frequent for maternal deaths.

The analysis of correlations for sibling death ages reported by MPS and HDSS reveals higher overall concordance, but discrepancies based on gender. These findings are consistent with the study by Helleringer et al. (2014) in Niakhar, Senegal (Helleringer, et al., 2014). This validation study aimed to test the effectiveness of a new data collection module on sibling survival and conducted a retrospective validation survey comparing two tools with demographic surveillance data. The results showed that all three modules provided similar information on sibling death ages (Helleringer, et al., 2014). Male respondents generally show greater consistency in their reports compared to female respondents. Analyzing discrepancies in the reported month, year, and exact date of death shows substantial variations between MPS and HDSS data. The largest discrepancies are observed for the month and exact date of death, while the year is generally better recalled. This suggests that respondents are more likely to remember general periods than precise details. These results are confirmed by a study conducted in several countries covered by the PMA project, which found that missing data on children's birth months were significantly higher compared to years of birth (Choi et al., 2018). These discrepancies may also be attributed to the effects of the questionnaire module used in the MPS validation survey. Our survey used a summarized questionnaire, which has been shown to underestimate mortality, at least in birth histories (Masquelier et al., 2023).

Impact of errors on mortality measurement

By artificially adding error patterns (such as omissions and date errors) to the DHS data and subsequently re-estimating the mortality levels and trends for children and adults, we observe some differences. We find that the combination of these error patterns leads to an

underestimation of infant mortality (for children under one year), an overestimation of child mortality (for children aged 1-4 years), and an estimation that aligns with standard estimates for under-five mortality levels (5q0). These differences may stem from the module used for the validation survey to collect child survival information (Masquelier et al., 2023). Moreover, other research has shown that omissions are more significant for deaths occurring one year after birth compared to other age groups at death (Nareeba et al., 2021). The overestimation of mortality for children aged 1-4 years may result from a lack of knowledge about children's birth dates or ages at death, which leads to age rounding for death events to 12 months. A validation study conducted at the HDSS site in MatLab demonstrated that the FBH module used in the DHS survey leads to age rounding of children's death ages to 12 months compared to the FPH module, thus shifting child death events (Eilerts et al., 2021; Espeut & Becker, 2015). Previous studies have also reported implausible distributions of age at death (AAD), with heaping at whole weeks, months, and years (Oza et al., 2014; Pullum & Staveteig, 2017). This issue may be exacerbated by the error patterns in the MPS, especially given the high prevalence of rounded ages in the MPS data as shown in Chapter 3. However, it is important to note that these differences are not statistically significant when considering confidence intervals. However, further research is needed to validate this method for measuring mortality in children under one year or in the 1-4 year age group.

Regarding the impact of error patterns in sibling survival data on the estimation of adult mortality levels and trends, our results suggest an underestimation (statistically non-significant) of mortality, regardless of gender or the age range considered (35q15 or 45q15). This trend is largely explained by omissions and errors in the reporting of dates of death, with a more significant impact when the death occurred several years ago. Indeed, the analysis of correlations between sibling death ages derived from MPS and HDSS showed near-perfect correlations (>97%) and small discrepancies in death date, rarely exceeding 12 months. The underestimation observed Chapter 4 in this study may largely be due to the module used for collecting sibling survival data (summarized and truncated sibling survival history), which can lead to shifting deaths outside the reference period, as often seen in retrospective F2F surveys (Hill, 2014; Odwe et al., 2015).

In the absence of F2F data for direct estimation of elderly mortality, error patterns derived from parent survival information were applied to MPS data from the main phase of the RaMMPS project. The results of these analyses indicate some differences in estimates (statistically non-

significant) between estimates derived from MPS alone and those with error patterns from the validation survey. Like most Sub-Saharian African countries, Burkina Faso lacks reliable data on elderly survival, making it impossible to compare these estimates with external sources (AbouZahr et al., 2015; Ouedraogo, 2020; Randall & Coast, 2016).

Factors influencing the quality of collected data

All data sources have limitations, and none can be considered a true "gold standard," as all are prone to omitting certain events (Nareeba et al., 2021). In the case of MPS, several factors influence the quality of the collected data. The environment in which the telephone interview takes place (e.g., at home, in a public place, or at work) can influence the accuracy of responses. Respondents may sometimes find themselves in situations that are not conducive to participation, such as having poor connection quality or being in a context that hinders concentration (Souza et al., 2024). The scientific literature remains divided on the effects of these conditions: some studies suggest that the use of mobile phones for data collection does not significantly alter the quality of the information gathered (M. Häder, 2012; Pew Research Center, 2012), while others mention a potential negative impact (Jäckle et al., 2010; Triga, 2019). However, the results of our analysis indicate that the location from which the respondent participates in the interview does not affect the quality or truthfulness of the data provided, whether it concerns personal information or details about the survival of relatives. Finally, our analysis emphasizes that the level of education is a key factor in the quality of data collected via mobile phone. People with higher levels of education generally provide more consistent and accurate responses. This finding aligns with several previous studies, which have shown that more educated respondents are not only more likely to participate in MPS, but also more reliable in their responses (Groves & Couper, 1998; C. Lau et al., 2025; Schmidt et al., 2020).

On the other hand, several logistical or contextual factors that one might suspect to affect data quality do not appear to have a significant effect. First, the length of the interview, even when it exceeds 15 minutes, was not associated with a deterioration in the quality of the information provided. This result contradicts a common assumption that respondent fatigue or boredom may lead to less reliable answers as the interview progresses (Aquilino, 1994; Roberts et al., 2010). Second, the day on which the interview takes place (whether a weekday or weekend) did not influence the accuracy of the collected data, suggesting that respondents are equally willing and focused regardless of the time of week. Third, the number of attempts required to contact a respondent, including when more than two calls were needed, did not affect the quality

of the responses obtained. This indicates that individuals who are harder to reach are not necessarily less reliable or less attentive when they eventually respond. Finally, it is interesting to note that whether a respondent has recently experienced a death in their family does not seem to alter the truthfulness or quality of the information provided during the interview, even when it involves sensitive questions regarding the survival of relatives. These observations contribute to a better understanding of the determinants of data quality in MPS and echo similar conclusions in previous works examining the stability of responses according to the interview context (Revilla, 2012; Revilla & Saris, 2013).

5.4.1 Limitations

The sample size for certain events in our validation sample was too small to accurately estimate various reporting parameters. For example, our estimates of the age discrepancies at maternal death according to the two data collection modes were based on a limited number of cases, leading to a high level of uncertainty. This affected not only our assessment of the impact of reporting errors on the accuracy of elderly mortality estimates, resulting in wide confidence intervals that included the possibility that the survey estimate was unbiased, but also presented limitations in assessing the factors related to respondent characteristics that could explain differences in the reported ages at maternal deaths. The same was true for the information collected on the survival of siblings, as the small sample size limited our ability to study the covariates of reporting errors, such as whether they were associated with respondent characteristics or certain beliefs or attitudes they might have. Therefore, we were unable to characterize the mechanisms behind the reporting errors in the MPS data in these instances. Due to the small sample size of deceased and matched children between the two data collection modes, our analysis did not allow us to study the covariates associated with reporting errors on children's age at death.

Second, we used a new module for collecting data on parental survival, as well as shortened modules for siblings and children. Therefore, we could not assess the accuracy of death date reports (month and/or year) based on the time elapsed since the death. Moreover, since the last visit to the HDSS area was at the end of 2020, some recent parental deaths may not have been recorded in the HDSS (those occurring after the HDSS fieldworker' visit). The sibling survival module was used to inquire about the total number of living or deceased siblings and those who

died in the past three years, with additional questions on their age, month, and year of death. These data did not allow us to assess the accuracy of death dates based on the time elapsed since death. Moreover, we lacked information on living siblings to evaluate age discrepancies between the MPS and HDSS. Regarding the child survival history module, it queried women of reproductive age about the total number of children, both living and deceased, disaggregated by sex, and details about children born after 2015. These data did not allow us to assess the accuracy of information on the FBH or the FPH commonly used in most demographic surveys. Furthermore, our study did not measure the full extent of reporting errors regarding living children. We only documented some age errors that transferred younger deaths (0–1 years) to the infant period (1–4 years). We could not measure the frequency of omissions or date shifts in living children, nor those age errors transferring deaths of children aged 1 to 4 years to the 5 to 9 age group. These errors are significant because they exclude some births from the denominator of the under-five mortality rate while leaving the numerator largely unchanged, potentially leading to a substantial upward bias in the survey estimates.

Third, and perhaps more importantly, our HDSS reference database may contain errors in death registration. The HDSS could include classification errors between the deaths of biological siblings and non-biological siblings, as well as between biological parents and adoptive parents. It is also possible that some pregnancies occurring within the target population were not recorded. As a result, some participants in our study may have experienced a neonatal death among their children that was not recorded in the HDSS, as evidenced by the 21% false positive rate. However, this rarely affected our evaluation of the net effects of reporting errors observed in Burkina Faso on mortality estimates for children under five. It did, however, affect estimates for child mortality and infant mortality.

Fourth, our results may not be representative of some contexts where data is collected in LMICs. Our study population is urban, which limits the applicability of the results to rural areas. Moreover, our study did not include women who had permanently migrated or were temporarily absent from the HDSS area. If the accuracy of reports in the different modules is correlated with certain sociodemographic characteristics of the women surveyed, then our results may not faithfully reflect the accuracy of the modules. Future validation studies on FBH data should aim to track migrant or mobile individuals.

Fifth, the individuals surveyed in this HDSS validation survey in Ouagadougou are frequently questioned and followed up on their reproductive health, child survival, living conditions,

residency status, and many other factors. They may, therefore, report information more accurately in a survey than other respondents who do not have such regular contact with data collectors. Therefore, the extent of reporting errors may be larger in other contexts where such intensive follow-up does not exist. Thus, the generalizability of our results to other contexts may be questioned. Additional validation studies of data on these various aspects should be conducted in diverse contexts in developing countries with less intensive follow-up.

Finally, the long-standing nature of the Ouagadougou HDSS and its data collection procedures limited further investigation of child survival. The HDSS records births that occur within the surveillance area but does not routinely collect complete birth histories for children born outside the surveillance area before a woman's enrolment. Consequently, information on the survival of children born before entry into the HDSS was unavailable. It is important to note that validation studies like this can only be conducted in contexts where demographic surveillance has been in place for several years.

5.5 Conclusion

MPS offer significant potential for the rapid collection of mortality data, especially in contexts where F2F surveys are difficult or impossible to conduct, as demonstrated during the COVID-19 pandemic. However, our study shows the need for heightened vigilance regarding the quality of data collected through this method and advocates for the application of rigorous corrective methods to ensure its reliability. Improving MPS involves better addressing reporting biases, omissions, and dating errors, particularly for neonatal and infant deaths. These biases can lead to a systematic underestimation of mortality, undermining the validity of public health indicators used to monitor progress toward health objectives.

Child deaths are more frequently omitted than surviving children, although the likelihood of omission does not vary systematically with the child’s age at death. Omission rates vary across maternal characteristics, with higher levels observed among younger mothers, followed by a decline during middle ages and a modest increase at older ages. These patterns point to structured differences in reporting completeness across respondent profiles. The findings show that the quality of data collected through MPS varies not only with individual respondent characteristics but also with interview conditions. This has implications for the standardization

of remote data collection practices. In particular, the results emphasize the importance of conducting interviews in environments that limit interruptions and distractions, especially when collecting factual information such as age or dates. They also point to the need for heightened attention during interviews with respondents with lower levels of education, among whom reporting errors are more frequent. The study further documents differences in reporting accuracy by gender in the context of adult and parental mortality, showing the relevance of sex-disaggregated analyses when assessing data quality. In addition, discrepancies between death dates reported in MPS and those recorded in HDSS data illustrate limitations in the precision of temporal information collected by phone. This limitation is not specific to MPS and is also observed in F2F data collection, reinforcing the need to adapt estimation and adjustment methods to the characteristics of each data collection mode.

6 Are mobile MPS useful to capture excess child mortality in countries facing complex humanitarian emergencies?[5]

[5] This chapter is based on a manuscript published: Dinoqu, K., Masquelier, B., Helleringer, S., Lankoandé, B.,

In this chapter, I evaluate the utility of MPS for estimating child mortality in conflict settings, using Burkina Faso as a case study, as armed conflict and forced displacements hamper traditional F2F data collection on an important share of the territory. Using the RaMMPS nationally-representative survey collected from September 2021 to October 2022, I compare regionally disaggregated mortality estimates from MPS with those from the DHS conducted in 2021, which could not cover parts of the national territory due to insecurity.

6.1 Introduction

For more than a decade, several Sahelian countries have been plagued by terrorist attacks, organized crime and conflicts between Islamist armed groups and government forces. Burkina Faso is no exception, and since the 2015 coup d'état, the situation has deteriorated significantly. According to the *Armed Conflict Location and Event Data* (ACLED) project, about one in five people in the country were exposed to armed violence within a 5km radius in 2024 (ACLED, 2025a). More than 2 million people (around 10% of the population) have fled their homes and around 40% of the national territory is currently beyond the control of the government (Human Rights Watch, 2023; UNHCR, 2025b; WFP, 2023). This widespread insecurity is likely to have both direct and indirect effects on the health and survival of the affected populations, but these are not systematically documented due to the incompleteness of death registration and the limitations of the health information system (Ouedraogo et al., 2024). In this chapter, we assess whether some of that information gap can be filled using MPS estimates of under-five mortality. DHS estimates for Burkina Faso suggest that under-five mortality declined in recent years, despite the ongoing security crisis: from 129 per 1,000 in the five years prior to the 2010 DHS to 48 per 1,000 in the period leading up to the 2021 DHS. Estimates produced by the *United Nations Inter-Agency Group for Child Mortality Estimation* (UN IGME) heavily rely on household survey data and are also suggestive of this downward trend (UN IGME, 2022), although the latest DHS was excluded from the model fitting due to concerns over data quality. In the 2021 DHS, only 5 of the 13 regions were fully surveyed. In the Sahel, the region worst-affected by insecurity, 28 of the 41 clusters were excluded from the sample due to security concerns (Figure 6.1). If these excluded areas also experienced excess mortality relative to the

---

Compaoré, Y., Billa, O., Soura, A., & Reniers, G. (Manuscript under review). Under-Five mortality in humanitarian emergencies: a comparison of face-to-face and mobile phone survey estimates from Burkina Faso. Tropical Medicine International Health.

rest of the country, for example directly due to conflict-related deaths, or indirectly due to more difficult access to healthcare services, then a household survey might misrepresent the true level of under-five mortality in Burkina Faso.

There is thus a need for alternative data gathering methods whenever F2F surveys are not feasible. As discussed in the previous chapters, MPS have become an increasingly viable modality for collecting health and mortality data, owing to the rapidly expanding mobile phone networks and ownership in many LMICs (Ben et al., 2015; D. G. Gibson, Pereira, et al., 2017; Labrique et al., 2017). In Burkina Faso, the number of active SIM cards per 100 inhabitants surged from 46 in 2011 to 112 in 2021 (World Bank, 2022). According to the 2019 census, the proportion of adults who personally own a mobile device was 85% (INSD, 2019). The 2021 DHS reports 75% and 90% ownership among women and men of reproductive age, respectively (INSD, 2021).

The Ebola and COVID-19 outbreaks accelerated the use of mobile phones in data collection in crisis settings (Lamanna et al., 2019; PMA, 2023; Vinceti et al., 2020; World Bank Group, 2020), but mortality estimation from MPS data remains relatively rare (Kante et al., 2025; Reniers et al., 2025). Few studies have formally evaluated how they can be used to complement or substitute for F2F surveys in populations affected by security crises. One study, conducted in Northern Cameroon, compared mortality rates derived from phone interviews with those from F2F surveys with similar results (Gignoux et al., 2020). Most studies of mortality in conflict-affected settings relied on reports of recent household deaths, and there is a need to understand which other instruments, such as birth or pregnancy histories (for child mortality) and sibling histories (for adult mortality) can be used or adapted for MPS.

Several possible methodological challenges associated with estimating mortality from MPS have already been discussed in this dissertation, including selection bias due to inequities in mobile phone ownership and relatively low response rates. Bias can be alleviated by careful sampling procedures and post-stratification weighting (Sánchez-Páez, Masquelier, Menashe-Oren, et al., 2023). It is, however, plausible that the specific conditions of populations affected by insecurity exacerbate this bias. In addition, respondents might be more hesitant to engage with interviewers over the phone as they cannot verify the purpose of the call or suffer from higher levels of stress. The degradation of infrastructure in conflict zones might also disrupt telecommunication networks. Since no gold standard measurement exists for Burkina Faso, this study is inevitably limited to comparing under-five mortality estimates derived from MPS and F2F surveys.

6.2 The security crisis in Burkina Faso

Security context and its impacts in Burkina Faso (2015–Present)

The collapse of the Libyan regime in 2011 and ongoing instability in Mali, fed an armed insurgency in Burkina Faso, which is responsible for numerous deaths and population displacement (Aspenia, 2021; Bank, 2012). These started as sporadic attacks in 2015, but gradually escalated, disproportionately affecting border regions such as the Sahel, North, East, and Boucle du Mouhoun, as well as the Center-North and Center-East regions (Renault, 2019). Approximately 40% of the country's territory is now considered beyond the control of the government (HRW, 2023) (Figure 6.1).

The security deterioration, measured by the number of direct insurgent-related deaths in each region, is shown in Figure 6.2 (ACLED, 2025b). In 2018, most fatalities resulted from attacks on military targets, but by 2019 civilians had become the primary victims (ACLED, 2025a). That same year, a state of emergency was declared in 14 provinces. The violence intensified in 2020, with a surge in attacks targeting civilians, humanitarian aid programs, and local self-defense groups. A temporary lull occurred between November 2020 and January 2021 due to a negotiated ceasefire during the presidential and legislative elections. In 2022, insurgent attacks led to a sharp increase in fatalities.

Figure 6.1: Geographic distribution of non-surveyed clusters during the 2021 DHS in Burkina Faso

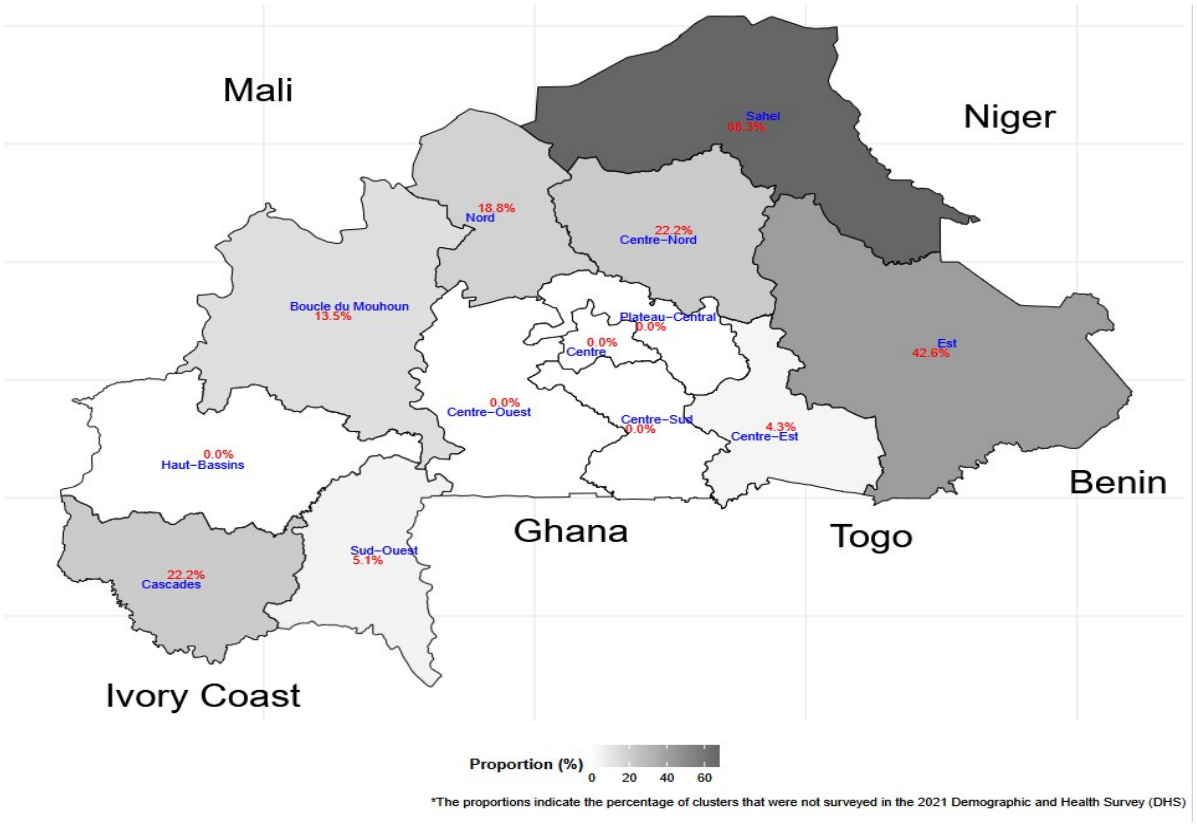
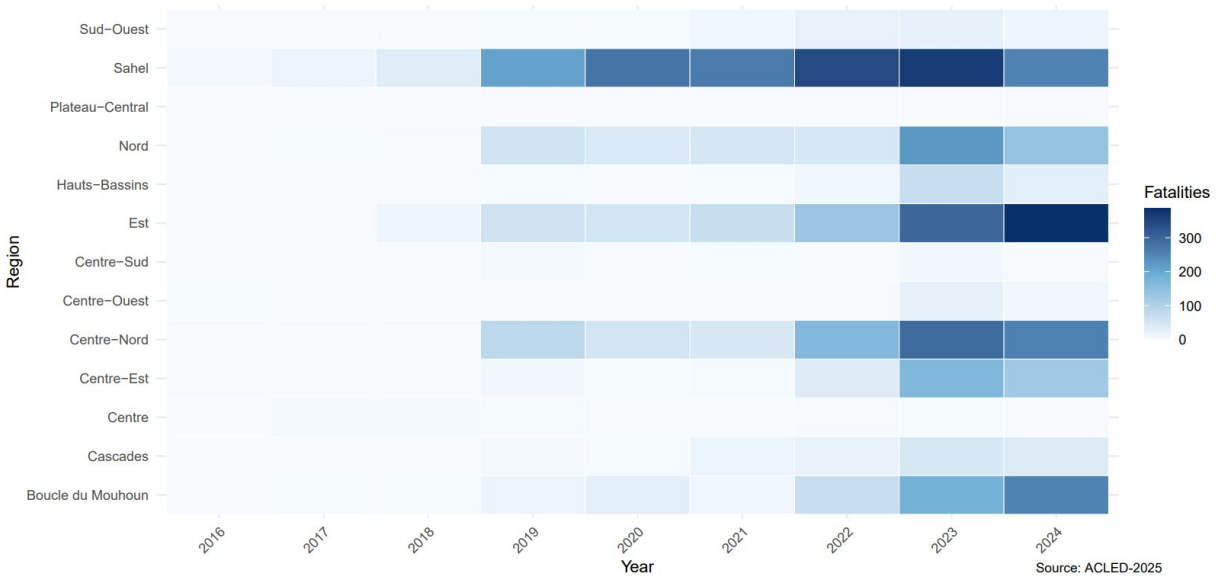


Figure 6.2: Violence-related fatalities by region in Burkina Faso 2016-2024



The consequences of this crisis are far-reaching. Nearly 10% of the population has been displaced, exacerbating food insecurity and social tensions. Agriculture, which provides a livelihood for 80% of the Burkinabe population, has been severely impacted by land loss and blockades imposed by armed groups, pushing the number of food-insecure individuals over 2.3 million in 2022 (OCHA, 2022). Healthcare services, already fragile, have been severely disrupted (OMS, 2023). According to the Ministry of Health, more than 38% of healthcare

facilities are affected, restricting access to medical care for 2.5 million individuals (MSH, 2022).

6.3 Methods

As indicated in Chapter 4, child mortality was estimated using a life-table or synthetic cohort approach using truncated birth histories reported by women of reproductive age and referring to all births that had occurred in the seven years prior to data collection. We calculated mortality rates directly, using dates of birth and death (or date of interview for living children) to tabulate deaths and exposure time. Period rates were converted to probabilities and chained together to obtain the under-five mortality rate ($_5q_0$) (Hill, 2014). This was done with the demogsurv package in the R statistical software, which allows for complex survey designs and accommodates weighting (Eaton & Masquelier, 2021).

We showed above that the sample of MPS respondents differed from the latest census in terms of a number of background characteristics (see Table 3.5 in Chapter 3 page 75). These differences can be attributed to inequalities in mobile phone ownership and selective non-response, which, in the case of the RDD arm, is not captured by the sampling quotas. The MPS sample was therefore weighted using raking weights to ensure that the marginal distributions of the weighted sample matched the census in terms of age, type of place of residence, household assets, education and region (conflict vs non-conflict affected regions) (further details are provided in (Ben et al., 2015)). Weighted estimates are presented here.

Mortality estimates were disaggregated by period and region. The selected periods correspond to low or no insecurity (2014–2017), moderate insecurity (2018–2019), and high insecurity (2020–2022). This classification is based on the number of violence-related fatalities reported by the ACLED project (Figure 6.2). A dichotomous region variable is used to distinguish regions that are affected by conflict (i.e., Sahel, North, Center-North, Boucle du Mouhoun, Center-East, and East) and regions that are more secure. Again, this classification is based on the number of violence-related fatalities reported in Figure 6.2. To assess whether observed differences across groups and over time were statistically meaningful, we compared mortality estimates using their 95% confidence intervals.

6.4 Results

6.4.1 Sample characteristics

Table 6.1 compares the distribution of selected socio-demographic and household characteristics of women of reproductive age across three data sources: the MPS, the DHS, and the population census. For the MPS, both unweighted and post-stratified weighted estimates are presented. Post-stratification weighting substantially modifies the socio-demographic profile of the MPS sample and brings most characteristics into closer alignment with census distributions. Differences between the weighted MPS and the DHS persist for several indicators, particularly for household amenities.

Across most characteristics, the unweighted MPS deviates from the census distribution. After weighting, MPS estimates are closer to census figures, particularly for age structure and place of residence. The proportion of women aged 15–29 rises from 49.1% in the unweighted MPS to 58.5% in the weighted MPS, closely approximating the census estimate of 59.0% and remaining comparable to the DHS estimate of 55.3%. In contrast, the share of women aged 30–49 declines in the weighted MPS and approaches the census distribution. In the unweighted MPS, women with secondary or higher education account for 37.4%; this proportion decreases to 10.2% after weighting, consistent with the census estimate of 9.7%. Conversely, the proportion of women with no formal education increases from 47.0% in the unweighted MPS to 67.1% in the weighted MPS, nearly identical to the census value of 67.4%. DHS estimates generally lie between the unweighted and weighted MPS values but differ from the census for several education categories.

With respect to marital status, the application of weights to the MPS increases the proportion of married women and reduces the proportion of single women, thereby bringing the distribution closer to census benchmarks. The weighted MPS estimate for married women (81.1%) exceeds both the DHS (72.9%) and census (70.3%) estimates, whereas the proportion of single women in the weighted MPS (14.7%) remains lower than in the two other sources. After weighting, the MPS replicates the census urban–rural distribution (29.9% urban and 70.1% rural). The DHS displays a comparable pattern, although with a higher share of urban women. Household size distributions exhibit more modest changes following weighting. The weighted MPS closely matches the DHS estimates for households with 5–8 members and those with nine or more members. In contrast, census data indicate a higher proportion of small households (1–4 persons) and a lower proportion of large households than observed in both surveys. For household amenities and living conditions, weighting produces more pronounced

shifts in the MPS distributions. Estimates of electricity access in the weighted MPS (55.9%) are nearly identical to the census figure (56.0%), whereas DHS estimates are lower. A similar pattern emerges for access to improved drinking water, with the weighted MPS remaining closer to the census than to the DHS. For durable roofing materials, the weighted MPS estimates lie between those reported by the DHS and the census.

Table 6.1: Comparison of women's characteristics according to data collection source (DHS, MPS and the census)

	MPS			**DHS**		**Census**
	Unweighted	Weighted		Weighted		
	%	%	95% CI	%	95% CI	%
Age group						
15-29 yrs	49.1	58.5	[57.3-59.7]	55.3	[54.5-56.1]	59.0
30-49 yrs	50.9	41.5	[40.3-42.7]	44.7	[43.9-45.5]	41.0
Education						
None	47.0	67.1	[65.9-68.2]	58.3	[57.5-59.1]	67.4
Primary	15.6	22.7	[21.7-23.8]	14.2	[13.7-14.8]	22.8
Secondary & higher	37.4	10.2	[9.6-10.9]	27.5	[26.7-28.2]	9.7
Marital status						
Married	76.8	81.1	[80.1-82.0]	72.9	[72.1-73.6]	70.3
Widowed	2.6	3.4	[3.0-3.8]	1.6	[1.4-1.8]	2.0
Divorced/sep	1.0	0.9	[0.7-1.1]	1.8	[1.6-2.0]	0.9
Single	19.6	14.7	[13.9-15.6]	23.8	[23.1-24.5]	26.8
Place of residence						
Urban	42.1	29.9	[28.8-31.0]	32.5	[31.7-33.3]	29.9
Rural	57.9	70.1	[69.0-71.2]	67.5	[66.7-68.3]	70.1
Household size						
1-4 pers	21.7	22.4	[21.4-23.4]	18.5	[17.8-19.1]	29.9
5-8 pers	44.9	40.6	[39.4-41.8]	44.0	[43.2-44.9]	40.6
9 pers&+	33.3	37.0	[35.8-38.2]	37.5	[36.7-38.3]	29.5
HH has electricity *						
Yes	75.2	55.9	[54.7-57.2]	24.1	[23.3-24.8]	56.0
No	24.8	44.1	[42.8-45.3]	75.9	[75.2-76.7]	44.0
Dwelling has durable roofing material						
Yes	91.0	84.6	[83.7-85.5]	87.0	[86.4-87.6]	81.2
No	9.0	15.4	[14.5-16.3]	13.0	[12.4-13.6]	18.8

Household has access to an improved source of drinking water						
Yes	86.7	78.7	[77.7-79.7]	31.4	[30.6-32.2]	68.5
No	13.3	21.3	[20.3-22.3]	68.6	[67.8-69.4]	31.5

Note: the weighting scheme used in this study differs from that used in a previous publication based on the same survey (Dianou et al., 2025). Here, survey weights were recalibrated through post-stratification so that the distributions in women of reproductive age in the MPS match those from the census data. * The definition of household electricity access is consistent between the MPS and the census. However, for the DHS, the exact construction of the variable is less clear because detailed information on the categories used to derive electricity access is not available.

6.4.2 Under-five mortality levels and trends

Figure 6.3 summarizes under-five mortality trends in conflict-affected areas and in regions that were relatively secure. The DHS estimates of the probabiliy of dying below age five declined slightly from about 55 per 1,000 in 2014–2017 (95% CI: 47–63) to 45 per 1,000 in 2020–2022 (95% CI: 36–55) in conflict-affected areas, and from about 58 per 1,000 in 2014–2017 (95% CI: 50–65) to 44 per 1,000 in 2020–2022 (95% CI: 33–55) in secure areas. These declines are, however, not statistically significant. Mortality stagnation also characterizes the MPS data for regions that were less affected by armed conflict. In contrast, the MPS estimates show a clear and statistically significant mortality increase in conflict-affected regions: from 47 per 1,000 in 2018-2019 (95%-CI: 38-57) to 82 in 2020-2022 (95%-CI: 67-98).

Figure 6.3: Trends in under-five mortality based on regional security context, derived from the RaMMPS survey and the 2021 DHS

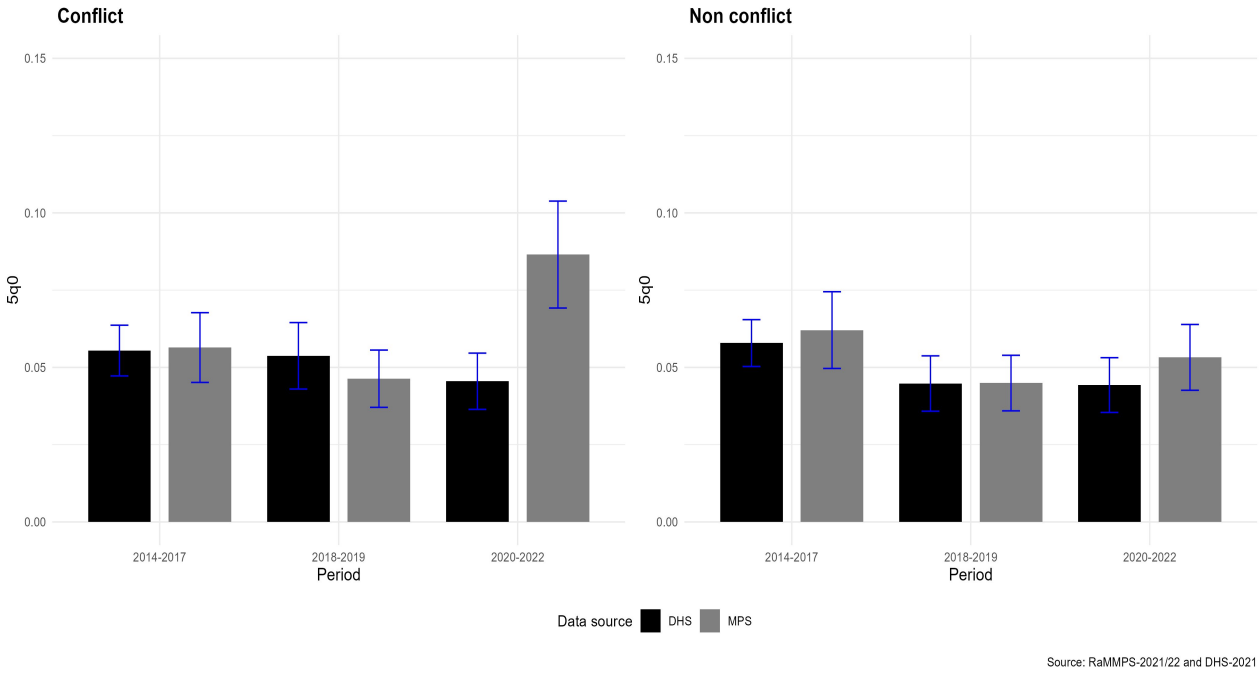
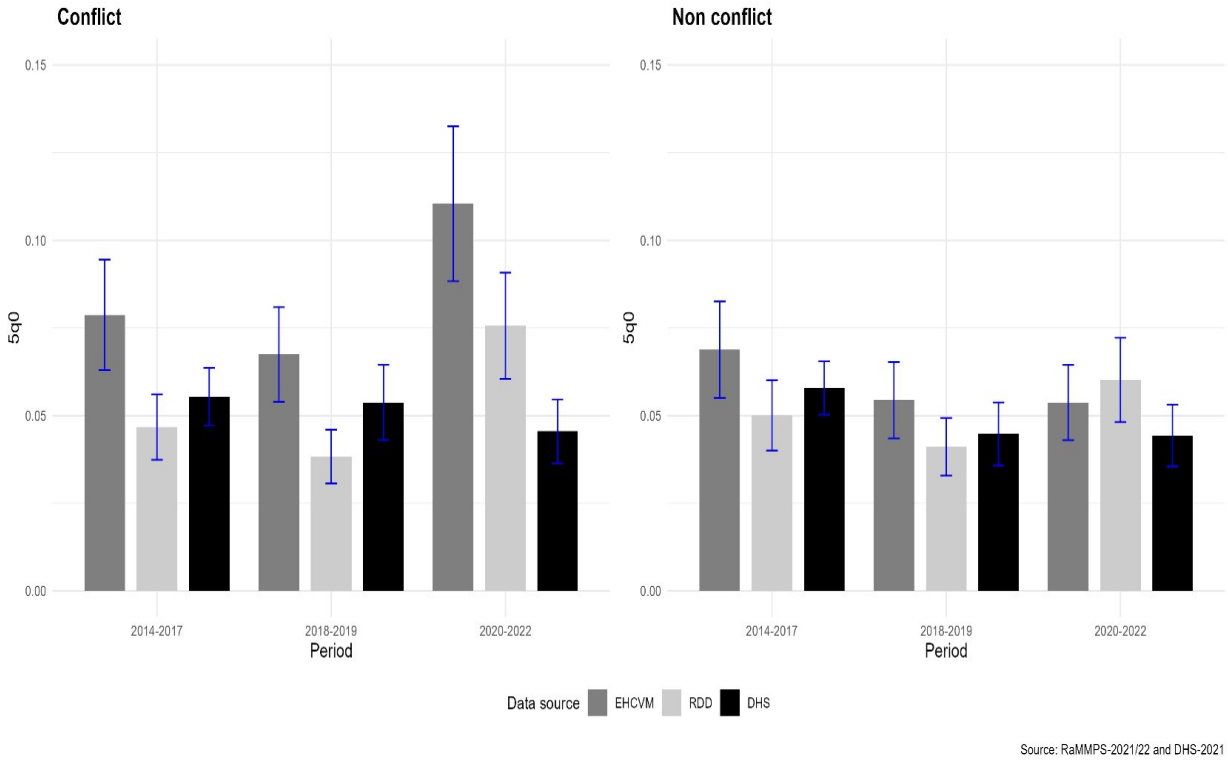


Figure 6.4 illustrates the levels and trends in under-five mortality by data source, period, and security status. As in Figure 6.3, there are no statistically significant differences in mortality levels across the various data sources for any given period in non-conflict areas. In conflict affected areas, the two RaMMPS samples (EHCVM and RDD) are indicative of a mortality reversal in 2020-2022. As indicated above, this is not the case for the DHS estimates. Further, it is worth noting that the MPS mortality estimates tend to be lower for the RDD than for the EHCVM sample. For the most recent period, this difference is, however, only marginally statistically significant.

Figure 6.4: Trends in under-five mortality based on regional security context, and survey sampling method



The following figures (Figure 6.5, Figure 6.6, Figure 6.7, and Figure 6.8) illustrate under-five mortality levels and trends categorized by age group (infants (1q0) and children (4q1)), data source, and RaMMPS branch. Figure 6.5 and Figure 6.6 focus on trends in child mortality, while Figure 6.7 and Figure 6.8 present trends in infant mortality. The disaggregated results for child and infant mortality confirm the patterns seen in the overall under-five mortality estimates, including variations across RaMMPS branches. Furthermore, they reveal that mortality levels are significantly higher among infants compared to children aged 1–4, as expected.

Figure 6.5: Trends in child mortality based on regional security context, derived from RaMMPS survey and 2021 DHS

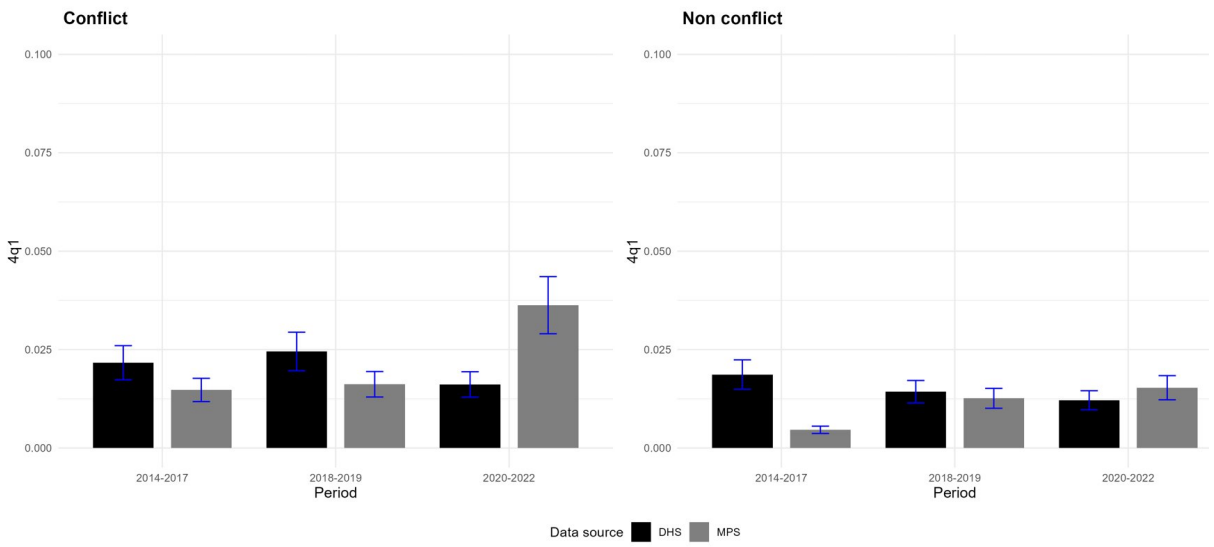


Figure 6.6: Trends in child mortality based on regional security context, and survey sampling method

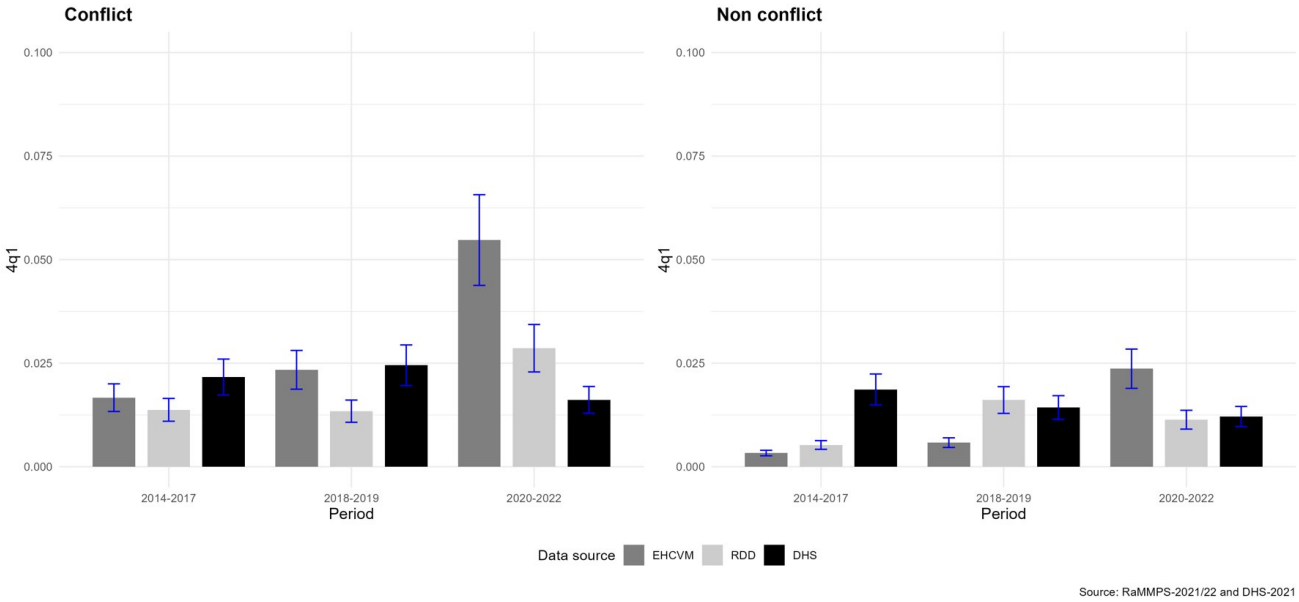


Figure 6.7: Trends in infant mortality based on regional security context, derived from RaMMPS survey and 2021 DHS

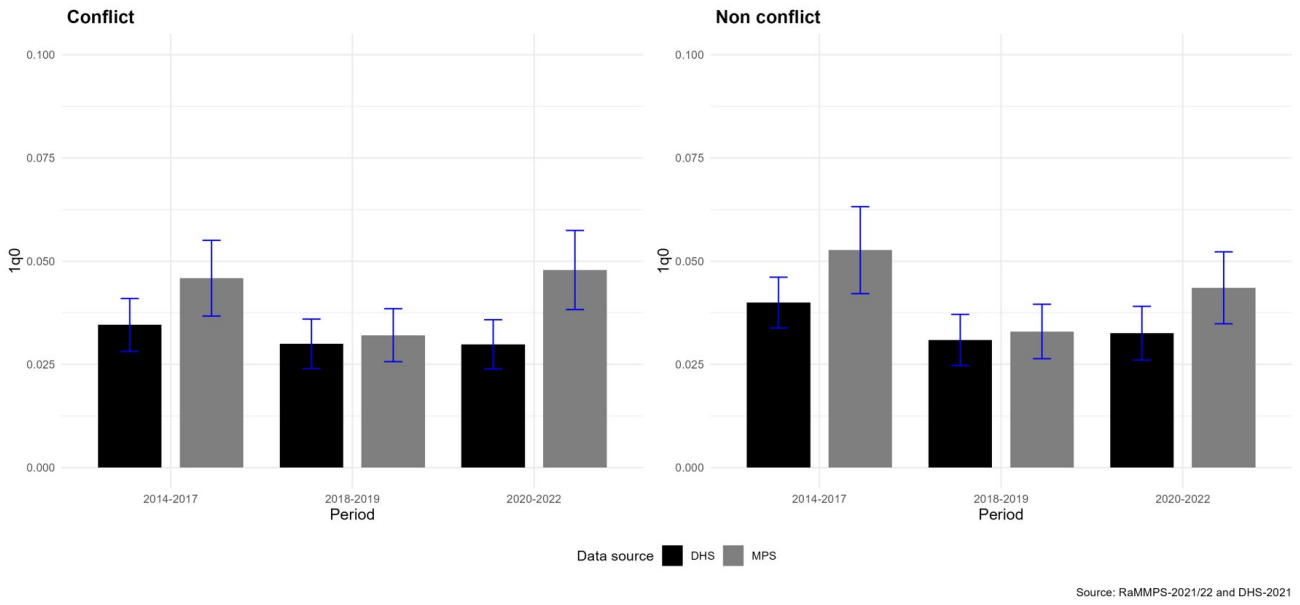


Figure 6.8: Trends in infant mortality based on regional security context, and survey sampling method

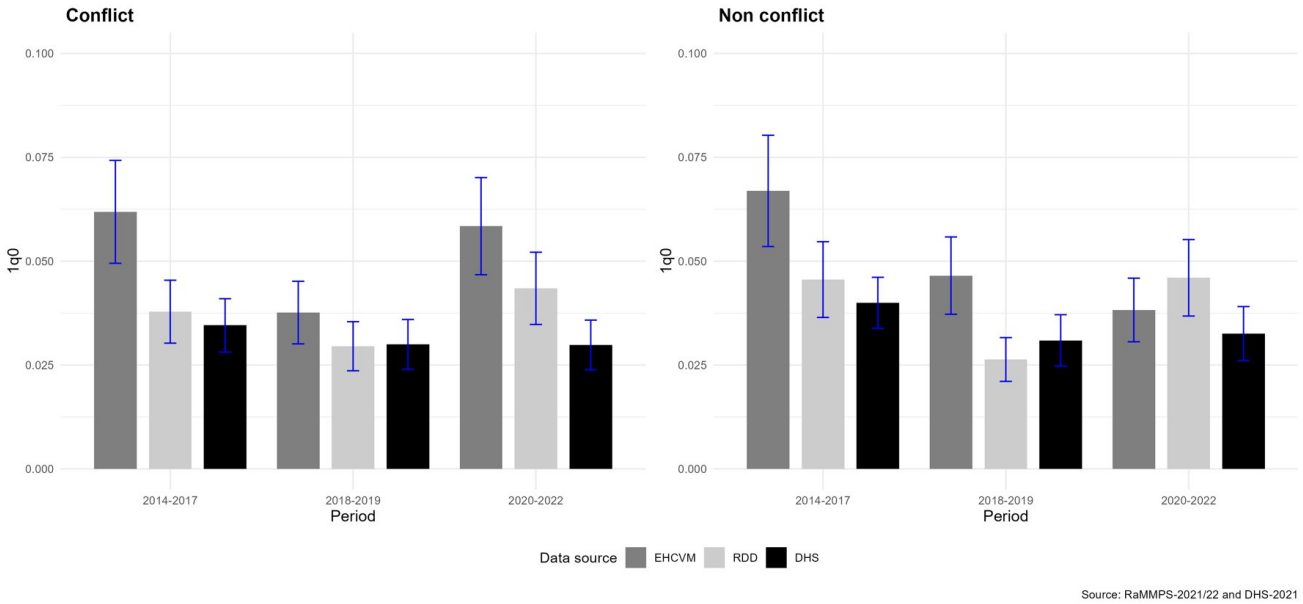


Table 6.2 below provides additional insight into the geographic distribution and mortality patterns of children in the MPS, distinguishing between those residing in provinces included in the DHS F2F sampling frame and those residing in provinces that were excluded from it. As noted earlier, the "Excluded" category corresponds to the provinces of Oudalan and Yagha in the Sahel region, and Kompienga, Komondjari, and Tapoa in the Eastern region, areas where insecurity significantly constrained DHS field operations.

Overall, only 1.8% of the children in the MPS sample (n = 204) lived in provinces not covered by the DHS, while the vast majority (98.2%; n = 11,018) resided in provinces included in the DHS sampling frame. Although the difference in the crude proportion of deceased children between excluded and included provinces appears small (5.7% vs. 5.2%), a more detailed examination of age at death and year of death reveals important differences between the two groups.

Regarding age at death, mortality among children in excluded provinces is more concentrated at older ages: 72.7% of deaths occurred after 12 months of age, compared with only 37.7% in the included provinces. Conversely, infant deaths (<12 months) represent only 27.3% of deaths in the excluded provinces, compared to 62.3% among included provinces. More striking differences emerge when considering the timing of deaths. In excluded provinces, the vast majority of deaths (81.8%) occurred between 2020 and 2022, which is the period marked by heightened insecurity and limited humanitarian access while only 18.2% occurred between 2015 and 2019. In contrast, among children residing in DHS-included provinces, deaths are more evenly distributed, with a larger share occurring before 2020 (59.6% between 2015 and 2019) and a smaller proportion during 2020–2022 (40.4%).

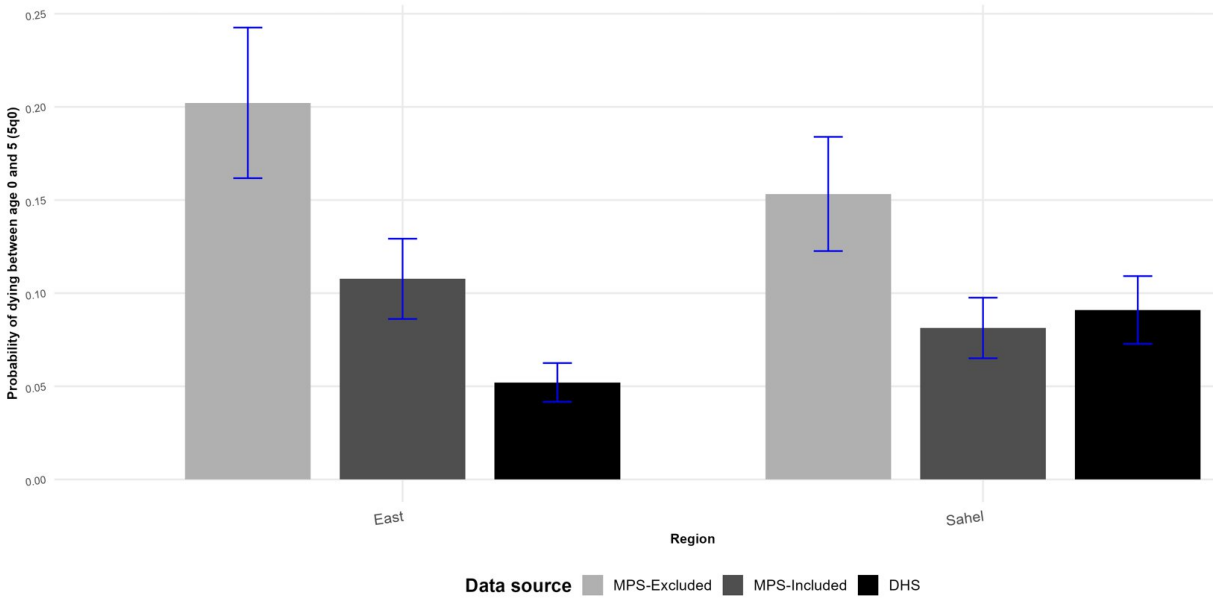
Table 6.2: Proportion of surveyed and deceased children in MPS sample by inclusion in the DHS sampling frame

	Province	
	Excluded	**Included**
Surveyed	1.8 (204)	98.2 (11 018)
Proportion of deceased	5.7 (11)	5.2 (544)
	Age at death	
Less than 12 month	27.3 (3)	62.3 (339)
12 months or more	72.7 (8)	37.7 (205)
	Period of death	
2020-2022	81.8 (9)	40.4 (220)
2015-2019	18.2 (2)	59.6 (324)

In terms of mortality, 5.7% (11/204) of children in excluded provinces had died, compared to 5.2% (544/11,018) in included provinces. Despite this minor difference, under-five mortality rates are significantly higher in the provinces excluded from the DHS (labelled “MPS-Excluded”), suggesting that the DHS may underestimate the under-five mortality rate (Figure 6.9). In the Sahel region, estimates from the DHS and the mobile phone interviews conducted in provinces included in the DHS sample are closely aligned. In contrast, the MPS estimates for the Eastern region are consistently higher than the DHS, even for the same provinces. A

more plausible explanation lies in the internal heterogeneity of the Eastern region. Although some provinces were officially classified as "secure" and included in the DHS sampling frame, security conditions often varied significantly within the same province. Therefore, the DHS survey may have only reached the accessible parts of these provinces, omitting harder-to-reach or partially insecure areas. In contrast, the MPS relying on mobile phone interviews, was able to reach respondents in these more remote or insecure localities, potentially contributing to the higher mortality estimates observed.

Figure 6.9: U5MR estimates for the period 2020-22 by survey source and region of residence



Box 5. Mortality measures based on recent household death in MPS

Although this thesis focuses on the collection of data on close relatives through MPS, relatively little attention has been paid so far to a much shorter instrument focusing specifically on deaths occurring in households during a recent reference period. Such an approach is closer to a mortality surveillance system than to the conventional demographic instruments used in DHS and censuses. Humanitarian guidance similarly emphasizes retrospective household mortality surveys as a practical source of mortality information when routine registration systems are unavailable, while highlighting the trade-off between longer recall periods, precision, and recall error.

In this box, the feasibility of this approach was explored using a household module asking whether any child aged under five or any person aged five years or older had died during the previous three months. Respondents were additionally asked about the time elapsed since each death. These reports were combined with information on household composition and recent household immigration to approximate person-time at risk during the recall period. Mortality was therefore expressed primarily as a crude mortality rate (CMR) per 1,000 person-years, rather than as a conventional probability of dying. Deaths among children under five were further classified into neonatal (<28 days), post-neonatal (28 days to <12 months), and ages 1–4 years.

Table 6.3 compares recent mortality estimates from the household death module of the MPS with estimates from the 2019 census and the 2021 DHS. The MPS estimated a CMR of 27.9 deaths per 1,000 person-years (95% CI: 25.0–31.0), compared with 9.2 deaths per 1,000 person-years from the census. Among children under five, the MPS estimated 5.8 neonatal deaths, 11.8 post-neonatal deaths, and 30.5 deaths at ages 1–4 per 1,000 person-years. The corresponding DHS estimates were 18.0, 13.0, and 18.0 per 1,000 live births, respectively.

These results should be interpreted with caution because the MPS and DHS estimates do not use the same denominator. The MPS estimates are expressed as deaths per 1,000 person-years, whereas the DHS estimates are expressed per 1,000 live births. Consequently, the age-specific estimates cannot be directly compared in terms of their numerical magnitude. The comparison provides descriptive evidence on the levels obtained from the different data sources, but does not constitute a direct validation of the MPS estimates against the DHS estimates. The CMR provides a more direct comparison between the MPS and census estimates because both are expressed per 1,000 person-years.

Table 6.3 : Recent mortality estimates from the household death module of the mobile phone survey compared with Census and DHS estimates

Indicator	MPS	2019 Census	2021-DHS
CMR (deaths/1,000 person-years)	27.9 (25.0–31.0)	9.2	—
Neonatal mortality	5.8	—	18.0
Postneonatal mortality	11.8	—	13.0
Mortality at ages 1–4	30.5	—	18.0

Note: MPS and Census CMR estimates are expressed as deaths per 1,000 person-years. MPS age-specific estimates are also expressed as deaths per 1,000 person-years, whereas DHS estimates are expressed as deaths per 1,000 live births. Therefore, age-specific MPS and DHS estimates are not directly comparable in magnitude.

Implications for the use of MPS in humanitarian mortality surveillance.

The findings support the feasibility of incorporating a short recent-death module into MPS when the objective is to obtain a rapid indication of population mortality. The approach is particularly attractive because it requires less respondent burden than a full retrospective mortality history and can be deployed remotely when face-to-face data collection is constrained. A recent study from Malawi similarly demonstrated the feasibility of collecting mortality information through mobile phone interviews, supporting the potential of telephone-based mortality measurement (Chasukwa et al., 2022). More recent work in Guinea-Bissau also highlights the importance of accurately recording the timing of recent deaths and shows that standard questions about dates of death remain subject to reporting error, even when calendar-based aids are introduced (Torrisi et al., 2025).

However, several improvements are needed before the approach can be considered a validated mortality surveillance method. First, the questionnaire should collect the exact date of death, rather than relying only on elapsed time. Second, the dates of household members' arrival should be collected more precisely to improve the calculation of person-time at risk. Third, age and sex should be recorded for each deceased person. For children, information on date of birth and live births would additionally make it possible to derive conventional neonatal, post-neonatal, infant, and under-five mortality measures that are more directly comparable with DHS and census estimates.

6.5 Discussion

In this chapter, I assessed whether MPS might complement or remedy the limitations of in-person data collection methods during humanitarian crises, using Burkina Faso as a case study. Uncertainties surrounding the funding of the DHS Program following the dismantling of the U.S. Agency for International Development by the Trump administration further heightens the relevance of cheaper alternatives to large household surveys for monitoring demographic and health trends in LMICs (Duthé, 2025). We have to date limited experience with MPS for measuring mortality in crisis settings. A number of studies demonstrated acceptability and feasibility of MPS for mortality analysis (Chasukwa et al., 2022; Morgan et al., 2025). Sample selection bias owing to unequal mobile phone ownership and participation is another key

methodological challenge that can limit the external validity of MPS. Sample selection can be mitigated through the imposition of sampling quotas and post-stratification weighting. They offer a correction in the expected direction, but in the absence of a gold standard, it is impossible to establish whether this removes bias entirely.

Our results suggest that MPS are better suited for estimating mortality in populations affected by humanitarian crises than traditional F2F surveys such as the DHS. In the most secure provinces of Burkina Faso, under-five mortality estimates from both the MPS and the DHS are comparable and suggestive of stagnating mortality levels. In provinces where, armed conflict is most pronounced, MPS are indicative of a mortality reversal (after 2020); a trend that is not captured in the 2021 Burkina Faso DHS. Our analysis suggests that this downward bias is due to the exclusion of the most inaccessible areas from the DHS sampling frame. This corroborates a study from Cameroon that documented the potential of MPS for mortality measurement in areas with Boko Haram–induced insecurity (Gignoux et al., 2020). In our study, the mortality increases in conflict-affected areas characterized both arms of the MPS, irrespective of the sampling method. However, the respondents recruited from pre-existing phone numbers tended to report a higher number of under-five deaths than those called at random. As discussed in the previous chapters (Chapter 3), it is possible that the establishment of a relationship of trust was facilitated when calling people who had previously been contacted in the EHCVM, compared to those called at random.

In areas without security challenges, we found no significant difference in mortality estimates between MPS and F2F surveys. This finding corroborates observations from other RaMMPS surveys conducted in Malawi (Chasukwa et al., 2022) and Mozambique (Kante et al., 2025).

The elevated child mortality in areas affected by armed conflict can be attributed to several factors. First, insecurity may directly cause violent deaths, as children can be unintentionally or intentionally harmed during attacks, explosions, or crossfire (ACLED, 2025b). While these events do not represent the majority of child deaths, their occurrence increases overall mortality levels and reflects the immediate consequences of living in unstable environments. However, collecting reliable information on conflict-related child deaths remains extremely challenging (Colombo & Terracini, 2025). Second, the security crisis has led to the deterioration of already fragile healthcare infrastructure, limiting access to health services for millions of displaced and non-displaced individuals (Diamondstein, 2022; HRW, 2023). Further, the economic slowdown or cessation of activities in high-conflict areas has exacerbated financial strain (Badini et al., 2022; Louart et al., 2021; Nikiema & Dedewanou, 2024; Tapsoba et al., 2021), and worsened child malnutrition (Costanza, 2024; Druhen, 2023). These security-related challenges were

compounded by the COVID-19 crisis (Lanau et al., 2023; Yankey et al., 2025). For internally displaced persons in particular, COVID-19 worsened living conditions, reducing humanitarian aid and increasing malnutrition (Ozer et al., 2022). Research also reported difficulties experienced in accessing healthcare services during the pandemic, even in rural areas (Bonnet et al., 2023). Additional studies have showed the combined negative effects of COVID-19 and insecurity on people's livelihoods, notably by disrupting agricultural activities, exacerbating psychosocial distress among displaced populations, and limiting access to essential services (Badini et al., 2022; Yougbaré et al., 2022). These negative impacts increase the risk of mortality in the general population, particularly among children. Although infants typically experience higher mortality levels than children aged 1–4 years, a trend well documented in LMICs (Lawn et al., 2005; Liu et al., 2016), our results suggest that the increase in mortality was more pronounced above age 1. The *relative* difference between MPS and DHS estimates was also greater for child mortality ($_4q_1$) than for infant mortality ($_1q_0$) in conflict-affected areas. This pattern indicates that the adverse effects of insecurity may weigh more heavily on children aged 1–4 than on infants. Infants depend heavily on maternal care, including breastfeeding, which helps protect them from infections and nutritional deficiencies even in unstable environments (Victora et al., 2016). In contrast, children aged 1–4 are more susceptible to environmental risks as they begin to eat solid foods, rely on household food security, and become more mobile in unsafe surroundings. These factors increase their risk of malnutrition, diarrheal diseases, respiratory infections, and decreased care-seeking during crises, issues known to elevate under-five mortality during conflicts (Wagner et al., 2018).

Beyond retrospective mortality estimation, the household death module shows the potential of MPS for recent mortality monitoring. The module covered deaths during the previous three months, which reduced the recall period compared with the truncated birth history. This short format may provide timely mortality information in settings where face-to-face surveys are difficult. It also differs from conventional birth and sibling histories because its purpose is closer to mortality surveillance. Evidence from Malawi supports the feasibility of mortality reporting by telephone (Chasukwa et al., 2022), while findings from Guinea-Bissau show that the timing of recent deaths remains subject to reporting errors (Torrisi et al., 2025). Our results therefore support the feasibility of the approach, but not its validation as a mortality surveillance method.

Comparability with conventional mortality measures remains a limitation. The household module expresses mortality per 1,000 person-years, whereas DHS age-specific estimates use live births as the denominator. The two sources therefore do not permit direct comparison of

age-specific levels. Future applications should collect exact dates of death, more precise information on household members' arrival, age and sex at death, and, for children, dates of birth and live births. These data would permit conventional neonatal, post-neonatal, infant and under-five mortality estimates.

While our findings demonstrate the potential of MPS for measuring mortality in crisis-affected settings, it is important to maintain a cautious perspective. Several unresolved issues remain. First, challenges related to data quality persist, including potential reporting errors and recall biases in mobile phone interviews that are not yet fully understood. Second, other sources of bias associated with MPS, such as selective nonresponse, interviewer effects, and coverage gaps due to mobile phone ownership, require further examination. These limitations indicate that MPS should be viewed as a valuable complement to, rather than a complete substitute for, traditional survey methods in fragile contexts. Finally, it is important to acknowledge some limitations related to the survey instruments used in the RaMMPS. First, specific information on households' exposure to violence or forced displacement was not collected in our study, which limits our ability to interpret mortality differences in conflict-affected areas. Second, the truncated birth history (TBH) instrument used in the Burkina Faso RaMMPS restricts the reconstruction of mortality trends over time, as older estimates tend to be less precise, potentially affecting the comparability of mortality across different periods (Hill, 2014; Masquelier et al., 2023).

7 Linking MPS and household data to investigate under-five mortality in Sub-Saharan Africa: the roles of food insecurity and household composition in conflict settings[6]

In this chapter, I build on the record linkage of two datasets collected through MPS to further *examine the impact of armed conflict on under-five mortality in Burkina Faso and to also explore the socio-economic determinants of child survival during periods of insecurity.*

This chapter uses data from two sources: the RaMMPS survey analyzed in the previous chapters and the HFPS (LSMS-HFPS) led by the National Statistical office, with support from the World Bank (2020–2024). I compare the characteristics of samples from both surveys and use direct mortality estimation techniques and survival analysis to evaluate variations in mortality across different security zones.

7.1 Introduction

In 2023, approximately 4.8 million children under the age of five died worldwide (UN IGME, 2024). A significant number of these deaths occurred in fragile and conflict-affected settings. In the 39 countries classified as fragile, the under-five mortality rate was 70 deaths per 1,000 live births, nearly three times higher than in non-fragile contexts. Although these countries comprised only 25% of global live births, they accounted for 47% of all under-five deaths (UN IGME, 2024). Understanding the determinants of child mortality and monitoring child mortality levels are major challenges for public health policies and a country's development. These efforts help to assess the effectiveness of health interventions, track progress in child survival, and guide decision-making to improve care for the most vulnerable populations (Requejo et al.,

[6] This chapter is based on a manuscript currently under review: Dianou, K., Masquelier, B., Helleringer, S., Lankoandé, B., Compaoré, Y., Billa, O., Soura, A., & Reniers, G. (Manuscript under internal review). Linking Mobile Phone Surveys (MPS) and household data to investigate under-_ve mortality in Sub-Saharan Africa: the roles of food insecurity and household composition in conflict settings.

2022). In conflict settings, this surveillance becomes even more essential, as crises heighten risks to child health through the destruction of healthcare infrastructure, disruptions in vaccination and nutrition services, and increased food insecurity and forced displacement (HRW, 2023; WHO, 2023). However, monitoring child mortality during conflicts is particularly challenging: access to affected populations is restricted, death registration systems (where they exist) are often disrupted, and traditional demographic surveys become difficult to conduct. In addition, the collection of reliable child mortality data faces structural limitations in many African countries, where civil registration systems are often incomplete or delayed (AbouZahr et al., 2015). This is the case, for example, in Sahelian countries, particularly in Burkina Faso, which faces significant challenges in data collection due to security issues, with around 40% of its territory being inaccessible due to terrorist control (Human Rights Watch, 2023). As indicated in the previous chapter, the violence has displaced roughly 10% of the population and caused numerous civilian and military casualties, thereby complicating the execution of surveys and censuses (WFP, 2023). This situation affects access to healthcare, and nutrition, and creates disparities in mortality rates among displaced populations, host communities, and those who remain in place. However, due to unreliable data, assessing the true extent of these impacts, is difficult.

Surprisingly, as we have seen in the previous chapter, child mortality trends in Burkina Faso, based on F2F data such as DHS and census, suggest that mortality has declined despite the ongoing security crisis. For example, the under-five mortality rate over the five years preceding the data collection date, estimated from DHS data for 2010 and 2021, shows a decline from 129 per 1,000 in 2010 to 48 per 1,000 in 2021 (INSD, 2021). The UN IGME estimates also reflect a similar trend (UN IGME, 2025). However, as we have shown in the preceding chapter, these figures are likely biased due to the exclusion of hard-to-reach areas during F2F surveys and the absence of adjustments in UN IGME models for the current deterioration of the security.

The MPS conducted in Burkina Faso offers valuable mortality estimates, but it provides limited insight into the underlying causal mechanisms. To address this limitation, the data can be integrated with other sources, such as HFPS. In this chapter, I adopt this combined approach, aiming to improve the understanding of child mortality patterns in conflict-affected areas and to fill a methodological and analytical gap in the literature. Both surveys relied on phone numbers provided by the same households during the 2018–2019 F2F survey, allowing for the merging of these datasets. This integration presents an opportunity to study child mortality levels and their determinants in crisis settings.

Several studies have investigated the determinants of under-five mortality in SSA. Research indicates that the leading causes of death among children under five are primarily preventable diseases, including diarrhea, pneumonia, malaria, and HIV. These health conditions are further exacerbated by recurrent infections, malnutrition, and socio-economic factors such as poverty, inadequate healthcare services, and low maternal education levels (Alhassan et al., 2020; Van Malderen et al., 2019; Zewudie et al., 2020). For instance, a recent systematic review by Avelina et al. (2025) identified socio-economic factors, such as poverty and maternal education level, alongside maternal age extremes, multiparity, inadequate prenatal care, and low birth weight as the most commonly reported determinants across multiple studies (Avelino et al., 2025).

Research has also examined child mortality determinants during periods of security or humanitarian crises, particularly in the Middle East and SSA (Atsiya et al., 2021; Dureab et al., 2019; Malembaka et al., 2021; Mehtar et al., 2021). Findings indicate that intensified armed conflicts in SSA are positively correlated with rising child mortality rates, primarily due to restricted access to healthcare services and humanitarian aid delivery (Amsalu et al., 2020; Atsiya et al., 2021). Other studies reveal that the destruction of healthcare infrastructure and limited access to clean water, resulting from armed conflicts, contribute to the outbreak of epidemics such as measles and yellow fever, significantly impacting mortality levels in these regions (Dureab et al., 2019; Mehtar et al., 2021). Further investigations into the causes of increased mortality rates during conflicts have identified multiple key factors, including limited healthcare access and low service utilization (Munyuzangabo et al., 2021), insufficient vaccination coverage (Ngo et al., 2020; Tsadik et al., 2023), poor healthcare-seeking behaviors (Adeyanju et al., 2025), and the qualification level of humanitarian health personnel (Amsalu et al., 2020). For example, Amsalu et al. (2020) examined the high neonatal mortality rates in Chad, Cameroon, and Niger, emphasizing the inadequate training and qualifications of healthcare personnel in pediatric care (Amsalu et al., 2020).

A substantial amount of information regarding the health status of populations living outside of refugee or internally displaced persons (IDP) camps in active conflict zones is not documented in peer-reviewed scientific literature. Among the studies that do provide data on these populations, many rely on retrospective medical record reviews or qualitative research (Malembaka et al., 2021), which can limit the study design and reduces the generalizability of the findings.

There is a gap in the literature regarding studies conducted via telephone or in conflict-affected areas to identify the direct factors influencing high mortality rates in these regions. This study

aims to assess the determinants of under-five mortality in insecurity-affected areas using MPS data.

7.2 Armed conflict, food insecurity, household structure and their impact on child health

Children and women exposed to armed conflicts or terrorist attacks suffer a wide range of injuries and illnesses directly attributable to these crises (Figure 7.1). Household composition including the number of members, family structure (nuclear or extended), and the presence of non-biological members is a key determinant of child well-being (Ekholuenetale et al., 2020). Family demography theories emphasize that residential arrangements shape economic resources, the availability of caregivers, norms of sharing and support, as well as the emotional and institutional stability to which children are exposed (Bessière & Gollac, 2020). Empirical research demonstrates that household structure significantly influences child survival outcomes. Studies indicate that children living in nuclear households with both parents present generally experience the lowest mortality risks compared to all other family arrangements (Houle et al., 2023). The presence of biological parents and an older sibling also contributes to improved infant survival (Wak et al., 2024). In contrast, the presence of multiple adults, polygynous unions, or various forms of family recomposition is associated with elevated risks (Houle et al., 2023). In the Sahelian context, particularly in Burkina Faso, extended family households appear particularly disadvantageous. Evidence shows that children residing in extended households face higher mortality risks than those in nuclear households (Akinyemi et al., 2016). Additional analyses suggest that nuclear households with more than one child tend to provide a more protective environment, while extended arrangements may expose children to greater vulnerability (Menashe-Oren, Bocquier, et al., 2023). Household size, especially the number of young children, has also emerged as a significant determinant. Studies have demonstrated that having three to five children under age five increases the likelihood of under-five mortality (Birhanie et al., 2025). Similarly, at the regional scale in SSA, households with larger numbers of children (3–5 or ≥6) face substantially higher mortality risks compared to households with only one to two children ever born (Ekholuenetale et al., 2020).

The influence of household structure on the survival of children under five is further exacerbated by the effects of conflict-induced forced displacement. Family separation is a frequent consequence of armed conflict (Staver, 2008). Statistics on the demographic profile

of internally displaced persons (IDPs) show a predominance of women and children (Bendavid et al., 2021; IDMC, 2025; UNHCR, 2025a). These displaced families are accommodated either in formal IDP camps or, more frequently, within host households (Davies, 2012; IDMC, 2025; Peisakhin et al., 2025). A growing body of evidence indicates that, in many displacement settings, a substantial proportion of women and children do not reside exclusively in camps but instead live with relatives or host families who provide shelter, social support, and protection (Davies, 2012; Peisakhin et al., 2025). While these hosting arrangements are necessary for the well-being of displaced families, they also place significant pressure on the economic and social resources of host households (Balgah & Yibongka, 2024; Davies, 2012). Qualitative studies further show that displaced women often prefer to stay with host families whenever possible rather than settle in formal camps (Erong, 2017). Despite the growing literature on camp-based IDPs, much less is known about displaced persons living outside camps, particularly in Sahelian contexts. This gap underscores the need to examine the characteristics of households that host forcibly displaced populations and to assess how these hosting arrangements may affect the survival of young children residing in these households.

Food insecurity is a well-documented determinant of under-five mortality, operating through both biological and behavioural pathways. Acute and chronic malnutrition impair immune responses, heighten susceptibility to infectious diseases, and increase mortality risks (Black et al., 2013). Maternal undernutrition during pregnancy further contributes to low birthweight one of the important predictors of neonatal and early childhood mortality (Victora et al., 2021). Beyond direct nutritional deficits, food insecurity reduces dietary diversity, constrains household care resources, and limits access to preventive and curative health services (Gassara & Chen, 2021; Kang et al., 2019; Kota et al., 2025).

A substantive body of empirical evidence links household food insecurity to poorer child health outcomes. Food-insecure households show lower dietary diversity (eating fewer types of nutrient-rich foods), which directly links to worse health, higher risks of chronic diseases (like heart disease), childhood undernutrition (stunting, wasting), and increased overall morbidity and mortality, with severity of insecurity tied to worse outcomes (Chandrasekhar et al., 2017). Maternal nutritional deficits have similarly been identified as a key mechanism driving child survival disparities in low-income settings (Kiel et al., 2007; Neves et al., 2020; Program, 2002; Rasmussen et al., 2009). In the Sahel, where climate shocks, recurrent conflict, and internal displacement are widespread, food insecurity functions as a central driver of household vulnerability and child survival (British Red Cross, 2025; United Nations, 2025).

Armed conflict further amplifies food insecurity and compromises child health. In several conflict-affected settings, higher conflict intensity is correlated with increased global acute malnutrition (GAM) and, to a lesser extent, under-five mortality (de Groot et al., 2025). Internal displacement and rising food prices also contribute to worsening GAM (de Groot et al., 2025). Evidence from Ethiopia indicates that ongoing conflict has disrupted livelihoods and local food systems, leaving more than 5.5 million people facing acute food insecurity (Muhyie et al., 2025). Among displaced households, sharp declines in dietary diversity, shortages of nutrient-rich foods, and increasing reliance on low-quality processed items have been documented (Dardona et al., 2025).

Studies across diverse conflict contexts show that exposure to violence reduces food consumption scores (FCS) and increases negative coping strategies including reliance on less preferred foods, reduced dietary variety, and smaller meal portions (George et al., 2020; Kafando & Sakurai, 2024; Muriuki et al., 2023). In Nigeria and South Sudan, armed conflict has been associated with increases in undernourishment, declines in agricultural productivity, and significant setbacks in child health (de Groot et al., 2025; Eneh & Eneh, 2025). At a broader level, conflict has been shown to slow progress toward the Sustainable Development Goals by an estimated 18 years, with non-linear deterioration as conflict intensifies (Wang et al., 2025). Evidence also suggests that household resilience can buffer some of these effects, though not fully offset them (Agwu, 2023). Comparable deterioration in food security has been observed among displaced populations in recent crises, including Ukrainian refugees (Shumilova et al., 2023).

The case of Burkina Faso is particularly alarming**.** Since 2016, escalating violence has disrupted agricultural production, restricted market access, and triggered large-scale population displacement (Badini et al., 2022; Druetz et al., 2020). Quantitative analyses show that conflict intensity in Burkina Faso reduces household food consumption scores (Kafando & Sakurai, 2024) and increases the use of coping strategies such as reduced food variety and portion size (Dardona et al., 2025; George et al., 2020). These disruptions heighten the risk of nutritional deficiencies among young children and may contribute to elevated under-five mortality in conflict-affected regions.

Children and women in areas affected by armed conflicts and terrorist attacks face a wide range of health risks, leading to increased mortality, especially among children under five (Klimo et al., 2015). Armed violence causes direct harm through injuries and deaths, particularly among pregnant women and young children. Simultaneously, it triggers indirect consequences that undermine maternal and child health. Evidence demonstrates that conflict settings are linked to

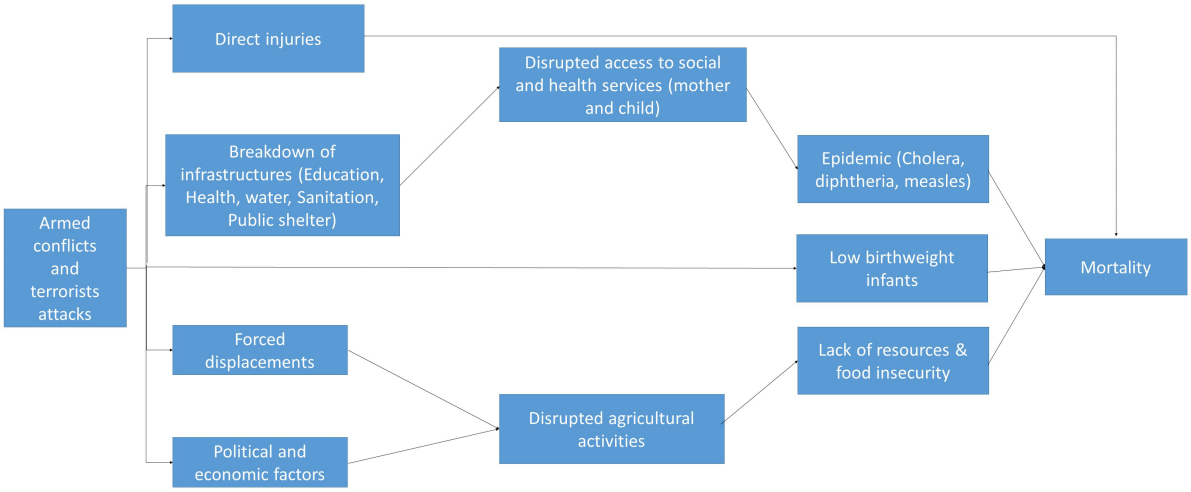
adverse pregnancy outcomes, poorer maternal health, and higher under-five mortality (Keasley et al., 2017; Kotsadam & Østby, 2019; Wagner et al., 2018).

Beyond direct physical harm, armed conflicts impact child survival through interconnected pathways. Insecurity disrupts access to essential preventive and curative health services, such as antenatal care, skilled birth attendance, immunization, and treatment for childhood illnesses. The destruction of infrastructure such as healthcare facilities, water and sanitation systems, schools, and public shelters weakens health systems and leads to increased vulnerability to infectious diseases and pregnancy-related complications (Adeyanju et al., 2025; Dureab et al., 2019). At the household level, exposure to violence is associated with greater psychosocial stress and a higher risk of domestic violence, further endangering maternal and child well-being (Keasley et al., 2017).

Conflicts also cause population displacement, disrupt agricultural production, and weaken local economies, which result in widespread food insecurity and resource shortages (DeJong et al., 2017; HRW, 2023; United Nations, 2025). These factors directly affect child nutrition and indirectly reduce households' ability to seek and afford healthcare, which leads to higher risks of malnutrition, delays in care-seeking, and poor living conditions (CROUZET, 2024; Druhen, 2023). In addition, interruptions to routine health services and supply chains contribute to declines in vaccination coverage and outbreaks of preventable infectious diseases such as measles, cholera, and diphtheria, which further increase the risk of child mortality (Dureab et al., 2019; Mehtar et al., 2021; Sahloul et al., 2016).

Direct and indirect mechanisms contribute to increased mortality rates for children under five in conflict-affected areas. While these pathways have been well-documented in other regions (Mehtar et al., 2021; O'hare & Southall, 2007; Sahloul et al., 2016; Tsadik et al., 2023), there is limited empirical evidence specific to Burkina Faso. This gap primarily stems from difficulties in data collection during periods of insecurity, as traditional F2F surveys often exclude conflict-affected and inaccessible areas, which leads to biased mortality estimates, as we have demonstrated in the previous chapter (Deb & Baudais, 2022; DHS, 2020; INSD, 2021). As a result, the true impact of the security crisis on child mortality is likely underestimated. Improving the measurement of these effects and identifying the key risk factors that drive deteriorations in maternal and child health outcomes are, therefore, essential for the design of effective public policies and humanitarian responses (Colombo & Terracini, 2025).

Figure 7.1: Conceptual framework linking armed conflict and child mortality



7.3 Data and methods

7.3.1 Data

This research draws on national data from MPS conducted by the National Institute of Statistics and Demography (INSD) between 2020 and 2024 and on the RaMMPS data. More details on RaMMPS surveys are provided in Chapter 2, starting on page 32. We describe below the other sources of data.

High-Frequency Phone Survey (HFPS) 2020-2024

The HFPS in Burkina Faso, conducted from June 2020 to July 2024 by INSD in collaboration with the World Bank, aimed to assess the pandemic's impact on households and businesses (more information is available here: https://microdata.worldbank.org/catalog/3768). The survey is another follow-up to the 2018/19 Harmonized Survey on Household Living Conditions (in French EHCVM: Enquête Harmonisée sur les Conditions de Vie des Ménages). It targeted 1,800 households, eventually contacting 2,500, with 1,968 households interviewed in the first phase. To ensure national representation, especially in rural areas, additional households were included in later phases (Table 7.1).

Each month, the same households were re-contacted via mobile phones to answer questions about COVID-19's impact on demographics, access to services, food security, employment,

income, and household shocks. Over time, new modules addressed issues like vaccination, mental health, and economic concerns (Table 7.2). The preferred respondent was the household head, but any knowledgeable adult could participate if the head was unavailable. Pre-loaded household data helped interviewers accurately identify and track households across survey rounds, maintaining the integrity and continuity of the panel.

This in-depth survey has provided insights into the impact of Covid-19 on various aspects of life in Burkina Faso. In addition to assessing the direct effects of the pandemic, it has collected data on the sociodemographic characteristics of respondents, household living conditions, and population movements over time. This dataset enables analyses of forced displacement and its consequences on key areas such as nutrition, health, and mortality (Bonnet et al., 2023; Gourlay et al., 2021).

Table 7.1 : Evolution of sample size and response rates across rounds of the phone survey

Round	Total sample	Additionnal sample	Surveyed	Response rate (%)	Start date	End date
1	2500	0	1968	78.72	2020-06-09	2020-07-01
2	1968	242	2037	92.17	2020-07-20	2020-08-14
3	2120	173	2013	94.95	2020-09-12	2020-10-21
4	2104	91	2011	95.58	2020-11-06	2020-12-02
5	2095	84	1944	92.79	2020-12-09	2020-12-30
6	2071	84	1985	95.85	2021-01-15	2021-02-01
7	2032	47	1979	97.39	2021-02-12	2021-03-02
8	2011	32	1967	97.81	2021-03-13	2021-04-01
9	1998	21	1971	98.60	2021-04-20	2021-05-04
10	1986	15	1946	97.99	2021-05-25	2021-06-15
11	1971	25	1924	97.62	2021-06-28	2021-07-20
12	2199	231	1847	83.99	2022-04-05	2022-05-15
13	1847	0	1735	93.94	2022-06-04	2022-06-30
14	1824	0	1708	93.64	2022-08-30	2022-09-25
15	1807	0	1700	94.08	2022-10-25	2022-11-27
16	1764	0	1688	94.56	2022-12-20	2023-01-22
17	1756	0	1642	93.51	2023-03-11	2023-04-03
18	2500	858	2026	81.04	2023-07-14	2023-08-09
19	2206	0	1851	91.36	2023-09-16	2023-10-30
20	1998	0	1902	95.15	2023-11-18	2023-12-20
21	1984	0	1893	95.42	2024-01-22	2024-02-22
22	1946	0	1829	93.99	2024-03-24	2024-04-22
23	1932	0	1808	94.41	2024-06-15	2024-07-22

Note: Additional samples were introduced in selected rounds to compensate for attrition and maintain sample size

Table 7.2 : Survey modules and data collection rounds

Module	Rounds covered	Number of rounds
Household roster	1–23	23
Access to basic needs	1–23	23
Employment and income	1–13, 15–23	22
Food security	2–5, 8–11, 13, 15, 17–23	17
Economic sentiment	13–16, 18–23	10
Other revenues	3, 5–11, 13, 15, 17	11
Shocks	2, 4, 6, 8, 10, 16, 19, 22	8
Fragility, conflict and violence	2, 4, 6, 8, 10	5
Credit	4, 10, 13, 17	4
COVID testing and vaccination	5, 10, 12, 14, 16	5
Knowledge on COVID-19	1, 3, 5, 10	4
Behavior and social distancing	1, 3, 5, 10	4
Social protection	3, 5, 7, 11	4
Education	5, 15, 21	3
Access to health care (individual)	14, 16–18, 20, 22	6
Food consumption score	18, 19, 23	3
Price of items	15, 16, 18–23	8
Subjective welfare	18–23	6
Concerns	11, 14	2
Personal health questionnaire	7, 10	2
Early child development	8	1
Displacement	15	1
Climate change	16	1
Household mobility	22	1

7.3.2 Methods

7.4.2.1 Measures

7.3.2.1 Dependent variable: Under-5 Mortality Rate

The dependent variable in this study is the under-5 mortality rate, which represents the probability of a child dying before reaching their fifth birthday. This variable was derived from the RaMMPS dataset, which collected reproductive history information from women of childbearing age. As previously mentioned, women were asked about each child born alive in the last 7 years, including their survival status, sex, date of birth, and, if deceased, age at death. These data were then transformed into person-years of exposure and used to compute mortality rates by dividing the number of deaths by the total number of person-years at risk (Hill, 2014).

7.3.2.2 Independent variable: food insecurity

Food insecurity was measured using data from the LSMS-HFPS surveys, applying the Voh methodology based on the Food Insecurity Experience Scale (FIES) (FAO, 2025). The FIES comprises eight questions capturing experiences of food-related constraints over the previous 12 months, including worrying about not having enough food, inability to eat healthy and nutritious meals, eating limited varieties, skipping meals, eating less than needed, having no food at home, going hungry without eating, and not eating for an entire day. This approach employs the weighted Rasch model, which estimates item severity and score distribution, while incorporating survey weights to ensure national representativeness (FAO, 2025).

For this study, we utilized seventeen rounds of HFPS data, selecting the eight core items from the food security scale. In each round, a weighted Rasch model was fitted to estimate item severities, respondent scores, and model reliability. This methodology provides a comparable measure of food insecurity prevalence over time at both individual and population levels. The resulting food insecurity scores were then categorized into three groups: (i) Food secure, (ii) Moderate food insecurity, and (iii) Severe food insecurity.

To capture temporal dynamics, this variable was modeled as a time-varying covariate, allowing its value to evolve across survey rounds. For rounds in which food security information was not collected (Figure 7.2), missing values were imputed using the closest available observation from adjacent rounds (either n−1 or n+1).

7.3.2.3 Independent variable: Household in-migration status

We constructed a categorical variable capturing household in-migration status (none, non-insecurity-related, and insecurity-related), based on the reported reasons for the arrival of new household members across survey rounds. The household in-migration status variable in this study identifies households that received new members between the baseline F2F phase of the EHCVM survey and the start of the HFPS phone survey, or between two rounds of the HFPS survey.

During each HFPS interview, household composition was updated (Figure 7.2). When individuals who were absent in the previous round appeared in the current round, respondents were asked about the reason for their arrival. Similarly, for those who were no longer part of the household, the reason for their departure was recorded. Using these data, we classified households into three categories :

- No migrants – households that did not receive any new members,
- Not due to insecurity – households that received new members for reasons other than insecurity,
- Due to insecurity – households that received new members who left their original location due to security threats.

This variable was also constructed as a time-varying covariate, allowing its value to change across survey rounds

7.3.2.4 Independent variable: insecurity level

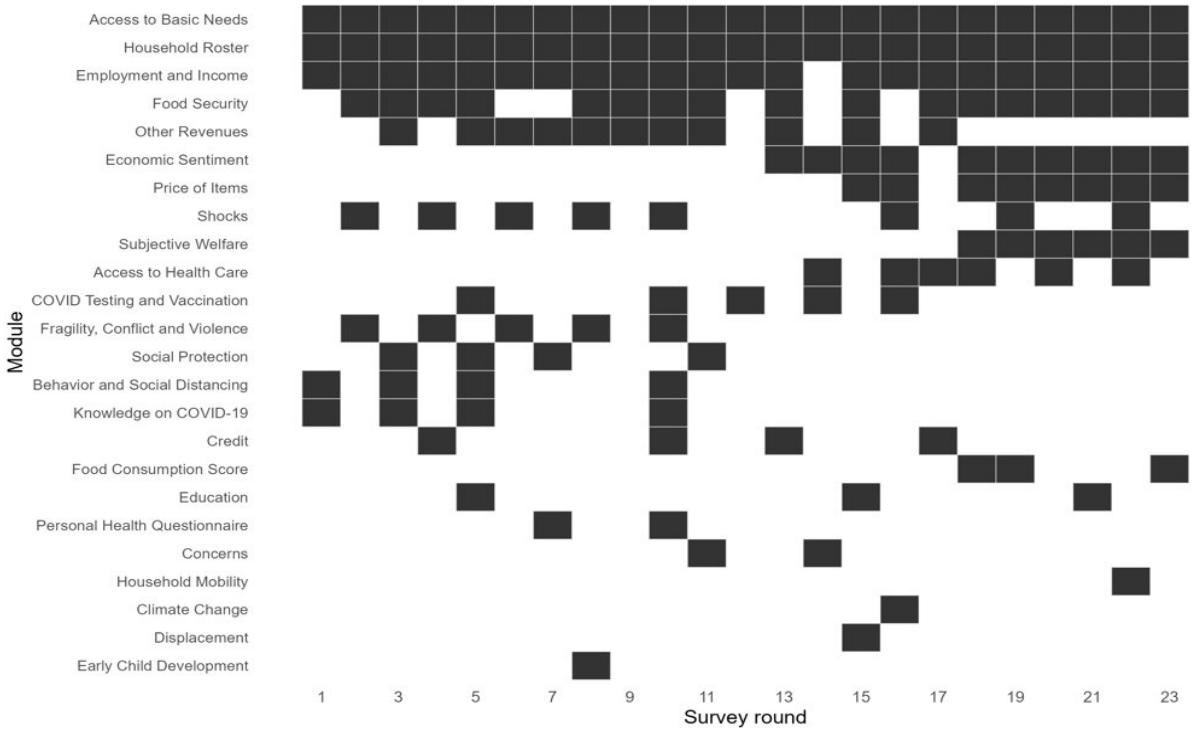
The regional security context was categorized based on the intensity of armed group attacks in each region between 2020 and 2022, as illustrated in Figure 6.2 on page 203. Regions with high levels of insecurity—Centre-Nord, Nord, Sahel, Centre-Est, Est, and Boucle du Mouhoun were classified as insecure regions.

7.3.2.5 Potential Confounders

To account for potential confounding factors, we controlled for several maternal sociodemographic characteristics that could influence under-5 mortality in our final model. Drawing on previous research, we identified three key maternal variables in our dataset that may mediate the relationship between our independent variables and child mortality:

- Maternal age,
- Marital status, and
- Educational attainment.

Figure 7.2 : Distribution of survey modules across rounds



7.3.2.6 Statistical analysis

We first conducted a record linkage between the two databases, matching households and individuals surveyed in the EHCVM branch of the RaMMPS survey with those in the LSMS-HFPS survey. This was possible because both surveys utilized phone numbers initially collected during the F2F 2018/2019 EHCVM, along with household identifiers and respondents' line numbers. We calculated the time gap between the HFPS and RaMMPS data collection dates to identify households surveyed almost simultaneously by both surveys. Next, we evaluated the internal consistency of the dataset by systematically comparing key sociodemographic characteristics of respondents across the two sources (HFPS and RaMMPS) to confirm the accuracy of the matches.

Leveraging the longitudinal structure of the MPS data to differentiate short- and long-term exposure to food insecurity, we first applied survival analysis using Kaplan–Meier curves to estimate the time it takes for food-secure households to transition for the first time into food insecurity. We then fitted a Cox proportional hazards model to identify the factors associated with an increased risk of experiencing food insecurity.

To further assess whether households hosting migrants differ systematically from those that do not, we extended the survival framework by examining the occurrence of migrant hosting as a

time-to-event outcome. Specifically, we estimated Cox proportional hazards models to identify the sociodemographic and economic characteristics associated with the hazard of hosting a migrant over time.

We used linked datasets from the EHCVM branch of the RaMMPS survey and the HFPS to examine factors that influence mortality levels. Children's survival times were estimated through segmentation of life courses according to birth dates and ages at death. Life segments defined by birthdays, changes in calendar year, or completed years before the survey date were compiled into a dataset that represents unique combinations of age, sex, calendar year, and time before data collection. For each period, follow-up time and death counts were calculated with the application of sample weights.

Child mortality indicators were estimated through a standard life-table approach (as shown in previous chapters) that relies on birth histories to derive age-specific mortality rates and compute the probability of survival from birth to age 5 (5q0) (Hill, 2014). Poisson regression models that assume an over-dispersed Poisson distribution were used to assess the association between mortality and the set of independent variables, with the logarithm of exposure time specified as an offset. Deaths and person-years that correspond to periods more than five years before the survey date were excluded. Two models were estimated: one that provides unadjusted estimates and another that yields estimates adjusted for maternal education, residential and migration status, age group, marital status, regional security context, and year of data collection.

As a reminder, we used post-stratification, constructing weights based on household assets, residence, age, and education, to ensure that the sample distribution aligned with both the cross-classification of these variables and the marginal distribution within the population.

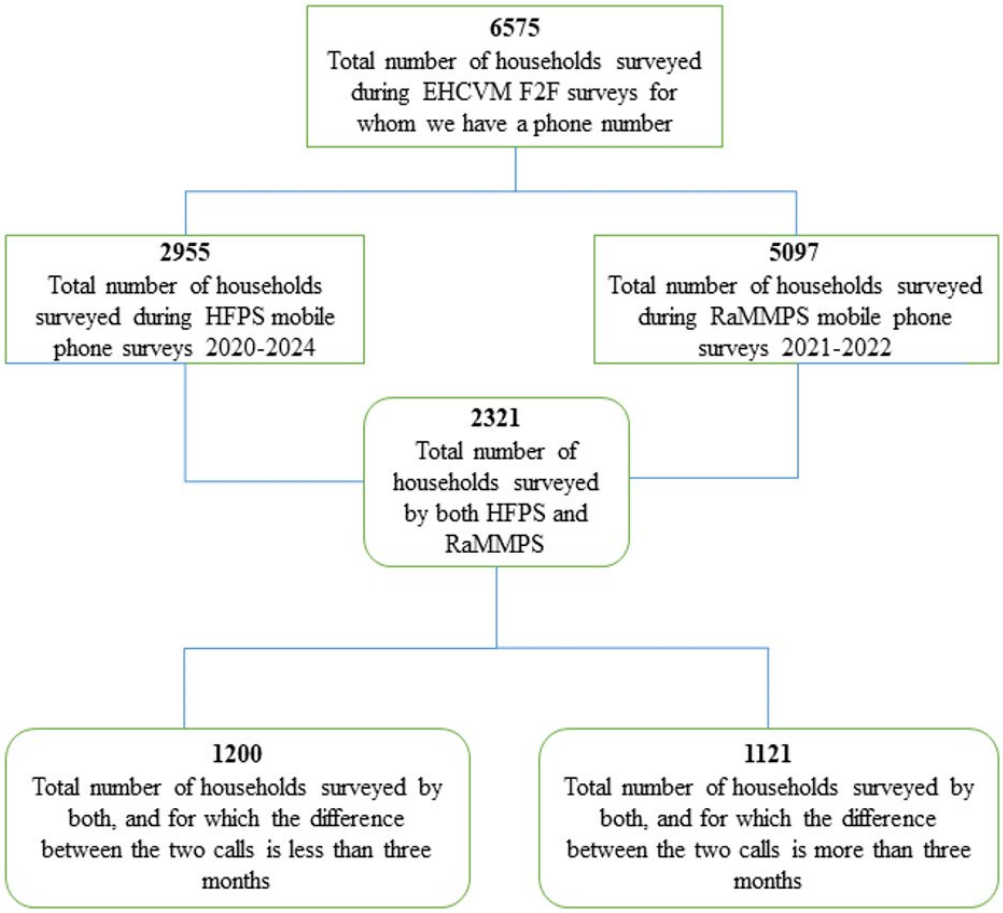
7.4 Results

7.4.1 Characteristics of study participants

Figure 7.3 illustrates the selection process for our analysis dataset, which consists of 1,200 households. The HFPS surveyed 2,955 households, while the EHCVM arm of the RaMMPS survey covered 5,097 households. All these households were drawn from the 6,575 that provided phone numbers during the original F2F survey conducted in 2018/2019. Among these, 2,321 households were surveyed simultaneously by both HFPS and RaMMPS. An analysis of

the time intervals between the HFPS and RaMMPS phone calls shows that 1,200 households were surveyed within less than three months, while 1,121 households were surveyed three months or more apart.

Figure 7.3: Flow chart of the study enrollment process



7.4.2 Socio-demographic characteristics

Table 7.3 shows the composition of the weighted and unweighted RaMMPS-EHCVM samples and compares them to the characteristics of household heads in the World Bank's HFPS conducted from 2020 to 2024. This comparison aims to evaluate the consistency of sociodemographic information across the two data sources. The unweighted RaMMPS-EHCVM sample has a higher proportion of female household heads, younger household heads, and larger households compared to the HFPS sample. However, the gap in the total number of people in the household between the two samples decreases after weighting and considering new household residents in the HFPS sample.

Differences between the two sources are expected, even though both surveys use the same phone numbers and match data at the individual level. Several factors may contribute to these discrepancies: (1) different household members may respond to the survey at different times, resulting in variations in reported household composition; (2) the questionnaire modules and wording differ between RaMMPS and HFPS, particularly in identifying new household members; (3) each survey may experience unique reporting errors or interviewer effects; and (4) the HFPS and RaMMPS rounds were conducted at different times, during which households may have changed (e.g., due to migration or births).

Furthermore, despite the weighting, significant differences in the ages of household heads persist between the two samples, especially among those under 30 and over 50 years old.

Table 7.3: Composition of the RaMMPS-EHCVM sample in Burkina Faso, compared with the World Bank's HFPS 2020-2024

	HFPS			**RaMMPS-EHCVM**		
	Unweighted	**Weighted**	**Total**	**Unweighted**	**Weighted**	**Total**
	%	**%**		**%**	**%**	
Sex of respondent						
Men	85.1	87.1	1,975.0	78.0	84.3	1,810.0
Women	14.9	12.9	347.0	22.0	15.7	512.0
Respondents age group						
15-29 yrs	4.5	5.6	104.0	13.0	15.0	303.0
30-49 yrs	50.4	49.5	1,170.0	53.1	52.0	1,232.0
50 yrs &+	45.1	44.9	1,047.0	33.9	33.0	787.0
Household size						
1-4 Members	26.5	23.2	615.0	21.3	31.5	495.0
5-8 Members	47.9	48.7	1,113.0	45.0	39.7	1,044.0
9 Members&+	25.6	28.1	594.0	33.7	28.8	783.0
Household size[a]						
1-4 Members	28.6	24.3	665.0	21.3	31.5	495.0
5-8 Members	47.8	48.6	1,111.0	45.0	39.7	1,044.0
9 Members&+	23.5	27.1	545.0	33.7	28.8	783.0
Place of residence						
Urban	61.0	36.6	1,417.0	64.1	43.9	1,489.0
Rural	39.0	63.4	905.0	35.9	56.1	833.0
Strate						
Ouagadougou	13.8	14.8	321.0	15.4	23.7	358.0
Other urban	47.2	21.7	1,096.0	48.7	20.2	1,131.0
Rural	39.0	63.4	905.0	35.9	56.1	833.0
Region						
Boucle du Mouhoun	6.0	7.1	139.0	6.2	7.3	143.0
Cascades	6.9	4.1	161.0	7.3	4.0	169.0

Centre	17.8	17.6	414.0	19.5	27.9	453.0
Centre-Est	7.5	10.9	175.0	7.6	9.0	176.0
Centre-Nord	7.5	7.3	173.0	7.1	7.1	166.0
Centre-Ouest	6.3	8.3	146.0	6.2	7.0	145.0
Centre-Sud	6.0	5.3	140.0	5.9	4.5	138.0
Est	7.2	7.3	167.0	6.3	3.8	147.0
Hauts-Bassins	12.1	12.6	280.0	12.3	11.7	285.0
Nord	6.7	7.9	156.0	7.0	7.6	163.0
Plateau-Central	6.3	4.2	147.0	6.0	4.6	140.0
Sahel	3.4	3.7	78.0	2.5	1.3	57.0
Sud-Ouest	6.3	3.8	146.0	6.0	4.3	140.0
Total	100.0	100.0	2,322.0	100.0	100.0	2,322.0

a: exclude new members arrived in the household after EHCVM 2018/2019 survey; EHCVM: Enquête Harmonisée sur les Conditions de Vie des Ménages

7.4.3 Households with short- and long-term exposure to food insecurity

The results of our analyses on food security indicate that approximately 88% of surveyed households experienced food insecurity at least once between 2020 and 2024 (Figure 11.28). The Kaplan–Meier survival curve shows that more than half of these households experienced food insecurity within the first 12 months of follow-up (Figure 11.29). This transition varies based on the sociodemographic and locality-related characteristics of the household head. Specifically, households residing in conflict-affected areas (Figure 7.4) , rural settings (Figure 11.31), those with at least five members (Figure 11.30), and those with at least one child under 14 years of age or an elderly member along with households hosting migrants, particularly internally displaced persons (Figure 11.33) are significantly more likely to experience an earlier shift into food insecurity compared to other households. These differences are statistically significant.

Figure 7.4: Kaplan-Meier curve for time to food insecurity by regional security context

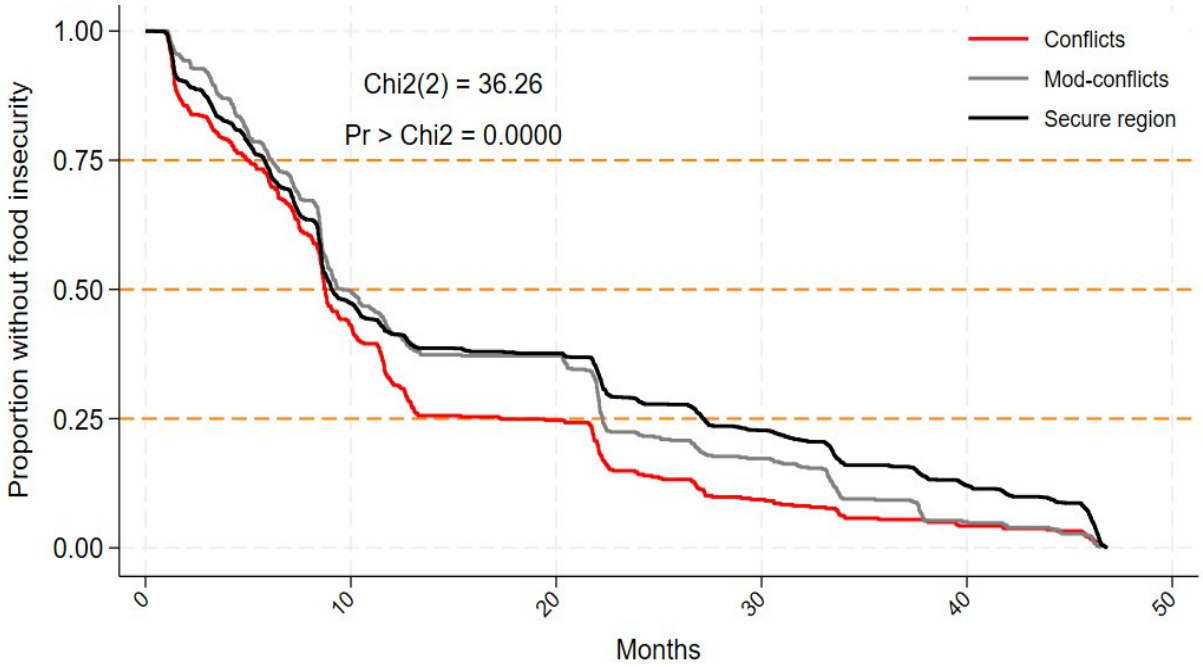


Table 7.4 presents the results of a Cox regression analysis of the risk that a food-secure household experiences food insecurity in Burkina Faso between 2020 and 2024. Overall, the variables included in the model show statistical significance at the 1% level in explaining the risk of food insecurity in Burkina Faso, with the exception of household composition and the sex of the household head. Households located in insecure regions face a higher risk of food insecurity than those in secure areas. In particular, households in high- and moderate-insecurity areas face risks that are 1.6 [1.3–1.8] and 1.2 [1.1–1.5] times higher, respectively, than those of households in secure regions. In addition, households that host internally displaced persons due to insecurity face up to twice 2.1 [1.3–3.1] the risk of food insecurity compared with households that do not host displaced persons. By contrast, the risk of food insecurity does not vary by the sex of the household head.

Table 7.4: Cox regression model for the risk of a food-secure household experiencing food insecurity in Burkina Faso

t	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Region of residence							
Secure region	***1***	.	.	.	.	.	
1. Conflicts	1.619	0.129	6.03	0.000	1.384	1.893	***
2. Mod-conflicts	1.243	0.102	2.65	0.008	1.058	1.459	***
Reason of migration							
No migrant	1	.	.	.	.	.	
1. Not insecurity	1.052	0.132	0.40	0.686	0.823	1.345	
2. Security reason	2.055	0.454	3.26	0.001	1.333	3.168	***
Household size							

Less than 5	1	.	.	.	.	.	
1. 5-9 members	1.218	0.098	2.46	0.014	1.041	1.425	**
2. 10 members and more mbrs	1.206	0.149	1.52	0.129	0.947	1.535	
Household composition							
No child	1	.	.	.	.	.	
1. 1-4 child	1.015	0.113	0.13	0.897	0.815	1.262	
2. 5 children or more	1.126	0.170	0.79	0.429	0.838	1.513	
HH head sex							
Male	1	.	.	.	.	.	
Female	0.991	0.080	-0.11	0.915	0.847	1.161	

Mean dependent var	17.654	SD dependent var	13.790
Pseudo r-squared	0.004	Number of obs	38252
Chi-square	63.617	Prob > chi2	0.000
Akaike crit. (AIC)	14387.226	Bayesian crit. (BIC)	14464.194

*** p<.01, ** p<.05, * p<.1

7.4.4 Analyzing the characteristics of households hosting migrants

Table 7.5 presents the results of a Cox proportional hazards model with time-varying covariates, where the event of interest corresponds to a household receiving a migrant due to security-related reasons. Compared to households living in non-conflict areas, those residing in moderately conflict-affected areas show a higher hazard of experiencing this event (HR = 2.60; $p < 0.01$), while the difference for households in high-conflict areas is not statistically significant ($p = 0.132$). With respect to socioeconomic status, households in the middle and richest wealth categories show significantly higher hazards relative to the poorest group, with hazard ratios of 2.79 ($p = 0.01$) and 4.80 ($p = 0.02$), respectively. No statistically significant association is observed between food security status and the hazard of receiving a migrant for security reasons, although the estimated hazard ratios for moderate and severe food insecurity are below one. Household size shows a marginal association, as households with 5 to 9 members have a higher hazard compared to smaller households (HR = 1.44; $p = 0.068$), whereas no significant difference is found for households with 10 or more members. Household composition, measured by the number of children, is not significantly associated with the outcome. Similarly, the sex of the household head does not show a statistically significant relationship with the hazard of receiving a migrant. The model further indicates a significant time-varying effect for the wealth index (HR = 0.774; $p = 0.013$). The baseline hazard ratios therefore represent the association at the beginning of the observation period, when wealthier households have a higher hazard of receiving a migrant than the poorest households. However,

because the time-varying coefficient is below one, this association weakens over time. In other words, although wealthier households are initially more likely to host migrants, the difference in hazard between wealth groups becomes progressively smaller as follow-up time increases. In sum, the model is statistically significant ($Chi^2 = 49.45$; $p < 0.001$) and is based on 18,685 observations. The pseudo R-squared is relatively low (0.020), which is common in survival models because model fit is not primarily assessed through explained variance. This pattern indicates that household wealth has its strongest association with migrant hosting early in the observation period, after which the relative advantage of wealthier households gradually declines.

Table 7.5: Cox proportional hazards model examining sociodemographic and economic determinants of migrant hosting over time (with time-varying covariates)

_t	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Regional context							
Non-conflicts	1	.	.	.	.	.	
Conflicts	1.405	0.317	1.51	0.132	0.903	2.187	
Mod-conficts	2.6	0.449	5.54	0.000	1.854	3.646	***
Wealth index							
Poorest	1	.	.	.	.	.	
Middle	2.791	1.108	2.59	0.010	1.282	6.078	***
Richest	4.798	3.242	2.32	0.020	1.276	18.035	**
Food security							
Secure	1	.	.	.	.	.	
Moderate	.867	0.169	-0.73	0.464	0.591	1.271	
Severe	.832	0.167	-0.91	0.361	0.561	1.234	
Household size							
Less than 5	1	.	.	.	.	.	
5-9 mbrs	1.44	0.287	1.83	0.068	0.974	2.130	*
10 and more mbrs	1.384	0.402	1.12	0.263	0.784	2.445	
Household composition							
No child	1	.	.	.	.	.	
1-4 child	1.045	0.309	0.15	0.881	0.586	1.865	
5 children or m~e	1.136	0.422	0.34	0.732	0.548	2.353	
HH head gender							
Male	1	.	.	.	.	.	
Female	1.12	0.212	0.60	0.550	0.773	1.624	
TVC							
Wealth index	.774	0.080	-2.49	.013	0.632	0.947	**

Mean dependent var	28.416	SD dependent var	12.254
Pseudo r-squared	0.020	Number of obs	18685
Chi-square	49.446	Prob > chi2	0.000
Akaike crit. (AIC)	2393.971	Bayesian crit. (BIC)	2487.997

Time-varying effect modeled using ln(time)
*** *p<.01, ** p<.05, * p<.1*

7.4.5 Effects of household and mother characteristics on mortality differentials

Table 7.6 presents the coefficients from Poisson regressions that analyze infant, child, and under-five mortality, differentiating between unadjusted and adjusted models. Household food security consistently predicts mortality: infants in severely food-insecure households face a risk more than double that of infants in food-secure households (unadjusted IRR = 2.080; adjusted IRR = 1.996), while under-five children in similar conditions experience nearly double the risk (unadjusted IRR = 1.885; adjusted IRR = 1.730). In contrast, the association between food insecurity and child mortality (ages 1–4) is weaker (unadjusted IRR = 1.440) and not statistically significant once controls are included (adjusted IRR = 1.344). The variable indicating households that host new members who have fled their previous place of residence for security-related reasons is also a determinant, with infants and under-five children in such households facing mortality risks between four and eight times higher than their peers (infant mortality: unadjusted IRR = 5.280, adjusted IRR = 8.036; under-five mortality: unadjusted IRR = 3.485, adjusted IRR = 5.141). This association remains after adjustment for household food security, household size, and other measured characteristics, which suggests that these factors do not fully account for the excess mortality observed among households hosting security-related migrants. Other dimensions associated with forced displacement, such as disruptions in access to healthcare, changes in caregiving arrangements, or increased household vulnerability, were not measured in the present study and therefore could not be examined. However, no significant effect is observed for children aged 1–4 years. Maternal education acts as a protective factor against infant mortality. Infants with educated mothers have about a 56% lower mortality risk than those with uneducated mothers (adjusted IRR = 0.437), and under-five children show a similar reduction (adjusted IRR = 0.575). The regional security context is particularly significant for child mortality, as children aged 1–4 living in secure areas are less likely to die (unadjusted IRR = 0.295; adjusted IRR = 0.120) compared to those in conflict-affected regions; this pattern is not observed for infants or overall under-five mortality. Finally, larger households (five or more members) are facing higher child mortality risks (adjusted IRR = 2.850), although no significant effects are found for infant or under-five mortality.

Table 7.6: Poisson regressions on infant (1q0) child (4q1) and under-five (5q0) mortality, adjusted and unadjusted coefficients

	Infant mortality		***Child mortality***		***Under-five mortality***	
Variables	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Gender						
Male	1	1	1	1	1	1
	(.)	(.)	(.)	(.)	(.)	(.)
Female	0.892	0.814	0.902	2.311**	0.895	1.057
	(-0.48)	(-0.77)	(-0.30)	(1.99)	(-0.56)	(0.25)
Food security						
Secure (ref)	1	1	1	1	1	1
	(.)	(.)	(.)	(.)	(.)	(.)
Moderate	1.631*	1.592	2.086*	1.594	1.770**	1.612*
	(1.69)	(1.54)	(1.78)	(1.09)	(2.42)	(1.96)
Severe	2.080**	1.996*	1.440	1.344	1.885**	1.730*
	(2.07)	(1.83)	(0.60)	(0.45)	(2.08)	(1.67)
Migration						
No migrant (ref)	1	1	1	1	1	1
	(.)	(.)	(.)	(.)	(.)	(.)
Not due to insecurity	0.207**	0.298*	0.647	0.477	0.357**	0.349**
	(-2.33)	(-1.77)	(-0.79)	(-0.98)	(-2.43)	(-2.09)
Due to insecurity	5.280***	8.036***	0.019	0.278	3.485***	5.141***
	(4.62)	(3.55)	(-0.01)	(0.07)	(3.54)	(2.93)
Education						
None (ref)	1	1	1	1	1	1
	(.)	(.)	(.)	(.)	(.)	(.)
Educated	0.444*	0.437**	0.345	1.145	0.414**	0.575*
	(-1.86)	(-2.30)	(-1.41)	(-2.30)	(-2.33)	(-1.89)
Age group of mother						
Less than 29 (ref)	1	1	1	1	1	1
	(.)	(.)	(.)	(.)	(.)	(.)
30-49 yrs	0.544	0.828	0.641	0.599	0.568	0.924
	(-1.41)	(-0.39)	(-0.60)	(-1.38)	(-1.52)	(-0.17)
Marital status						
Unmaried	1	1	1	1	1	1
	(.)	(.)	(.)	(.)	(.)	(.)
Married or cohabiting	0.590	0.209** (-2.31)	182	156	0.889	0.406
	(-0.85)		(0.01)	(-0.01)	(-0.19)	(-1.35)
Regional context						
Insecurity	1	1	1	1	1	1
	(.)	(.)	(.)	(.)	(.)	(.)
Moderate	1.013	1.480	0.814	0.401**	0.916	0.848
	(0.03)	(0.87)	(-0.51)	(-2.01)	(-0.32)	(-0.53)
Security	1.170	1.426	0.295***	0.120***	0.746	0.686
	(0.47)	(0.83)	(-2.76)	(-3.70)	(-1.15)	(-1.25)
Year of survey						
2020 (ref)	1	1	1	1	1	1
	(.)	(.)	(.)	(.)	(.)	(.)

2021	68.265	58.780	0.616	0.117**	1.048	0.680
	(0.48)	(0.46)	(-0.62)	(-2.51)	(0.06)	(-0.51)
2022	155.681	144.100	0.366	0.0822***	1.357	1.036
	(0.58)	(0.57)	(-1.35)	(-2.92)	(0.43)	(0.05)
2023/24	130.874	124.8 (0.55)	0.330	0.0291***	1.163	0.733
	(0.56)		(-1.38)	(-3.12)	(0.21)	(-0.40)
HH size						
< 5 pers	1	1	1	1	1	1
	(.)	(.)	(.)	(.)	(.)	(.)
5 pers or more	0.772	0.627	1.486	2.850*	0.940	0.895
	(-1.05)	(-1.62)	(0.99)	(1.84)	(-0.29)	(-0.45)

Exponentiated coefficients; t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01

7.5 Discussion

Using longitudinal phone survey data collected between 2020 and 2024 by the National Institute of Statistics and Demography and data from the RaMMPS survey, this study examines how the ongoing security crisis in Burkina Faso shapes under-five mortality patterns. The findings indicate that excess mortality among children in conflict-affected settings is linked to the indirect consequences of the crisis, such as population displacement, food insecurity, and disruptions in access to healthcare, although the data do not allow identification of the medical causes of death. Rather, it is driven by a variety of interrelated household-level vulnerabilities. We identify food insecurity, migration-related household arrangements, and maternal education as key factors associated with under-five mortality that may help explain the relationship between insecurity and child survival. Children in food-insecure households, especially those facing moderate or severe food insecurity, show higher mortality risks. Children residing in households hosting migrants displaced by insecurity also face elevated mortality risks compared to those in non-hosting households. Our longitudinal analyses further demonstrate that migrant hosting is not only a marker of vulnerability but also a potential driver of subsequent food insecurity, thus contributing to increased child mortality. Finally, maternal education appears as a protective factor against child death, mitigating mortality risks even in contexts of insecurity and displacement.

Regarding the direct or indirect effects of the security crisis on child mortality differences, our findings indicate that mortality risks vary depending on household food security, migration status and the mother's education level. Children from households experiencing moderate or severe food-insecurity face a higher risk of death compared to children from food-secure households. Several studies have confirmed this relationship between food insecurity through

malnutrition, and high mortality rates, particularly among children under five (Azanaw et al., 2023; Djoumessi, 2022; Mason et al., 2012; Ogbu et al., 2022). Food insecurity is commonly associated with insufficient food availability and limited dietary diversity, which restricts adherence to nutritional recommendations and adversely affects maternal and child health (Nguyen et al., 2023). International agencies, notably the Food and Agriculture Organization (FAO) and the World Health Organization (WHO), highlight the role of a balanced and diverse diet in ensuring adequate intake of essential nutrients, particularly during pregnancy and early childhood, which represent critical periods for growth and development (FAO, 2001). Among mothers, inadequate or poorly diversified diets frequently result in deficiencies in key micronutrients, including iron, vitamin A, and folic acid. These deficiencies increase the risk of anemia, obstetric complications, and low birth weight (Black et al., 2013; Nareeba et al., 2021). Beyond their immediate effects on maternal health, such nutritional inadequacies compromise fetal development and are associated with elevated risks of neonatal mortality and intrauterine growth restriction (Christian et al., 2015; Imdad et al., 2010). Children are also directly affected by insufficient and monotonous diets, which constitute major determinants of both acute and chronic malnutrition. Evidence consistently shows that protein–energy malnutrition and micronutrient deficiencies impair immune function, thereby increasing vulnerability to severe infections such as pneumonia and diarrhea, which remain the leading causes of death among children under five years of age (Vaivada et al., 2017). In contexts of prolonged food insecurity, these nutritional deficits further contribute to irreversible growth faltering, with lasting consequences for physical development and cognitive performance (Victora et al., 2021). In Burkina Faso, malnutrition continues to represent a major public health concern. An assessment of child feeding practices conducted in 2020, based on WHO and UNICEF guidelines established in 2011, reported that only about half of children were breastfed within the first hour after birth, and a similar proportion received exclusive breastfeeding during the first six months of life. Moreover, inadequate dietary diversity in complementary feeding affected more than 70% of children (Dembele & Sanni, 2020). These challenges have intensified in recent years due to the security crisis, which has damaged health, education, and agricultural infrastructure (Cedoca, 2022), limited access to essential services, and aggravated household food insecurity (Human Rights Watch, 2023). The combined effect of these factors explains the differences in mortality rates linked to the prevalence of food insecurity among children.

Children from households hosting migrants due to security reasons face a higher risk of death compared to those from non-migrant households or households hosting migrants for reasons

unrelated to insecurity. These results are consistent with the broader context of forced migration driven by insecurity, which has become increasingly common in conflict-affected regions. The existing literature on the relationship between forced migration and food security has largely concentrated on refugee camp contexts, which has limited empirical evidence on the effects of internal displacement on host households outside such settings. Despite this gap, prior research indicates that conflict-induced displacement intensifies economic and social vulnerabilities among both displaced populations and host families and, in some cases, constitutes the principal factor underlying household relocation decisions (Yuen et al., 2022). As a consequence, households that accommodate individuals fleeing insecurity face heightened pressure on already constrained resources, particularly with respect to food availability and access (Bessière & Gollac, 2020). Food insufficiency and malnutrition are well-established determinants of child mortality, as documented in global assessments of causes of child deaths (Black et al., 2013). In addition to these direct nutritional pathways, forced migration and insecurity may affect child survival indirectly through reduced access to healthcare services and the erosion of community support systems in insecure regions. Empirical studies further show that displacement increases exposure to infectious diseases, especially in contexts characterized by overcrowded and precarious living conditions (Nacher et al., 2024). At the same time, livelihood instability and limited availability of healthcare services in host areas contribute to elevated child mortality risks in displacement-affected populations (Lokotola et al., 2024; Salami et al., 2021). Furthermore, hosting displaced populations often results in larger household sizes. A substantial body of evidence indicates that children residing in larger households face higher mortality risks than those living in smaller households, even after accounting for socioeconomic factors (Akinyemi et al., 2016; Ekholuenetale et al., 2020). Moreover, comparative studies suggest that migrant children experience higher risks of malnutrition, poor physical health, mental health disorders, and mortality than non-migrant children, although they tend to have lower risks of adverse birth outcomes (Chang et al., 2022).

Our findings contribute to the literature on food insecurity in crisis-affected settings by providing empirical evidence that hosting internally displaced persons (IDPs) as a result of insecurity is associated with a higher subsequent risk of household food insecurity. Host households exhibit up to twice the likelihood of food insecurity compared with non-host households, even after adjustment for regional security conditions and other relevant covariates. These results suggest that migrant hosting is not merely a marker of vulnerability but may also act as a driver of deteriorating food security.

Evidence from humanitarian and displacement research supports this interpretation. Large inflows of displaced populations have repeatedly been linked to increased pressure on local resources and markets. In Bangladesh, the arrival of Rohingya refugees was associated with higher levels of food insecurity and reduced dietary diversity among host communities, driven by increased demand for basic goods, labor market competition, and rising living costs. These effects persisted even after accounting for humanitarian assistance (Tran et al., 2025). Comparable dynamics have been documented in West and Central Africa, where the rapid expansion of IDP populations has exceeded the capacity of local food systems and basic services, thereby constraining food availability for both displaced populations and host households (Dialogue Migrations, 2023).

At the same time, displaced households themselves face severe food insecurity, which underscores the bidirectional relationship between displacement and access to food. For example, evidence from Armenia shows that displaced individuals residing with relatives or friends experienced substantially higher levels of reduced food purchasing capacity than non-displaced households, highlighting the economic disruptions associated with displacement (Majnoonian et al., 2024). Studies conducted in refugee-hosting contexts further indicate that host households often face elevated food insecurity. World Bank assessments have shown that households located near camps adopt more negative coping strategies and experience worse food security outcomes than surrounding non-host populations (World Bank Group, 2024).

In parallel, maternal education emerges as a key determinant of differences in child mortality in contexts affected by insecurity. A substantial body of literature identifies maternal education as one of the strongest predictors of child survival, given its influence on health-seeking behavior, childcare practices, and access to healthcare services (Fuchs, 2010). Higher levels of maternal education are consistently associated with improved knowledge of preventive health practices, including vaccination and appropriate nutrition, which play a critical role in reducing child mortality. Meta-analytic evidence indicates that each additional year of maternal schooling corresponds to a measurable reduction in child mortality, primarily through enhanced health literacy and more effective use of healthcare services (Balaj et al., 2021; Fuchs, 2010).

Beyond healthcare utilization, maternal education is also linked to improved hygiene and nutrition practices, which reduce exposure to infectious diseases, a leading cause of child mortality in crisis-affected settings (Caldwell, 1980; Nsiah-Asamoah et al., 2022; Tariqujjaman et al., 2022). In insecure and displacement-affected environments, education further functions as a protective factor by facilitating access to information on service availability and enabling mothers to navigate disrupted health systems more effectively. Educated mothers are also better

positioned to advocate for their children's health needs and mobilize available resources under unstable conditions (Antai et al., 2010).

This study has several limitations, many of which reflect well-documented constraints of mobile phone surveys (MPS). Compared with face-to-face interviews, MPS are more susceptible to both sampling and non-sampling biases. Unequal access to mobile phones introduces selection bias, with a tendency to overrepresent younger, urban, male, and more educated respondents (Ben et al., 2015; Lau et al., 2019; L'Engle et al., 2018). Higher non-response rates further affect representativeness (Greenfield et al., 2000). To mitigate these limitations, post-stratification weights were applied. Nevertheless, data quality may still be affected by network connectivity, call quality, and the limited capacity of phone interviews to establish rapport between interviewers and respondents (Blumenstock & Eagle, 2012; Greenleaf et al., 2020; Lynn & Kaminska, 2013). In addition, the HFPS data lack several key variables, and the temporal depth of available information remains limited.

Despite these constraints, the study demonstrates that MPS can serve as a valuable tool for collecting data on child mortality in contexts affected by health and security crises and for informing policy debates on the relationship between conflict exposure and child survival. Notably, contemporaneous face-to-face surveys did not capture these patterns. The analysis further identifies key determinants of under-five mortality in Burkina Faso, with maternal education, household food insecurity, and the hosting of internally displaced persons emerging as the principal factors associated with elevated mortality risks.

Based on these findings, several policy implications follow. First, efforts to reduce under-five mortality in conflict-affected settings such as Burkina Faso should prioritize the expansion of maternal education programs, particularly in insecure areas. Such initiatives should focus on literacy and health education, with the objective of strengthening informed decision-making related to healthcare utilization, nutrition, and childcare. Practical components addressing nutrition, hygiene, and preventive care are essential, given their role in mitigating the risks associated with malnutrition and infectious diseases.

Second, the integration of health and nutrition services in conflict-affected areas is critical for improving child survival. Mobile clinics and community-based interventions should prioritize maternal and child health services, including vaccination, nutritional support, and prenatal care. Effective coordination between local authorities and international organizations is necessary to ensure that food assistance and healthcare services reach the most vulnerable households, particularly those hosting displaced populations. Special attention should be directed toward

pregnant and lactating women and young children, for whom nutritional deficits have long-lasting consequences.

Finally, humanitarian responses should extend beyond displaced populations residing in camps or formal settlements. The results underscore the importance of systematically including host households within humanitarian targeting strategies. Although these households play a central role in absorbing displacement shocks, they face heightened risks of food insecurity and child mortality due to increased pressure on limited resources. Expanding support to host households through food assistance, cash transfers, and access to essential health and nutrition services would reduce negative spillover effects of displacement, strengthen household resilience, and improve child survival outcomes in conflict-affected communities.

8 General discussion

8.1 Main findings

Rather than reiterating the well-documented limitations of civil registration systems and F2F surveys, this section emphasizes the specific contribution of MPS as an alternative or complementary data source for mortality measurement, particularly in fragile and crisis-affected contexts. Although large-scale surveys and censuses remain central to mortality estimation in SSA, insecurity, health emergencies, and logistical barriers increasingly constrain their implementation. In such contexts, MPS provide a pragmatic option to address temporal and geographic data gaps. Nevertheless, their application to mortality estimation remains limited and raises important concerns related to data quality and reporting errors. Accordingly, this doctoral thesis aimed to assess the implications of using MPS for estimating mortality levels and trends in LMICs, using Burkina Faso as a case study. Building on a comparative analytical framework combining population censuses, DHS, HDSS data, HFPS, and RaMMPS MPS, this thesis examined how survey mode affects mortality estimates through four main mechanisms: (1) coverage bias related to mobile phone ownership, (2) differences in estimated mortality levels and trends, (3) reporting errors, including age misreporting, date misreporting, and omission of deaths, and (4) the ability of MPS to capture indirect, household-level pathways through which insecurity influences child mortality.

The answers to the research questions formulated in Chapter 1 are summarized below.

RQ 1: To what extent does mobile phone ownership bias affect mortality differentials observed between MPS and F2F surveys?

MPS depend on access to and ownership of mobile phones, which are not evenly distributed across populations in LMICs (Berry et al., 2021; Lambrecht et al., 2023). Therefore, mortality estimates derived from MPS can be affected by selection bias related to socio-demographic characteristics associated with both phone ownership and survey participation. Chapters 3 and 4 examined the magnitude and implications of this bias for mortality estimation in Burkina Faso.

Chapter 3 focused on the feasibility, efficiency, and representativeness of two MPS sampling strategies implemented under the RaMMPS project: follow-up interviews with respondents from a prior F2F survey (EHCVM-based sampling) and de novo recruitment through RDD. The results indicate that mobile phone ownership and reachability are correlated with place of residence, education, wealth, age, and gender. Compared to census benchmarks, both MPS strategies underrepresented rural, poorer, and less-educated populations; however, these biases were more pronounced in the RDD arm. While the EHCVM-based strategy benefited from higher response and cooperation rates due to pre-existing contact and survey familiarity, it nonetheless inherited the coverage limitations of mobile phone ownership and attrition since the original F2F survey. Bias in mobile phone surveys operates through multiple mechanisms. First, coverage bias arises from the exclusion of individuals without mobile phones. Second, among those who own phones, differential likelihood of being reached introduces contact bias. Third, conditional on contact, variation in willingness to participate leads to nonresponse bias. Importantly, while operational efforts and post-stratification weighting can mitigate some of these selection effects, their effectiveness varies depending on the outcome of interest and population subgroup. In particular, recent evidence suggests that weighting adjustments may be less critical for recovering adult mortality estimates (Sahar et al., 2024). Moreover, any observed discrepancies in mortality estimates cannot be attributed solely to sampling and response biases, as they may also reflect measurement issues such as underreporting or misreporting in mobile phone surveys.

Chapter 4 examined the consequences of these selection patterns for mortality estimation by comparing mortality indicators derived from the RaMMPS survey to estimates from censuses, DHS, and UN model-based estimates. The results show that differences in mortality estimates

vary by age group and by the type of mortality instrument used, highlighting that discrepancies cannot be attributed solely to differential mobile phone ownership. Indirect estimates of U5MR were consistent with UN estimates. In contrast, direct estimates derived from truncated birth histories tended to produce lower mortality levels. More pronounced discrepancies were observed for adult and old age mortality. Estimates of adult mortality (35q15) derived from SSH were lower than UN estimates, and mortality at older ages (30q50) derived from PSH showed large downward biases, particularly among women. These discrepancies align with the selective underrepresentation of individuals from disadvantaged backgrounds who face higher mortality risks, and with reporting challenges exacerbated by shortened questionnaires and the cognitive burden of recalling complex survival histories over the phone. Importantly, UN model-based estimates should not be interpreted as a definitive benchmark, but rather as one point of comparison among several sources.

Results from Chapters 3 and 4 suggest that mortality estimates derived from mobile phone surveys may be affected by a combination of selection and measurement biases. While post-stratification weighting improves alignment with estimates from other sources, it cannot fully correct for unobserved differences between phone survey respondents and the broader population.

Table 8.1: research question 1 and related hypotheses

Research questions and hypotheses	**X/ ✓**
RQ1: ***To what extent does mobile phone ownership bias affect mortality differentials observed between MPS and F2F surveys?***	
H1.1: Mortality estimates derived from MPS differ significantly from those obtained through F2F surveys due to the selective exclusion of individuals without access to mobile phones	✓
H1.2: The impact of inequalities in mobile phone ownership on mortality estimates is more pronounced for adult and older-age mortality than for child mortality.	✓
H1.3: Standard weighting and adjustment procedures reduce, but do not fully eliminate, selection bias in mortality estimation arising from mobile phone ownership.	✓
X = rejected, ✓= accepted	

RQ 2: What are the differences in mortality levels and trends estimated from F2F surveys compared with MPS?

The second research question explores the comparability of mortality levels and trends derived from MPS with those obtained from traditional F2F surveys and model-based estimates

produced by United Nations agencies. Chapters 4 and 6 address this question by examining the degree of convergence between MPS-based estimates and established reference sources, considering variations across age groups, estimation approaches, and crisis-affected settings.

Chapter 4 presented a national-level assessment based on the RaMMPS survey conducted in Burkina Faso in 2021–2022. This chapter focused on how comparability varies by mortality indicator. The results indicate a good convergence with reference estimates for U5MR when using indirect methods based on summary birth histories. In contrast, comparability diminishes for adult and older-age mortality, as MPS-based estimates differ from United Nations benchmarks. These discrepancies report the increased sensitivity of adult and elderly mortality indicators to both survey mode and estimation method. In addition, differences observed in direct estimates of under-five mortality derived from MPS may reflect limitations related to the survey instrument—such as the use of truncated birth histories—rather than the sampling frame alone.

Chapter 6 extended this comparison by focusing explicitly on mortality trends in conflict-affected settings, where F2F data collection is hindered. Using regionally disaggregated under-five mortality estimates, the chapter compared MPS-based estimates with those from the 2021 DHS, which excluded large parts of the national territory due to insecurity. The results show that, in regions not affected by armed conflict, MPS and DHS data show similar patterns of stagnating under-five mortality. By contrast, in conflict-affected regions, MPS data indicate an increase in under-five mortality between the pre-conflict and conflict periods, an increase that is not apparent in the DHS estimates. This discrepancy may arise because F2F surveys conducted in insecure environments might underestimate mortality by excluding the most affected populations, while MPS can partially overcome these geographic and security-related limitations. The findings from Chapter 6 thus demonstrate that MPS can reveal mortality dynamics that remain invisible to conventional survey systems when insecurity restricts fieldwork.

In sum, Chapters 4 indicates that mortality estimates derived from MPS are not uniformly comparable to those from F2F surveys or UN models. For child mortality, MPS can generate estimates that are consistent with F2F surveys and UN estimates, particularly when indirect methods are used. However, for adult and older-age mortality, MPS estimates tend to be lower than reference values, likely due to coverage and reporting errors inherent in phone-based data collection, in addition to constraints imposed by the design of the mortality questionnaires.

Table 8.2: research question 2 and related hypotheses

Research questions and hypotheses	**X/ ✓**
RQ2: ***What are the differences in mortality levels and trends estimated from F2F surveys compared with MPS?***	
H2.1: Compared with F2F surveys, MPS generate mortality estimates that are more prone to measurement errors, leading to systematic and age-specific differences in both the direction and magnitude of estimated child, adult, and older-age mortality.	✓
X = rejected, ✓= accepted	

RQ 3: Can the effects of age misreporting, date misreporting, and death omissions be isolated as drivers of mortality differences between MPS and F2F surveys?

Differences in mortality estimates derived from mobile phone surveys (MPS) and face-to-face (F2F) surveys can be attributed to several reporting mechanisms, including age misreporting, inaccuracies in the dating of events, and the omission of deaths (Lankoandé et al., 2022; Masquelier et al., 2021). Each of these mechanisms has the potential to introduce systematic bias into mortality measurement. Importantly, these sources of error may operate concurrently rather than independently. Their combined effects can partially offset or obscure one another in aggregate mortality estimates, which complicates direct comparisons across survey modes (Jensen et al., 2025). As a result, similarities or discrepancies between MPS- and F2F-based estimates cannot be interpreted without careful consideration of the underlying reporting processes. In this context, identifying the relative contribution of each mechanism is critical for assessing whether observed differences in mortality estimates reflect true variations in mortality levels or are primarily driven by mode-specific reporting errors. A clearer understanding of these processes is therefore necessary to evaluate the validity of mortality measures derived from different survey modalities and to guide the appropriate use of MPS in demographic and health research.

To address this research question, Chapter 5 relied on a validation study conducted within the OHDSS, which provides high-quality longitudinal demographic data (Rossier et al., 2012). Mortality information collected via MPS was linked at the individual level to OHDSS records, allowing for a direct comparison of reported ages, dates of events, and survival status. This design makes it possible to isolate specific reporting errors and to assess their respective impacts on mortality estimates across different age groups and indicators.

While age and date misreporting are present in MPS data, their magnitude is generally modest. Fewer than 10% of respondents reported age discrepancies greater than two years when compared to OHDSS records, and correlations between MPS and HDSS data for ages at death

and years of birth or death were high. Errors were more frequent among less-educated respondents and in interviews conducted outside the home. Importantly, most age and date errors were small, often confined to month-level inaccuracies or shifts of less than one year. These errors tended to cancel each other out at the aggregate level and did not generate substantial distortions in overall mortality estimates. However, some age-specific patterns were affected, particularly for infant mortality and deaths occurring long before the interview. Age and date misreporting occur in MPS, but they are no more prevalent than in F2F surveys and do not explain mortality differences.

Although the sensitivity of MPS in detecting deaths is high particularly for child deaths specificity is lower, especially for sibling deaths, although this is linked to limitations of the OPO data for this type of relatives. Omissions and inconsistencies in reporting survival status are more consequential than errors in ages or dates. Omission of deaths was more pronounced for events occurring several years prior to the interview and varied by respondent characteristics such as gender, education, and marital status. When omission patterns were explicitly incorporated into mortality re-estimation exercises, they led to downward bias in mortality levels, especially for adult mortality derived from SSH.

Our analyses confirm that the impact of reporting errors varies across mortality indicators. For child mortality, omissions and age displacement primarily affect infant mortality estimates, while under-five mortality remains relatively robust due to offsetting errors. For adult mortality derived from SSH, omissions and date errors lead to modest underestimation of mortality levels and trends. For older-age mortality based on parental survival histories, reporting errors introduce additional uncertainty, though external validation remains limited due to the lack of reliable benchmarks.

Table 8.3: research question 3 and related hypotheses

Research questions and hypotheses	**X/ ✓**
RQ3: ***Can the effects of age misreporting, date misreporting, and death omissions be isolated as drivers of mortality differences between MPS and F2F surveys?***	
H3.1: Age and date misreporting are more frequent in MPS than in F2F surveys and contribute to distortions in age-specific mortality patterns.	X (partially)
H3.2: Compared with F2F surveys, MPS are associated with higher levels of death omission and systematic underestimation of mortality.	✓
H3.3: The relative contribution of reporting errors differs by type of mortality indicator (child, adult, household mortality).	✓
X = rejected, ✓= accepted	

RQ 4: **Do MPS capture excess child mortality in conflict-affected areas that is missed by F2F surveys, and through which household-level mechanisms?**

In conflict-affected settings, traditional F2F surveys often face severe operational constraints, resulting in the partial or complete exclusion of insecure areas from sampling frames (DHS, 2020; INSD, 2021; Rosenberg, 2024). This raise concerns that standard survey-based mortality estimates may underestimate true mortality levels and fail to capture excess mortality associated with insecurity. MPS, by contrast, offer the potential to reach populations living in areas inaccessible to F2F surveys and to document mortality patterns and vulnerabilities that would otherwise remain invisible (Torres Munguía et al., 2023).

Chapters 6 and 7 address this research question by combining evidence from (i) regionally disaggregated under-five mortality estimates derived from MPS and DHS data, and (ii) longitudinal and integrated MPS datasets that allow the identification of household-level mechanisms linking insecurity and child mortality.

In regions not affected by armed conflict, under-five mortality estimates derived from MPS align with those obtained from the DHS. Both suggest stagnation but comparable mortality levels over recent periods. By contrast, in conflict-affected areas, MPS data reveal an increase in under-five mortality that is not apparent in DHS estimates. Specifically, MPS estimates indicate a rise in under-five mortality in insecure regions between 2018–2019 and 2020–2022, whereas DHS estimates based on a sampling frame that excluded the most insecure clusters do not show such an increase. This discrepancy could be explained by the systematic exclusion of conflict-affected populations from F2F surveys, leading to an underestimation of mortality in national and regional DHS-based figures.

Analyses integrating HFPS data indicate that the association between insecurity and under-five mortality is closely linked to adverse household conditions, including food insecurity, migration-related household arrangements, and maternal education. Armed conflict is associated with rapid transitions into food insecurity, particularly among households residing in insecure zones, rural areas, and large households.

Households that host internally displaced persons (IDPs) constitute a particularly vulnerable group, as migrant hosting both reflects pre-existing socio-economic strain and contributes to its intensification. Results from survival and regression analyses indicate that household food insecurity and migrant hosting are associated with higher risks of infant and under-five mortality, even after adjustment for key socio-economic characteristics.

Importantly, the available data do not identify the causes of death or children's direct exposure to violent events. Therefore, this study cannot distinguish between direct and indirect conflict-related mortality. Instead, the analyses show that higher under-five mortality is associated with household characteristics linked to the security crisis. In particular, children living in households hosting internally displaced persons (IDPs) face significantly higher mortality risks than those residing in non-hosting households. These associations are strongest among infants, for whom mortality risks are several times higher, and remain statistically significant for under-five mortality after controlling for household wealth, maternal education, household size, and place of residence.

Further analysis indicates that migrant hosting is not randomly distributed across households. Hosting is more frequently observed among larger and relatively wealthier households and in areas characterized by moderate levels of insecurity. Nevertheless, despite these seemingly protective characteristics, hosting displaced populations generates additional vulnerability. Increased household size places greater pressure on food resources, caregiving capacity, and funds for accessing healthcare services, thereby heightening risks for young children.

The combined use of mortality-focused MPS data (RaMMPS) and socio-economic high-frequency phone survey data (LSMS-HFPS) enhances analytical power. This integration enables the simultaneous examination of mortality outcomes, household vulnerabilities, and dynamic processes such as transitions into food insecurity analyses that are not feasible using DHS or other F2F surveys alone, particularly in insecure settings. Longitudinal evidence shows that food insecurity and migrant hosting are not static characteristics but evolve rapidly over time, especially in conflict-affected areas. By connecting these dynamics to child survival outcomes, the study exposes recurring patterns of vulnerability that would be undetectable in cross-sectional studies or geographically restricted in-person surveys. Therefore, integrating multiple MPS datasets enables a more nuanced and policy-relevant understanding of mortality differences and their causes in crisis situations.

Table 8.4: research question 4 and hypotheses related

Research questions and hypotheses	**X/ ✓**
RQ 4: Do MPS capture excess child mortality in conflict-affected areas that is missed by F2F surveys, and through which household-level mechanisms?	
H4.1: Child mortality estimates derived from MPS are higher than those from F2F surveys in conflict-affected areas, while estimates are	✓

comparable in secure areas.	
H4.2: Higher child mortality in conflict-affected areas is primarily associated with indirect household-level vulnerabilities such as food insecurity and hosting internally displaced persons rather than with direct exposure to armed violence	X
H4.3: Children living in households hosting internally displaced persons face higher risks of infant and under-five mortality compared to children in non-hosting households, even after controlling for socio-economic characteristics.	✓
H4.4: The integration of multiple mobile phone survey datasets strengthens the ability to identify mortality differentials and their determinants in conflict-affected areas, revealing patterns that are not observable using F2F surveys alone.	✓
X = rejected, ✓= accepted	

8.2 Strengths of this thesis

This thesis presents several important strengths that contribute to the literature on mortality measurement in crisis-affected settings.

First, the thesis adopts a multi-dimensional analytical framework that goes beyond simple comparisons of mortality levels across survey modes. Rather than treating discrepancies between MPS and F2F surveys as a single source of bias, the analysis explicitly disentangles multiple mechanisms, including selection bias related to mobile phone ownership, differences in estimated mortality levels and trends, and reporting errors such as age misreporting, date misreporting, and omission of deaths. This integrated approach provides a clearer explanation of why mortality estimates differ by data collection mode, an issue that remains insufficiently addressed in the existing literature.

Second, the analysis draws on a rich set of complementary data sources, including national population censuses, multiple DHS, MPS conducted under the RaMMPS programme, High-Frequency Phone Surveys (HFPS), and longitudinal data from a HDSS. This combination allows for both national-level comparisons and validation analyses at the individual and household levels. In particular, the use of HDSS data as a reference standard offers a “robust” benchmark for assessing reporting accuracy and for identifying specific sources of measurement error in survey-based mortality estimates.

Third, the thesis makes a substantive contribution to the literature on mortality measurement in insecure and conflict-affected contexts. By exploiting the capacity of MPS to reach populations living in areas that are partially or fully inaccessible to F2F surveys, the analysis shows that conventional data sources are likely to underestimate child mortality in insecure regions. This finding has important implications for mortality monitoring and policy prioritization in fragile settings.

Fourth, the thesis explicitly examines household-level mechanisms linking insecurity to child mortality. By combining mortality-focused MPS with longitudinal socio-economic phone survey data, the analysis moves beyond descriptive comparisons to identify indirect pathways through which conflict and insecurity affect child survival, including food insecurity, and household composition.

Fifth, from a methodological perspective, this work advances the literature on data quality in MPS. By separately assessing the contributions of age misreporting, date misreporting, and omission of deaths, the analysis clarifies which sources of error most strongly affect different mortality indicators, particularly child and adult mortality. These results provide practical guidance for researchers and statistical offices that rely on MPS to estimate or adjust mortality levels.

Finally, the thesis benefits from the use of MPS implemented under real operational conditions as part of large-scale national and international data collection programmes. Rather than evaluating MPS in idealized experimental settings, the analysis assesses their performance under the constraints commonly faced by national statistical systems in LMICs, including insecurity, limited financial resources, and the demand for timely data. Although the empirical focus is on Burkina Faso, the relevance of the findings extends well beyond a single country. Many LMICs face similar challenges related to weak civil registration systems, rising insecurity, and increased reliance on MPS. By situating the analysis within global initiatives such as RaMMPS and the World Bank's HFPS, and by grounding the discussion in the literature on mortality measurement, this thesis offers insights applicable to a wide range of fragile and crisis-affected contexts.

8.3 Limitations of this thesis

Despite its contributions, this thesis is subject to several limitations that should be acknowledged when interpreting its findings. These limitations are inherent both to the data

sources used and to the methodological choices required to study mortality in fragile and conflict-affected settings.

A first limitation relates to the absence of a true gold standard for mortality measurement at the national level in Burkina Faso. CRVS systems remain incomplete (Mikkelsen et al., 2015; Niamba, 2019), and even the most widely used benchmarks such as DHS surveys, censuses, or UN-modeled estimates are themselves subject to substantial uncertainty, particularly in insecure areas (INSD, 2019, 2021). As a result, comparisons between MPS and F2F surveys cannot be interpreted as strict validations against a perfectly accurate reference. Instead, the analyses should be understood as relative comparisons between imperfect data sources, each affected by distinct forms of bias (Tabutin, 2006).

Second, while the thesis explicitly examines selection bias associated with mobile phone ownership, it cannot fully eliminate this bias. Although post-stratification weights were applied to adjust for observable differences in age, sex, education, and place of residence, unobserved characteristics may still be unevenly distributed between phone owners and non-owners. This limitation is particularly relevant in conflict-affected settings, where displacement, loss of assets, and network disruptions may jointly influence both mobile phone access and mortality risks.

Third, the quality of mortality reporting in MPS remains constrained by the interview mode itself. While this thesis identifies and quantifies specific reporting errors, such as age misreporting, date misreporting, and death omission it cannot directly observe the full cognitive and emotional processes underlying these errors. Shorter interview durations, reduced rapport between interviewers and respondents, and interruptions due to poor network connectivity may affect recall and willingness to report sensitive events such as deaths. These factors may vary across individuals and contexts in ways that are difficult to model explicitly.

A further limitation concerns the measurement of adult mortality, which relies on summary instruments such as summary sibling and birth histories. These instruments are known to be sensitive to reporting errors even in F2F surveys, and their adaptation to MPS may exacerbate these issues (Helleringer, Pison, Kanté, et al., 2014; Mathers & Boerma, 2010). Therefore, the downward biases observed in adult mortality estimates from MPS should be interpreted with caution, as they may reflect both genuine underreporting and structural limitations of the data collection instruments.

The analyses focusing on conflict-affected areas also face important constraints. Although MPS improve coverage relative to F2F surveys, they may still under-represent the most severely affected populations, such as households without stable access to electricity, those living in

areas with destroyed telecommunications infrastructure, or individuals experiencing displacement. As a result, even MPS may underestimate the full extent of excess mortality in the most insecure zones.

Another limitation relates to the generalizability of the findings. Although Burkina Faso is representative of many Sahelian and fragile contexts, the specific patterns of mobile phone ownership, conflict dynamics, displacement, and survey implementation may differ across countries. As such, the magnitude of biases and the performance of MPS observed in this thesis may not translate directly to other settings without careful contextual adaptation.

Finally, while this thesis emphasizes the potential of integrating multiple MPS datasets, such integration is operationally demanding and depends on institutional coordination, consistent survey design, and data sharing agreements. These conditions are not always met in practice, particularly in LMICs. Therefore, some of the methodological approaches proposed in this research may be more challenging to implement at scale than under the relatively favorable conditions of the study.

8.4 The policy and practice recommendations

The results of this thesis carry several implications for policymakers, national statistical offices, and international partners seeking to monitor mortality and population vulnerability in LMICs and crisis-affected settings.

First, MPS should be formally recognized as a complementary data source for mortality monitoring, particularly when F2F surveys are infeasible due to insecurity, health emergencies, or logistical constraints. While not a substitute for robust civil registration systems, MPS can provide timely and actionable information that would otherwise be unavailable, especially in settings where CRVS systems are underperforming and where data collection is hindered by resource limitations, restricted mobility, or access constraints.

Second, policymakers should interpret conventional mortality estimates with caution in conflict-affected settings. Apparent declines or stagnation in child mortality derived from F2F surveys or modeled estimates may partly reflect coverage gaps rather than improvements in survival. Integrating MPS evidence can help identify hidden excess mortality and prevent optimistic assessments of progress toward child survival goals.

Third, the findings show the importance of addressing indirect household-level drivers of child mortality in humanitarian and development responses. Food insecurity and the hosting of

internally displaced persons emerged as key mechanisms linking conflict to increased child mortality. Policies and humanitarian interventions should therefore extend beyond camp-based assistance to include host households, which often absorb displaced populations at substantial economic and nutritional costs.

Fourth, investments in women's education and household resilience remain critical. The protective role of maternal education on child survival observed across analyses has implications for policies aimed at sustaining girls' schooling and adult education during periods of crisis. Programs aimed at stabilizing household food security through cash transfers, food assistance, or livelihood support are also likely to yield gains in child survival.

Finally, national statistical systems and their partners should invest in institutional capacity for MPS implementation and analysis. This includes developing standardized protocols, strengthening interviewer training, ensuring transparent documentation of selection and response processes, and routinely applying bias-adjustment techniques. Embedding MPS within official statistical strategies can enhance their credibility and policy relevance.

8.5 Future research directions

The findings of this thesis open several avenues for future research aimed at improving mortality measurement and understanding vulnerability dynamics in LMICs, particularly in fragile and conflict-affected settings.

First, further work is needed to refine survey instruments for mortality measurement in MPS. Experimental studies, such as Randomized Controlled Trial (RCT), comparing alternative questionnaire designs such as summary sibling histories, event calendars, or repeated short modules could help identify formats that minimize reporting errors while remaining feasible within the constraints of phone interviews. Cognitive interviewing and qualitative follow-up studies would be particularly valuable to better understand how respondents recall and report deaths over the phone, and how this process differs from F2F interactions.

Second, future research should explore hybrid and adaptive survey designs that combine MPS with targeted F2F data collection. For example, limited in-person surveys could be used to calibrate phone-based estimates or to validate mortality reporting in specific subpopulations, such as displaced households or residents of high-insecurity zones. Adaptive sampling strategies, in which survey protocols evolve in response to observed non-response or bias patterns, also warrant further investigation.

Third, there is a need to advance statistical methods for correcting selection and reporting biases in MPS data. Beyond post-stratification weighting, future studies could assess the performance of model-based approaches, including Bayesian hierarchical models, small-area estimation techniques, or data integration frameworks that explicitly combine MPS data with census, DHS, or health facility data (Mahama, 2022; Zhang et al., 2025). Simulation studies could help quantify the conditions under which these methods reduce bias.

Fourth, the longitudinal potential of MPS remains underexploited. Future research should examine how panel-based MPS can be used to monitor changes in mortality risk and household vulnerability over time, particularly during protracted crises. Such designs would enable causal inference regarding the pathways linking insecurity, displacement, food insecurity, and child mortality.

Fifth, additional work is needed to better understand equity and exclusion in mobile phone–based data collection. Research should explicitly examine which populations remain systematically underrepresented in MPS, including the poorest households, women with limited phone access, and populations in areas with degraded infrastructure and assess innovative strategies to reach them, such as shared phone protocols, community intermediaries, or mixed-mode recruitment.

Finally, comparative research across countries and crisis contexts would help establish the external validity of the findings. Multi-country studies using harmonized MPS instruments could clarify how the performance of phone-based mortality estimation varies by conflict intensity, displacement patterns, and telecommunications infrastructure, thereby informing context-specific best practices.

9 Conclusion

This thesis examined the potential and limitations of MPS for mortality measurement in LMICs, with particular attention to Burkina Faso and to settings affected by insecurity and humanitarian crises. It examined the different sources of survey error that may affect MPS mortality estimates, from coverage, sampling and nonresponse errors to measurement and reporting errors, as well as the role of post-survey adjustments. Across the different chapters, the results

show that MPS can provide valuable mortality information when conventional face-to-face (F2F) surveys are difficult or impossible to conduct. However, their validity depends on how respondents enter the survey, who participates, how mortality information is collected, and how the resulting data are processed. MPS should therefore not be considered as a single survey method with a fixed level of accuracy. Their performance depends on the combination of survey design, population coverage, participation, questionnaire design, interview conditions, and mortality reporting.

The first set of findings concerns representation. Mobile phone ownership creates an important coverage constraint because access to a phone is not evenly distributed across the population. In Burkina Faso, MPS samples over-represented younger, more educated, urban, and relatively advantaged populations, while some groups with potentially higher mortality risks remained under-represented. The problem was particularly relevant among women, who are central to the measurement of child mortality because birth histories are usually obtained from women of reproductive age. The RDD and EHCVM-based approaches also produced different patterns of representation and participation. The EHCVM approach benefited from an existing household sampling frame and longitudinal contact information, whereas RDD provided access to individuals outside the original F2F sample but remained subject to phone access, network coverage, and selective participation. The evidence therefore does not support a universal preference for one sampling strategy. Rather, the appropriate design depends on the survey objective, the availability of a suitable sampling frame, the security context, and the population that must be reached.

Post-stratification improved the alignment of MPS samples with census distributions for several observable characteristics, particularly age, residence, education, household assets, and region. Nevertheless, important differences remained for variables that were not included in the weighting procedure. This result confirms that weighting can reduce some representation errors but cannot fully correct unobserved differences between participants and the target population. The absence of detailed information on the characteristics of mobile phone users also limits the capacity to assess the full extent of coverage bias. Thus, weighted MPS estimates should not automatically be interpreted as fully representative estimates of the national population.

The second major set of findings concerns the survey instruments. The thesis shows that differences in mortality estimates cannot be attributed only to who participates in the survey. The way mortality information is collected also matters. The truncated birth history used for child mortality estimation may lead to omissions or transfers of births and deaths outside the reference period. The summary sibling history used for adult mortality presents additional

difficulties because it provides less detailed information on age, date of death, and time since death than a full sibling history. The resulting adult mortality estimates were substantially lower than external estimates, and imputation of dates brought some estimates closer to expected levels. These findings suggest that the choice of instrument is itself an important component of measurement quality.

The validation study conducted in the OHDSS provides further evidence of this issue. It showed that mortality reporting by phone is affected by omissions, age misreporting, and errors in the timing of deaths. Child deaths were more frequently omitted than surviving children, and reporting accuracy varied according to respondent characteristics and interview conditions. Differences between reported and recorded dates of death also demonstrate that even when a death is correctly reported, its temporal placement may remain uncertain. A representative MPS would not necessarily produce accurate mortality estimates if the questionnaire fails to capture deaths or dates correctly.

The third component concerns the response process. Telephone interviews provide advantages in terms of speed, operational flexibility, and access to populations that cannot be reached safely by field teams. At the same time, the interviewer has less control over the interview environment. Respondents may answer while at work, travelling, in a public place, or under poor network conditions. Interruptions, limited privacy, short interviews, and reduced opportunities for probing may affect the completeness and precision of mortality reports. The validation results suggest that interview conditions deserve greater attention, particularly when respondents report sensitive events such as deaths or provide dates and ages.

These findings have important implications for the interpretation of mortality levels. For under-five mortality, MPS estimates were generally more consistent with F2F surveys and census-based estimates than adult mortality estimates, particularly when indirect methods were used. Direct estimates from truncated birth histories showed evidence of downward bias, whereas indirect estimates were closer to UN IGME estimates. This contrast illustrates why mortality estimates should not be interpreted without reference to the instrument and estimation method used. For adult mortality, the limitations of summary sibling histories were more pronounced. The results therefore suggest that MPS may be more suitable for some mortality indicators than others and that instrument-specific validation should precede large-scale use.

The findings from conflict-affected areas provide an additional contribution. Conventional F2F data suggested continued declines in under-five mortality despite the deterioration of security conditions. By contrast, MPS estimates indicated an increase in under-five mortality in conflict-affected regions during the period of highest insecurity, while mortality remained

comparatively stable in less affected regions. This contrast suggests that conventional surveys may fail to capture part of the mortality burden when insecurity prevents access to selected clusters. At the same time, MPS should not be regarded as free from coverage problems in conflict zones. Populations without stable electricity, mobile network access, or secure living conditions may remain difficult to reach. MPS may therefore reduce, but not eliminate, the exclusion of populations most affected by conflict.

The final chapter extends this analysis by linking mortality information from RaMMPS with socioeconomic information from the HFPS. This approach moves beyond the measurement of mortality levels and provides evidence on potential pathways between insecurity and child survival, including food insecurity and household displacement. It demonstrates that MPS can serve not only as a source of mortality estimates but also as a platform for the analysis of household vulnerability when compatible datasets are available.

This thesis leads to a broader conclusion: *the value of MPS lies less in their ability to replace F2F surveys than in their capacity to complement existing demographic data systems under conditions where conventional approaches face major constraints*. MPS can provide timely information during conflicts, epidemics, and other crises, but their estimates require careful assessment of representation and measurement errors. They are particularly valuable when combined with censuses, DHS, HDSS data, or other independent sources rather than used in isolation.

This thesis also highlights the absence of a perfect reference standard for mortality measurement in Burkina Faso. Civil registration remains incomplete, while DHS, census, and UN estimates are themselves subject to uncertainty, especially in insecure areas. The comparisons presented here should therefore not be interpreted as validation against a definitive gold standard. Rather, they represent comparisons between data sources that have different strengths and limitations. The OHDSS validation study provides a stronger individual-level benchmark, but even HDSS data may contain missed events or classification errors and cover only defined populations and periods.

Future research should therefore focus on reducing specific sources of error and/or seeking a single correction for "MPS bias"**.** Sampling strategies should incorporate better information on mobile phone ownership and access, including among women, rural populations, and populations affected by displacement. Weighting procedures should use auxiliary variables that capture both participation and mortality risk whenever such information is available. Questionnaire design also requires further development. Full birth and sibling histories should be tested against shortened instruments, with particular attention to interview duration and

respondent burden. Validation studies in HDSS settings can provide valuable evidence on omissions, age reporting, and event dating, while repeated surveys can help assess the stability of these errors across populations and crisis contexts.

In sum, this thesis demonstrates that MPS have a meaningful role in mortality measurement in fragile and conflict-affected settings, but their usefulness depends on a clear understanding of who is reached, who participates, what information the instrument captures, and how accurately respondents report it. The distinction between representation errors and measurement errors provides a practical framework for this assessment. Coverage, sampling, and nonresponse require different forms of investigation and correction from problems related to questionnaire design, reporting, and data processing. Recognizing these distinctions will be essential if MPS are to become a reliable component of mortality surveillance systems in Burkina Faso and other LMICs affected by crises.

10 References

AAPOR. (2016). Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for Surveys 9th edition. 81.

AbouZahr, C., de Savigny, D., Mikkelsen, L., Setel, P. W., Lozano, R., & Lopez, A. D. (2015). Towards universal civil registration and vital statistics systems: The time is now. The Lancet, 386(10001), 1407-1418. https://doi.org/10.1016/S0140-6736(15)60170-2

ACLED. (2025a). Conflict Exposure : Distribution of the total number of deaths from insurgent attacks per month by target type. ACLED. https://acleddata.com/conflict-exposure/

ACLED. (2025b). Explorer. ACLED. https://acleddata.com/explorer/

ACSS. (2023). Burkina Faso Crisis Continues to Spiral. Africa Center for Strategic Studies. https://africacenter.org/spotlight/burkina-faso-crisis-continues-to-spiral/

Adair, T., Badr, A., Mikkelsen, L., Hooper, J., & Lopez, A. D. (2023). Global analysis of birth statistics from civil registration and vital statistics systems. Bulletin of the World Health Organization, 101(12), 768-776. https://doi.org/10.2471/BLT.22.289035

Adair, T., Firth, S., Phyo, T. P. P., Bo, K. S., & Lopez, A. D. (2021). Monitoring progress with national and subnational health goals by integrating verbal autopsy and medically certified cause of death data. BMJ Global Health, 6(5), e005387. https://doi.org/10.1136/bmjgh-2021-005387

Adeyanju, G. C., Schrage, P., Jalo, R. I., Abreu, L., & Schaub, M. (2025). Armed violent conflict and healthcare-seeking behavior for maternal and child health in sub-Saharan Africa : A systematic review. PLOS ONE, 20(2), e0317094. https://doi.org/10.1371/journal.pone.0317094

Agresti, A. (1992). A Survey of Exact Inference for Contingency Tables. Statistical Science, 7(1), 131-153. https://doi.org/10.1214/ss/1177011454

Agwu, G. A. (2023). The Boko Haram Conflict and Food Insecurity : Does Resilience Capacity Matter? Journal of African Economies, 32(4), 352-382. https://doi.org/10.1093/jae/ejac015

Akinyemi, J. O., Chisumpa, V. H., & Odimegwu, C. O. (2016). Household structure, maternal characteristics and childhood mortality in rural sub-Saharan Africa. Rural and Remote Health, 16(2), 1-19. https://doi.org/10.3316/informit.225477603821930

Alhassan, J. A. K., Adeyinka, D. A., & Olakunde, B. O. (2020). Equity dimensions of the decline in under-five mortality in Ghana : A joinpoint regression analysis. Tropical Medicine & International Health: TM & IH, 25(6), 732-739. https://doi.org/10.1111/tmi.13391

Alkema, L., & You, D. (2012). Child mortality estimation : A comparison of UN IGME and IHME estimates of levels and trends in under-five mortality rates and deaths. PLoS Medicine, 9(8), e1001288. https://doi.org/10.1371/journal.pmed.1001288

Alrababah, A., Casalis, M., Masterson, D., Hangartner, D., Wehrli, S., & Weinstein, J. (2025). Reducing attrition in phone-based panel surveys : Best practices and semi-automation for survey workflows. Political Science Research and Methods, 1-10. https://doi.org/10.1017/psrm.2025.6

Amouzou, A., Barros, A. J. D., Requejo, J., Faye, C., Akseer, N., Bendavid, E., Blumenberg, C., Borghi, J., Baz, S. E., Federspiel, F., Ferreira, L. Z., Hazel, E., Heft-Neal, S., Hellwig, F., Liu, L., Maïga, A., Munos, M., Pitt, C., Shawar, Y. R., … Boerma, T. (2025). The 2025 report of the Lancet Countdown to 2030 for women's, children's, and adolescents' health : Tracking progress on health and nutrition. The Lancet, 405(10488), 1505-1554. https://doi.org/10.1016/S0140-6736(25)00151-5

Amsalu, R., Schulte-Hillen, C., Garcia, D. M., Lafferty, N., Morris, C. N., Gee, S., Akseer, N., Scudder, E., Sami, S., Barasa, S. O., Had, H., Maalim, M. F., Moluh, S., & Berkelhamer, S. (2020). Lessons Learned From Helping Babies Survive in Humanitarian Settings. Pediatrics, 146(Supplement_2), S208-S217. https://doi.org/10.1542/peds.2020-016915L

Antai, D., Wedrén, S., Bellocco, R., & Moradi, T. (2010). Migration and child health inequities in Nigeria : A multilevel analysis of contextual- and individual-level factors. Tropical Medicine & International Health: TM & IH, 15(12), 1464-1474. https://doi.org/10.1111/j.1365-3156.2010.02643.x

Antoine, P. (2013). Randall Sara, Coast Ernestina., Compaore Natacha, Antoine Philippe, 2013 : "The power of the interviewer" Demographic Research, vol 28, p. 763-792 (www.demographic-research.org/Volumes/Vol28/27/). https://www.academia.edu/9942247/Randall_Sara_Coast_Ernestina_Compaore_Natacha_Antoine_Philippe_2013_The_power_of_the_interviewer_Demographic_Research_vol_28_p_763_792_www_demographic_research_org_Volumes_Vol28_27_

Anumudu, S. I., Uhegwu, C. C., & Anumudu, C. K. (2025). A scoping review of maternal mortality, its health determinants, and factors that influence care utilization in women of child-bearing years in Nigeria. Global Health Journal, 9(3), 185-199. https://doi.org/10.1016/j.glohj.2025.10.004

APAI-CRVS. (2017). PROGRAMME AFRICAIN d'amélioration accélérée des systèmes d'enregistrement des faits d'état civil et d'établissement des statistiques de l'état civil Plan stratégique chiffré 2017-2021. Commission économique pour l'Afrique. https://archive.uneca.org/sites/default/files/uploaded-documents/ACS/4th-CoM-on-CRVS/fr_africa_programme_for_accelerated_improvement_of_civil_registration_.pdf

APAI-CRVS. (2025). About APAI-CRVS | APAI-CRVS. https://apai-crvs.uneca.org/about-apai-crvs?utm_source=chatgpt.com

Aquilino, W. S. (1994). INTERVIEW MODE EFFECTS IN SURVEYS OF DRUG AND ALCOHOL USE : A FIELD EXPERIMENT. Public Opinion Quarterly, 58(2), 210-240. https://doi.org/10.1086/269419

Aspenia. (2021, novembre 13). Instability in the Sahel region and security concerns in Burkina Faso. Aspenia Online. https://aspeniaonline.it/instability-in-the-sahel-region-and-security-concerns-in-burkina-faso/

Atsiya, P. A., Atim, G. K., & Atsiya, G. P. (2021). THE EFFECT OF ARMED CONFLICT ON UNDER-FIVE MORTALITY IN SUB-SAHARAN AFRICA (SSA). In PERSPECTIVES ON CONFLICT PREVENTION,PERSPECTIVES ON CONFLICT PREVENTION, MANAGEMENT AND RESOLUTION IN AFRICAMANAGEMENT AND RESOLUTION IN AFRICA PERSPECTIVES ON CONFLICT PREVENTION, MANAGEMENT AND RESOLUTION IN AFRICA.

Avelino, I. C., Van-Dúnem, J., & Varandas, L. (2025). Under-five mortality and social determinants in africa : A systematic review. European Journal of Pediatrics, 184(2), 150. https://doi.org/10.1007/s00431-024-05966-w

Azad, A., Sernbo, E., Svärd, V., Holmlund, L., & Björk Brämberg, E. (2021). Conducting In-Depth Interviews via Mobile Phone with Persons with Common Mental Disorders and Multimorbidity : The Challenges and Advantages as Experienced by Participants and Researchers. International Journal of Environmental Research and Public Health, 18(22), 11828. https://doi.org/10.3390/ijerph182211828

Azanaw, M. M., Anley, D. T., Anteneh, R. M., Arage, G., & Muche, A. A. (2023). Effects of armed conflicts on childhood undernutrition in Africa : A systematic review and meta-analysis. Systematic Reviews, 12(1), 46. https://doi.org/10.1186/s13643-023-02206-4

Ba, E. H. M. F. D. (2021). Le confiage : Une culture et/ou un système de protection de l'enfance ? In Parentalité(s) et après ? (p. 313-336). érès. https://doi.org/10.3917/eres.meyer.2021.01.0313

Badini, M., Guira, M., Guissou, A., & Lhomme, A. (2022). Au Burkina Faso, les maraîchers du Bam face aux conditions d'insécurité. ALIMENTERRE.

https://www.alimenterre.org/au-burkina-faso-les-maraichers-du-bam-face-aux-conditions-d-insecurite

Balaj, M., York, H. W., Sripada, K., Besnier, E., Vonen, H. D., Aravkin, A., Friedman, J., Griswold, M., Jensen, M. R., Mohammad, T., Mullany, E. C., Solhaug, S., Sorensen, R., Stonkute, D., Tallaksen, A., Whisnant, J., Zheng, P., Gakidou, E., & Eikemo, T. A. (2021). Parental education and inequalities in child mortality : A global systematic review and meta-analysis. The Lancet, 398(10300), 608-620. https://doi.org/10.1016/S0140-6736(21)00534-1

Balgah, R. A., & Yibongka, H. M. (2024). Conflict-Induced Displacement and Livelihood Dynamics of Internally Displaced Persons and Host Families (SSRN Scholarly Paper No. 4859680). Social Science Research Network. https://doi.org/10.2139/ssrn.4859680

Bank, K. (2012). Letter dated 17 January 2012 from the Secretary-General addressed to the President of the Security Council. Journal of International Peacekeeping, 6(4-6), 219-221. https://doi.org/10.1163/187541100X00319

Ben, L., Robert, M., Jonathan, M., Tiago, P., & Stephen, D. (2015). Do Mobile Phone Surveys Work in Poor Countries ? - Working Paper 398 | Center for Global Development | Ideas to Action. https://www.cgdev.org/publication/do-mobile-phone-surveys-work-poor-countries-working-paper-398

Bendavid, E., Boerma, T., Akseer, N., Langer, A., Malembaka, E. B., Okiro, E. A., Wise, P. H., Heft-Neal, S., Black, R. E., Bhutta, Z. A., & BRANCH Consortium Steering Committee. (2021). The effects of armed conflict on the health of women and children. Lancet (London, England), 397(10273), 522-532. https://doi.org/10.1016/S0140-6736(21)00131-8

Bendavid, E., Seligman, B., & Kubo, J. (2011). Comparative Analysis of Old-Age Mortality Estimations in Africa. PLOS ONE, 6(10), e26607. https://doi.org/10.1371/journal.pone.0026607

Benstead, L. (2010). Effects of Interviewer Gender and Hijab on Gender-Related Survey Responses : Findings from a Nationally-Representative Field Experiment in Morocco (SSRN Scholarly Paper No. 1670813). https://papers.ssrn.com/abstract=1670813

Berry, I., Mangtani, P., Rahman, M., Khan, I. A., Sarkar, S., Naureen, T., Greer, A. L., Morris, S. K., Fisman, D. N., & Flora, M. S. (2021). Population Health Surveillance Using Mobile Phone Surveys in Low- and Middle-Income Countries : Methodology and Sample Representativeness of a Cross-sectional Survey of Live Poultry Exposure in Bangladesh. JMIR Public Health and Surveillance, 7(11), e29020. https://doi.org/10.2196/29020

Berzelak, N., & Vehovar, V. (2018). Mode Effects on Socially Desirable Responding in Web Surveys Compared to Face-to-Face and Telephone Surveys. https://eds.p.ebscohost.com/abstract?site=eds&scope=site&jrnl=18540023&AN=134630479&h=ZGht5g1b3ZeZCFGMi0aZEK9FgYkNPKAHdXwomlhEOv5B%2bxERGJ3mcEAlXOSipeDfjurM0Kx0%2fwg7hE5o3QjRkQ%3d%3d&crl=c&resultLocal=ErrCrlNoResults&resultNs=Ehost&crlhashurl=login.aspx%3fdirect%3dtrue%26profile%3dehost%26scope%3dsite%26authtype%3dcrawler%26jrnl%3d18540023%26AN%3d134630479

Bessière, C., & Gollac, S. (2020). 1. La famille, une institution économique. SH / L'envers des faits, 23-51.

Bethlehem, J. (2009). Weighting Adjustment. In Applied Survey Methods (p. 249-275). John Wiley & Sons, Ltd. https://doi.org/10.1002/9780470494998.ch10

Biemer, P. P., & Lyberg, L. E. (2003). Errors Due to Interviewers and Interviewing. In Introduction to Survey Quality (p. 149-187). John Wiley & Sons, Ltd. https://doi.org/10.1002/0471458740.ch5

Birhanie, A. L., Tessema, Z. T., Endalew, B., & Tamirat, K. S. (2025). Under-five mortality and its associated factors in sub-Saharan Africa : A multilevel analysis of recent demographic and health surveys data based on Bayesian approach. BMC Pediatrics, 25(1), 103. https://doi.org/10.1186/s12887-025-05454-6

Black, R. E., Victora, C. G., Walker, S. P., Bhutta, Z. A., Christian, P., de Onis, M., Ezzati, M., Grantham-McGregor, S., Katz, J., Martorell, R., Uauy, R., & Maternal and Child Nutrition Study Group. (2013). Maternal and child undernutrition and overweight in low-income and middle-income countries. Lancet (London, England), 382(9890), 427-451. https://doi.org/10.1016/S0140-6736(13)60937-X

Blumenstock, J. E., & Eagle, N. (2012). Divided We Call : Disparities in Access and Use of Mobile Phones in Rwanda. Information Technologies & International Development, 8(2), Article 2.

Bongaarts, J., & Guilmoto, C. Z. (2015). How Many More Missing Women? Excess Female Mortality and Prenatal Sex Selection, 1970–2050. Population and Development Review, 41(2), 241-269.

Bonnet, E., Beaugé, Y., Ba, M. F., Sidibé, S., De Allegri, M., & Ridde, V. (2023). Correction : Knowledge of COVID-19 and the impact on indigents' access to healthcare in Burkina Faso. International Journal for Equity in Health, 22(1), 10. https://doi.org/10.1186/s12939-022-01797-z

Borkotoky, K., & Unisa, S. (2014). Indicators to Examine Quality of Large Scale Survey Data : An Example through District Level Household and Facility Survey. PLOS ONE, 9(3), e90113. https://doi.org/10.1371/journal.pone.0090113

Brick, J. M., Edwards, W. S., & Lee, S. (2007). Sampling Telephone Numbers and Adults, Interview Length, and Weighting in The California Health Interview Survey Cell Phone Pilot Study. Public Opinion Quarterly, 71(5), 793-813. https://doi.org/10.1093/poq/nfm052

Brick, J. M., & Kalton, G. (1996). Handling missing data in survey research. Statistical Methods in Medical Research, 5(3), 215-238. https://doi.org/10.1177/096228029600500302

Brinkel, J., Kraemer, A., Krumkamp, R., May, J., & Fobil, J. (2014). Mobile Phone-Based mHealth Approaches for Public Health Surveillance in Sub-Saharan Africa : A Systematic Review. International journal of environmental research and public health. https://doi.org/10.3390/ijerph111111559

British Red Cross. (2025). The Sahel | Humanitarian Aid. British Red Cross. https://www.redcross.org.uk/about-us/what-we-do/international/the-sahel

Brubaker, J., Kilic, T., & Wollburg, P. (2021). Representativeness of individual-level data in COVID-19 phone surveys : Findings from Sub-Saharan Africa. PLOS ONE, 16(11), e0258877. https://doi.org/10.1371/journal.pone.0258877

Caldwell, J. C. (1980). Education as a factor in mortality decline : An examination of Nigerian data. In Proceedings of the meeting on socioeconomic determinants and consequences of mortality; deliberations de la reunion sur les facteurs et les consequences socio-economiques de la mortalite, El Colegio de Mexico, Mexico City, 19-25 June 1979.

Cedoca. (2022). BURKINA FASO Situation sécuritaire.

Chandrasekhar, S., Aguayo, V. M., Krishna, V., & Nair, R. (2017). Household food insecurity and children's dietary diversity and nutrition in India. Evidence from the comprehensive nutrition survey in Maharashtra. Maternal & Child Nutrition, 13(Suppl 2), e12447. https://doi.org/10.1111/mcn.12447

Chang, R., Li, C., Qi, H., Zhang, Y., & Zhang, J. (2022). Birth and Health Outcomes of Children Migrating With Parents : A Systematic Review and Meta-Analysis. Frontiers in Pediatrics, 10. https://doi.org/10.3389/fped.2022.810150

Chasukwa, M., Choko, A. T., Muthema, F., Nkahlamba, M. M., Saikolo, J., Tlhajoane, M., Reniers, G., Dulani, B., & Helleringer, S. (2022). Collecting mortality data via mobile phone surveys : A non-inferiority randomized trial in Malawi (p. 2022.03.02.22271441). medRxiv. https://doi.org/10.1101/2022.03.02.22271441

Cheung, Y. T. D., Weng, X., Wang, M. P., Ho, S. Y., Kwong, A. C. S., Lai, V. W. Y., & Lam, T. H. (2019). Effect of prepaid and promised financial incentive on follow-up survey response in cigarette smokers : A randomized controlled trial. BMC Medical Research Methodology, 19(1), 138. https://doi.org/10.1186/s12874-019-0786-9

Choi, Y., Li, Q., & Zachary, B. (2018). Measuring fertility through mobile–phone based household surveys : Methods, data quality, and lessons learned from PMA2020 surveys. Demographic Research, 38, 1663-1698. https://doi.org/10.4054/DemRes.2018.38.55

Christian, P., Mullany, L. C., Hurley, K. M., Katz, J., & Black, R. E. (2015). Nutrition and maternal, neonatal, and child health. Seminars in Perinatology, Global Perinatal Medicine, 39(5), 361-372. https://doi.org/10.1053/j.semperi.2015.06.009

Colombo, S., & Terracini, B. (2025). Estimating and interpreting mortality data in conflicts : Challenges, controversies, and significance. Epidemiologia E Prevenzione, 49(1), 84-90. https://doi.org/10.19191/EP25.1.A855.012

CONASUR. (2022). CONASUR:Situation des populations déplacées internes au 30 septembre 2022 | Food Security Cluster. https://fscluster.org/fr/burkina-faso/document/conasursituation-des-populations

Costanza, M. (2024, novembre 8). Dégradation des conditions sanitaires et alimentaires au Burkina Faso : Des besoins urgents dans une crise oubliée | Impact. IMPACT Initiatives.

https://www.impact-initiatives.org/what-we-do/news/degradation-des-conditions-sanitaires-et-alimentaires-au-burkina-faso-des-besoins-urgents-dans-une-crise-oubliee/

Couper, M. P. (2011). The Future of Modes of Data Collection. Public Opinion Quarterly, 75(5), 889-908. https://doi.org/10.1093/poq/nfr046

CROUZET, M. (2024, avril 25). Rapport Mondial sur les Crises Alimentaires : 59 pays touchés par la malnutrition aiguë en 2023. UNICEF. https://www.unicef.fr/article/rapport-mondial-sur-les-crises-alimentaires-59-pays-touches-par-la-malnutrition-aigue-en-2023/

Dabalen, A. L., Etang, A., Hoogeveen, J., Mushi, E., Schipper, Y., & Engelhardt, J. (2016). Mobile Phone Panel Surveys in Developing Countries : A Practical Guide for Microdata Collection. https://doi.org/10.1596/978-1-4648-0904-0

Dardona, Z., Amane, M., & Boussaa, S. (2025). Assessing the effects of 2023–2024 conflict on food security, dietary habits, and nutritional well-being among the population of Gaza. Discover Public Health, 22(1), 373. https://doi.org/10.1186/s12982-025-00761-w

Davies, A. (2012). IDPs in Host Families and Host Communities : Assistance for hosting arrangements.

Davis, R. E., Couper, M. P., Janz, N. K., Caldwell, C. H., & Resnicow, K. (2010). Interviewer effects in public health surveys. Health Education Research, 25(1), 14-26. https://doi.org/10.1093/her/cyp046

Deb, S., & Baudais, V. (2022). The Challenges of Data Collection in Conflict-affected Areas : A Case Study in the Liptako-Gourma Region. Stockholm International Peace Research Institute. https://doi.org/10.55163/VWIM3307

DeBell, M. (2009). User's Guide to the Advance Release of the 2008-2009 ANES Panel Study.

Debrah, L. B., Mohammed, A., Osei-Mensah, J., Mubarik, Y., Agbenyega, O., Ayisi-Boateng, N. K., Pfarr, K., Kuehlwein, J., Klarmann-Schulz, U., Hoerauf, A., & Debrah, A. (2020). Morbidity management and surveillance of lymphatic filariasis disease and acute dermatolymphangioadenitis attacks using a mobile phone-based tool by community health volunteers in Ghana. PLoS neglected tropical diseases. https://doi.org/10.1371/journal.pntd.0008839

de Groot, C., Alhaffar, M. B. A., & Eriksson, A. (2025). Societies at risk : The correlation between intensity of armed conflict and child health during the civil war in South Sudan. Archives of Public Health, 83(1), 45. https://doi.org/10.1186/s13690-025-01523-5

DeJong, J., Ghattas, H., Bashour, H., Mourtada, R., Akik, C., & Reese-Masterson, A. (2017). Reproductive, maternal, neonatal and child health in conflict : A case study on Syria using Countdown indicators. BMJ Global Health, 2(3). https://doi.org/10.1136/bmjgh-2017-000302

de Leeuw, E. D., Hox, J. J., & Dillman, D. A. (2008). Mixed-mode Surveys : When and Why. 2.

Dembele, B., & Sanni, M. A. (2020). Inadequate Feeding Practices Persist in Burkina Faso. American Journal of Food and Nutrition, 8(1), Article 1. https://doi.org/10.12691/ajfn-8-1-4

DESA. (2021). Ensuring continuity in survey operations while mitigating risk of COVID-19 transmission : New guidance available. https://covid-19-response.unstatshub.org/https:/covid-19-response.unstatshub.org/posts/ensuring-continuity-in-survey-operations/

Deville, J.-C., & Särndal, C.-E. (1992). Calibration Estimators in Survey Sampling. Journal of the American Statistical Association, 87(418), 376-382. https://doi.org/10.2307/2290268

DHS. (2019). DHS Standard Demographic and Health Survey (DHS) | GHDx. http://ghdx.healthdata.org/series/dhs-standard-demographic-and-health-survey-dhs

DHS. (2020). The DHS Program—COVID-19 Update : Some DHS surveys return to the field; others postponed until 2021. https://dhsprogram.com/Who-We-Are/News-Room/COVID-19-Update-Some-DHS-surveys-return-to-the-field-others-postponed-until-2021.cfm

DHS Program. (2015, janvier 13). Harnessing Technology to Streamline Data Collection. The DHS Program Blog. http://blog.dhsprogram.com/harnessing-technology-streamline-data-collection/

Dialogue Migrations. (2023, août 1). Focus on food insecurity of displaced people in the Sahel and West Africa. Dialogue Migrations. https://dialoguemigration.com/fr/news/focus-on-food-insecurity-of-displaced-people-in-the-sahel-and-west-africa/?utm_source=chatgpt.com

Diamondstein, M. (2022, mai 19). Impact of the COVID-19 Pandemic on Sexual and Reproductive Health Services in Burkina Faso, Ethiopia, Kenya, Malawi and Uganda. Center for Reproductive Rights. https://reproductiverights.org/impact-covid-19-pandemic-sexual-and-reproductive-health-burkina-faso-ethiopia-kenya-malawi-uganda/

Dianou, K., Masquelier, B., Soura, A., Lankoandé, Y. B., Bassinga, H., Menashe Oren, A., & Reniers, G. (2025). The use of mobile phone surveys for rapid mortality monitoring : A national study in Burkina Faso.

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). Reducing People's Reluctance to Respond to Surveys. In Internet, Phone, Mail, and Mixed-Mode Surveys (p. 19-55). John Wiley & Sons, Ltd. https://doi.org/10.1002/9781394260645.ch2

Djoumessi, Y. F. (2022). The impact of malnutrition on infant mortality and life expectancy in Africa. Nutrition, 103-104, 111760. https://doi.org/10.1016/j.nut.2022.111760

Druetz, T., Browne, L., Bicaba, F., Mitchell, M. I., & Bicaba, A. (2020). Effects of terrorist attacks on access to maternal healthcare services : A national longitudinal study in Burkina Faso. BMJ Global Health, 5(9). https://doi.org/10.1136/bmjgh-2020-002879

Druhen, G. (2023, novembre 29). Burkina Faso : L'insécurité plonge les enfants dans la malnutrition. UNICEF. https://www.unicef.fr/article/linsecurite-plonge-les-enfants-du-burkina-faso-dans-la-malnutrition/

Dureab, F., Al-Sakkaf, M., Ismail, O., Kuunibe, N., Krisam, J., Müller, O., & Jahn, A. (2019). Diphtheria outbreak in Yemen : The impact of conflict on a fragile health system. Conflict and Health, 13(1), 19. https://doi.org/10.1186/s13031-019-0204-2

Duthé, G. (2025, février 23). Arrêt de l'USAID : Un grand frein aux recherches sur la santé et le développement - AOC media. AOC media - Analyse Opinion Critique. https://aoc.media/analyse/2025/02/23/arret-de-lusaid-un-grand-frein-aux-recherches-sur-la-sante-et-le-developpement/

Eaton, J. W., & Masquelier, B. (2021). demogsurv : Demographic analysis of DHS and other household surveys. https://mrc-ide.r-universe.dev/demogsurv

Ecofin, A. (2025). Couverture réseau : Le Burkina Faso annonce le déploiement de 800 tours télécoms. Agence Ecofin. https://www.agenceecofin.com/actualites-numerique/2605-128677-couverture-reseau-le-burkina-faso-annonce-le-deploiement-de-800-tours-telecoms

Eilerts, H., Romero Prieto, J., Eaton, J. W., & Reniers, G. (2021). Age patterns of under-5 mortality in sub-Saharan Africa during 1990–2018 : A comparison of estimates from demographic surveillance with full birth histories and the historic record. Demographic Research, 44, 415-442. https://doi.org/10.4054/DemRes.2021.44.18

Ekholm, O., Gundgaard, J., Rasmussen, N. K. R., & Hansen, E. H. (2010). The effect of health, socio-economic position, and mode of data collection on non-response in health interview surveys. Scandinavian Journal of Public Health, 38(7), 699-706. https://doi.org/10.1177/1403494810382474

Ekholuenetale, M., Wegbom, A. I., Tudeme, G., & Onikan, A. (2020). Household factors associated with infant and under-five mortality in sub-Saharan Africa countries. International Journal of Child Care and Education Policy, 14(1), 10. https://doi.org/10.1186/s40723-020-00075-1

Ellis, C. H., & Krosnick, J. A. (1999). Comparing telephone and face to face surveys in terms of sample representativeness : A Meta-Analysis of Demographics Characteristics. Ann Arbor: Universidad de Michigan, NES.

Eneh, O. C., & Eneh, C. A. (2025). A longitudinal study of violent armed conflict and economic health nexus in Nigeria. Journal of Health, Population and Nutrition, 44(1). https://doi.org/10.1186/s41043-025-00996-y

Erong, C. (2017). Community Hosting of Internally Displaced Persons in Maiduguri, Borno State-Nigeria [PhD, Institute of Social Studies]. https://thesis.eur.nl/pub/41648/Erong-C._MA2016-17_SJP.pdf

Espeut, D., & Becker, S. (2015). The validity of birth and pregnancy histories in rural Bangladesh. Journal of Health, Population and Nutrition, 33(1), 17. https://doi.org/10.1186/s41043-015-0027-8

FAO. (2001). La nutrition durant certaines périodes de la vie : Grossesse, lactation, petite enfance, enfance et vieillesse. https://www.fao.org/4/w0073f/w0073f07.htm

FAO. (2025). Échelle de mesure de l'insécurité alimentaire vécue | Voices of the Hungry | Organisation des Nations Unies pour l'alimentation et l'agriculture. https://www.fao.org/in-action/voices-of-the-hungry/fies/fr/

Feeney, G. (2001). The Impact of HIV/AIDS on Adult Mortality in Zimbabwe. Population and Development Review, 27(4), 771-780. https://doi.org/10.1111/j.1728-4457.2001.00771.x

Felderer, B., Kirchner, A., & Kreuter, F. (2019). The Effect of Survey Mode on Data Quality : Disentangling Nonresponse and Measurement Error Bias. https://doi.org/10.2478/jos-2019-0005

Fuchs, R. (2010). Education or wealth : Which matters more for reducing child mortality in developing countries? Vienna Yearbook of Population Research, 8, 175-199. https://doi.org/10.1553/populationyearbook2010s175

Gallup, I. (2016, février 17). Disparities in Cellphone Ownership Pose Challenges in Africa. Gallup.Com. https://news.gallup.com/poll/189269/disparities-cellphone-ownership-pose-challenges-africa.aspx

Ganaba, R., Ilboudo, P. G. C., Cresswell, J. A., Yaogo, M., Diallo, C. O., Richard, F., Cunden, N., Filippi, V., & Witter, S. (2016). The obstetric care subsidy policy in Burkina Faso : What are the effects after five years of implementation? Findings of a complex evaluation. BMC Pregnancy and Childbirth, 16(1), 84. https://doi.org/10.1186/s12884-016-0875-2

Gassara, G., & Chen, J. (2021). Household Food Insecurity, Dietary Diversity, and Stunting in Sub-Saharan Africa : A Systematic Review. Nutrients, 13(12), 4401. https://doi.org/10.3390/nu13124401

Gavrilov, L. A., & Gavrilova, N. S. (2022). Trends in Human Species-Specific Lifespan and Actuarial Aging Rate. Biochemistry. Biokhimiia, 87(12), 1622-1633. https://doi.org/10.1134/S0006297922120173

GBD. (2017). Global, regional, and national under-5 mortality, adult mortality, age-specific mortality, and life expectancy, 1970–2016 : A systematic analysis for the Global Burden

of Disease Study 2016. Lancet (London, England), 390(10100), 1084-1150. https://doi.org/10.1016/S0140-6736(17)31833-0

GeoPoll. (2015). Mobile phone survey africa Archives. GeoPoll. https://www.geopoll.com/blog/tag/mobile-phone-survey-africa/

George, J., Adelaja, A., & Weatherspoon, D. (2020). Armed Conflicts and Food Insecurity : Evidence from Boko Haram's Attacks. American Journal of Agricultural Economics, 102(1), 114-131. https://doi.org/10.1093/ajae/aaz039

Gibson, D., Kibria, G. M. A., Pariyo, G. W., Ahmed, S., Ali, J., Labrique, A. B., Khan, I. A., Rutebemberwa, E., Flora, M. S., & Hyder, A. A. (2022). Promised and Lottery Airtime Incentives to Improve Interactive Voice Response Survey Participation Among Adults in Bangladesh and Uganda : Randomized Controlled Trial. Journal of Medical Internet Research, 24(5), e36943. https://doi.org/10.2196/36943

Gibson, D., Pereira, A., Farrenkopf, B. A., Labrique, A., Pariyo, G., & Hyder, A. (2017). Mobile Phone Surveys for Collecting Population-Level Estimates in Low- and Middle-Income Countries : A Literature Review. Undefined. /paper/Mobile-Phone-Surveys-for-Collecting-Estimates-in-A-Gibson-Pereira/6140559aac9911ea7ff8f10a6ab916251cf3b850

Gibson, G., Pereira, A., Farrenkopf, B. A., Labrique, A. B., Pariyo, G. W., & Hyder, A. A. (2017). Mobile Phone Surveys for Collecting Population-Level Estimates in Low- and Middle-Income Countries : A Literature Review. Journal of Medical Internet Research, 19(5), e139. https://doi.org/10.2196/jmir.7428

Gignoux, E. M. H., Donfack Sontsa, O. T., Mudasiru, A., Eyong, J., Ntone, R., Tamakloe Koku, M., Adji, D. M., Etoundi, A., Boum, Y., Jamet, C., Cabrol, J.-C., & Porten, K. (2020). A telephone based assessment of the health situation in the far north region of

Cameroon. Conflict and Health, 14(1), 82. https://doi.org/10.1186/s13031-020-00327-4

Gourlay, S., Kilic, T., Martuscelli, A., Wollburg, P., & Zezza, A. (2021). Viewpoint : High-frequency phone surveys on COVID-19: Good practices, open questions. Food Policy, 105, 102153. https://doi.org/10.1016/j.foodpol.2021.102153

Gouvernement du Canada, S. C. (2020, mars 9). Enquête sociale générale de 2019 sur la sécurité des Canadiens : Rapport technique. https://www.statcan.gc.ca/fr/programmes-statistiques/document/4504_D1_V1

Green, E., Bennett, H., Brayne, C., Tyler, L. K., Brayne, C., Bullmore, E. T., Calder, A. C., Cusack, R., Dalgleish, T., Duncan, J., Henson, R. N., Matthews, F. E., Marslen-Wilson, W. D., Rowe, J. B., Shafto, M. A., Campbell, K., Cheung, T., Davis, S., Geerligs, L., … Cam-CAN. (2018). Exploring patterns of response across the lifespan : The Cambridge Centre for Ageing and Neuroscience (Cam-CAN) study. BMC Public Health, 18(1), 760. https://doi.org/10.1186/s12889-018-5663-7

Greenfield, T. K., Midanik, L. T., & Rogers, J. D. (2000). Effects of telephone versus face-to-face interview modes on reports of alcohol consumption. Addiction, 95(2), 277-284. https://doi.org/10.1046/j.1360-0443.2000.95227714.x

Greenleaf, A. R., Gadiaga, A., Choi, Y., Guiella, G., Turke, S., Battle, N., Ahmed, S., & Moreau, C. (2020). Automated and Interviewer-Administered Mobile Phone Surveys in Burkina Faso : Sociodemographic Differences Among Female Mobile Phone Survey Respondents and Nonrespondents. JMIR mHealth and uHealth, 8(7), e17891. https://doi.org/10.2196/17891

Grigoreva, M. V., Zvonovsky, V. B., & Solovieva, J. V. (2019). Strategies And Experiences Of Telephone Surveys In The World. European Proceedings of Social and Behavioural

Sciences, Global Challenges and Prospects of the Modern Economic Development. https://doi.org/10.15405/epsbs.2019.03.62

Groves, R. M. (1979). Actors and Questions in Telephone and Personal Interview Surveys. Public Opinion Quarterly, 43(2), 190-205. https://doi.org/10.1086/268511

Groves, R. M., & Couper, M. P. (1998). Influences of Household Characteristics on Survey Cooperation. In Nonresponse in Household Interview Surveys (p. 119-154). John Wiley & Sons, Ltd. https://doi.org/10.1002/9781118490082.ch5

Häder, M. (2012). Data Quality in Telephone Surveys via Mobile and Landline Phone. In S. Häder, M. Häder, & M. Kühne (Éds.), Telephone Surveys in Europe : Research and Practice (p. 247-262). Springer. https://doi.org/10.1007/978-3-642-25411-6_16

Hanifi, S. M. A., Alam, S. S., Shuma, S. S., & Reidpath, D. D. (2021). Insights Into Excess Mortality During the First Months of the COVID-19 Pandemic From a Rural, Demographic Surveillance Site in Bangladesh. Frontiers in Public Health, 9. https://www.frontiersin.org/articles/10.3389/fpubh.2021.622379

Hasanov, R., & Hasanova, L. (2020). Adapting household surveys to the situation of the pandemic. United Nations Economic Commission for Europe, 6. https://unece.org/sites/default/files/2021-03/Issue6_Adapting%20household%20surveys%20EN.pdf

Headey, D., Zaw, O., Than, Kristi, M., Xinshen, D., Sophie, G., & Isabel, L. (2020). Poverty, food insecurity, and social protection during COVID-19 in Myanmar : Combined evidence from a household telephone survey and micro-simulations. Intl Food Policy Res Inst.

Helleringer, S., Lau, S. W., Luhar, S., Banda, J., Lankoande, B., Tlhajoane, M., & Reniers, G. (2023). Increased Age Heaping in Mobile Phone Surveys Conducted in Low-Income

and Middle-Income Countries. Socius, 9, 23780231231158766. https://doi.org/10.1177/23780231231158766

Helleringer, S., Liu, L., Chu, Y., Rodrigues, A., & Fisker, A. B. (2020). Biases in Survey Estimates of Neonatal Mortality : Results From a Validation Study in Urban Areas of Guinea-Bissau. Demography, 57(5), 1705-1726. https://doi.org/10.1007/s13524-020-00911-6

Helleringer, S., Pison, G., Kanté, A. M., Duthé, G., & Andro, A. (2014). Reporting Errors in Siblings' Survival Histories and Their Impact on Adult Mortality Estimates : Results From a Record Linkage Study in Senegal. Demography, 51(2), 387-411. https://doi.org/10.1007/s13524-013-0268-3

Helleringer, S., Pison, G., Masquelier, B., Kanté, A. M., Douillot, L., Duthé, G., Sokhna, C., & Delaunay, V. (2014). Improving the Quality of Adult Mortality Data Collected in Demographic Surveys : Validation Study of a New Siblings' Survival Questionnaire in Niakhar, Senegal. PLOS Medicine, 11(5), e1001652. https://doi.org/10.1371/journal.pmed.1001652

Hersh, S., Nair, D., Komaragiri, P. B., & Adlakha, R. K. (2021). Patchy signals : Capturing women's voices in mobile phone surveys of rural India. BMJ Global Health, 6(Suppl 5), e005411. https://doi.org/10.1136/bmjgh-2021-005411

Hill, K. (2014). Direct estimation of child mortality from birth. In : Moultrie, T., Dorrington, R., Hill, A., Hill, K., Timæus, I., Zaba, Z. (eds.) Tools for Demographic Estimation. https://scholar.google.com/scholar_lookup?title=Direct+estimation+of+child+mortality+from+birth+histories&author=K+Hill&author=T+Moultrie&author=R+Dorrington&author=A+Hill&author=K+Hill&publication_year=2013&

Hill, K., Brady, E., Zimmerman, L., Montana, L., Silva, R., & Amouzou, A. (2015). Monitoring Change in Child Mortality through Household Surveys. PLOS ONE, 10(11), e0137713. https://doi.org/10.1371/journal.pone.0137713

Himelein, K., Eckman, S., Kastelic, J. G., McGee, K., Wild, M., Yoshida, N., & Hoogeveen, J. (2020). High Frequency Mobile Phone Surveys of Households to Assess the Impacts of COVID-19 Guidelines on Sampling Design. World Bank, Washington, DC. https://documents1.worldbank.org/curated/en/742581588695955271/pdf/Guidelines-on-Sampling-Design.pdf

Himelein, K., Eckman, S., Lau, C., & McKenzy, D. (2020). Mobile Phone Surveys for Understanding COVID-19 Impacts : Part I Sampling and Mode. https://blogs.worldbank.org/impactevaluations/mobile-phone-surveys-understanding-covid-19-impacts-part-i-sampling-and-mode

Himelein, K., & Kastelic, J. G. (2015). The Socio-Economic Impacts of Ebola in Liberia : Results from a High Frequency Cell Phone Survey, Round 5. World Bank. https://openknowledge.worldbank.org/handle/10986/21893

Hirschman, C., Preston, S., & Loi, V. M. (1995). Vietnamese Casualties During the American War : A New Estimate. Population and Development Review, 21(4), 783-812. https://doi.org/10.2307/2137774

Holbrook, A. L., GREEN, M. C., & KROSNICK, J. A. (2003). Telephone versus Face-to-Face Interviewing of National Probability Samples with Long Questionnaires : Comparisons of Respondent Satisficing and Social Desirability Response Bias*. Public Opinion Quarterly, 67(1), 79-125. https://doi.org/10.1086/346010

Houle, B., Kabudula, C., Gareta, D., Herbst, K., & Clark, S. J. (2023). Household structure, composition and child mortality in the unfolding antiretroviral therapy era in rural South

Africa : Comparative evidence from population surveillance, 2000–2015. BMJ Open, 13(3), e070388. https://doi.org/10.1136/bmjopen-2022-070388

HRW. (2023, juin 15). Burkina Faso : Upsurge in Atrocities by Islamist Armed Groups | Human Rights Watch. https://www.hrw.org/news/2023/06/15/burkina-faso-upsurge-atrocities-islamist-armed-groups

Human Rights Watch. (2023). Burkina Faso : Événements de 2022. In Rapport mondial 2023. https://www.hrw.org/fr/world-report/2023/country-chapters/383648

ICF International. (2012). Urvey Organization Manual for Demographic and Health Surveys. MEASURE DHS. Calverton. Maryland: ICF International. https://dhsprogram.com/pubs/pdf/DHSM10/DHS6_Survey_Org_Manual_7Dec2012_DHSM10.pdf

IDMC. (2025). The world's leading source of data and analysis on internal displacement. IDMC - Internal Displacement Monitoring Centre. https://www.internal-displacement.org/home

Ilboudo, P. G., & Siri, A. (2023). Effects of the free healthcare policy on maternal and child health in Burkina Faso : A nationwide evaluation using interrupted time-series analysis. Health Economics Review, 13(1), 27. https://doi.org/10.1186/s13561-023-00443-w

Imdad, A., Herzer, K., Mayo-Wilson, E., Yakoob, M. Y., & Bhutta, Z. A. (2010). Vitamin A supplementation for preventing morbidity and mortality in children from 6 months to 5 years of age. Cochrane Database of Systematic Reviews, (12). https://doi.org/10.1002/14651858.CD008524.pub2

INSD. (2012). Enquête Démographique et de Santé et à Indicateurs Multiples (EDSBF-MICS IV). https://dhsprogram.com/pubs/pdf/FR256/FR256.pdf

INSD. (2019). Résultats du 5E Recensement Général de la Population et de l'Habitation | INSD. https://www.insd.bf/fr/resultats

INSD. (2021). Enquête Démographique et de Santé 2021. https://dhsprogram.com/pubs/pdf/OF49/OF49pou.pdf

Institut national de la statistique et de la démographie. (2014). Burkina Faso—Enquête multisectorielle continue, 2014. https://microdata.insd.bf/index.php/catalog/12/study-description

Jäckle, A., Roberts, C., & Lynn, P. (2010). Assessing the Effect of Data Collection Mode on Measurement. International Statistical Review, 78(1), 3.

James, K. S., & Rajan, S. I. (2004). Respondents and Quality of Survey Data. Economic and Political Weekly, 39(7), 659-663.

Jennings, L., Omoni, A., Akerele, A., Ibrahim, Y., & Ekanem, E. (2015). Disparities in mobile phone access and maternal health service utilization in Nigeria : A population-based survey. International Journal of Medical Informatics, 84(5), 341-348. https://doi.org/10.1016/j.ijmedinf.2015.01.016

Jensen, A. M., Thysen, S. M., Martins, J. S. D., Fernandes, D. A., Rodrigues, A., Helleringer, S., & Fisker, A. B. (2025). Displacements in reported date of birth and differences in age at death in surveys of child mortality : A record linkage study in Guinea-Bissau. Journal of Population Research, 42(2), 12. https://doi.org/10.1007/s12546-025-09367-0

Jha, P., Deshmukh, Y., Tumbe, C., Suraweera, W., Bhowmick, A., Sharma, S., Novosad, P., Fu, S. H., Newcombe, L., Gelband, H., & Brown, P. (2022). COVID mortality in India : National survey data and health facility deaths. Science, 375(6581), 667-671. https://doi.org/10.1126/science.abm5154

Kafando, W. A., & Sakurai, T. (2024). Armed conflicts and household food insecurity : Effects and mechanisms. Agricultural Economics, 55(2), 313-328. https://doi.org/10.1111/agec.12814

Kalton, G., & Flores-Cervantes, I. (2003). Weighting methods. Journal of Official Statistics, 19(2), 81-97.

Kalton, G., & Government of Canada, S. C. (2017, décembre 21). Comments on the Rao and Fuller (2017) paper by Graham Kalton. https://www150.statcan.gc.ca/n1/pub/12-001-x/2017002/article/54895-eng.htm?utm_source=chatgpt.com

Kang, Y., Hurley, K. M., Ruel-Bergeron, J., Monclus, A. B., Oemcke, R., Wu, L. S. F., Mitra, M., Phuka, J., Klemm, R., West, K. P., & Christian, P. (2019). Household food insecurity is associated with low dietary diversity among pregnant and lactating women in rural Malawi. Public Health Nutrition, 22(4), 697-705. https://doi.org/10.1017/S1368980018002719

Kante, A. M., Manhica, C., Aveika, A., Mulungo, A., Van Dyk, F., Machava, N., Kuo, H., Saccor, C., Gibson, D. G., Monjane, C., Black, R. E., Macicame, I., & Amouzou, A. (2025). Measuring childhood mortality through mobile phone interviews in Mozambique. Tropical Medicine & International Health: TM & IH. https://doi.org/10.1111/tmi.70004

Karlinsky, A. (2024). International completeness of death registration. Demographic Research, 50, 1151-1170. https://doi.org/10.4054/DemRes.2024.50.38

Kasidi, T., Jeffery, C., Koncobo, Z., & Randolph, Z., Alberto. (2022). Burkina Faso - High Frequency Phone Survey on Internally Displaced Persons : Survey Methodology Note [Text/HTML]. World Bank. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099722308092212339/IDU05a954da302c4304eb6093f90fdca847e9cca

Keasley, J., Blickwedel, J., & Quenby, S. (2017). Adverse effects of exposure to armed conflict on pregnancy : A systematic review. BMJ Global Health, 2(4). https://doi.org/10.1136/bmjgh-2017-000377

Keeter, S., Miller, C., Kohut, A., Groves, R. M., & Presser, S. (2000). Consequences of reducing nonresponse in a national telephone survey. Public Opinion Quarterly, 64(2), 125-148. https://doi.org/10.1086/317759

Kiel, D. W., Dodson, E. A., Artal, R., Boehmer, T. K., & Leet, T. L. (2007). Gestational weight gain and pregnancy outcomes in obese women : How much is enough? Obstetrics and Gynecology, 110(4), 752-758. https://doi.org/10.1097/01.AOG.0000278819.17190.87

Klausch, T., Hox, J., & Schouten, B. (2015). Selection error in single- and mixed mode surveys of the Dutch general population. Journal of the Royal Statistical Society. Series A (Statistics in Society), 178(4), 945-961.

Klimo, P. J., Ragel, B. T., Jones, G. M., & McCafferty, R. (2015). Severe Pediatric Head Injury During the Iraq and Afghanistan Conflicts. Neurosurgery, 77(1), 1. https://doi.org/10.1227/NEU.0000000000000743

Kofi Teteh Baah, S., Stemmler, H., Genoni, E. M., & Lakner, C. (2024). Filling the gaps in survey data for a world free of poverty on a livable planet. World Bank Blogs. https://blogs.worldbank.org/en/opendata/filling-the-gaps-in-survey-data-for-a-world-free-of-poverty-on-a

Kolenikov, S. (2016). Post-stratification or non-response adjustment? Survey Practice, 9(3). https://doi.org/10.29115/SP-2016-0014

Konaté, B., Berthé, A., Hien, H., Tou, F., Millogo, A., Badini-Kinda, F., Drabo, M., Macq, J., & Franssen, A. (2019). Isolement résidentiel et cohabitation intergénérationnelle au Burkina Faso. Gérontologie et société, 41158(1), 139-151. https://doi.org/10.3917/gs1.158.0139

Kota, K., Pongou, R., & Chomienne, M.-H. (2025). Impact of household food insecurity on the use of maternal health services in the Savanes region, Togo : A qualitative study. BMC Public Health, 25(1), 2040. https://doi.org/10.1186/s12889-025-23220-2

Kotsadam, A., & Østby, G. (2019). Armed conflict and maternal mortality : A micro-level analysis of sub-Saharan Africa, 1989–2013. Social Science & Medicine, 239, 112526. https://doi.org/10.1016/j.socscimed.2019.112526

Koyuncu, Y. (2021). Surveys in Covid-19 and Post Covid-19 Days. Surveys in Covid-19 and Post Covid-19 Days. https://www.academia.edu/72192547/Surveys_in_Covid_19_and_Post_Covid_19_Days

Kreuter, F., Olson, K., Wagner, J., Yan, T., Ezzati-Rice, T. M., Casas-Cordero, C., Lemay, M., Peytchev, A., Groves, R. M., & Raghunathan, T. E. (2010). Using proxy measures and other correlates of survey outcomes to adjust for non-response : Examples from multiple surveys. Journal of the Royal Statistical Society: Series A (Statistics in Society), 173(2), 389-407. https://doi.org/10.1111/j.1467-985X.2009.00621.x

Krugman, D., Smith, J., & Abimbola, S. (2025). Global health after USAID cuts. The Lancet, 406(10520), 2628. https://doi.org/10.1016/S0140-6736(25)02018-5

Kuehne, A., Lynch, E., Marshall, E., Tiffany, A., Alley, I., Bawo, L., Massaquoi, M., Lodesani, C., Vaillant, P. L., Porten, K., & Gignoux, E. (2016). Mortality, Morbidity and Health-Seeking Behaviour during the Ebola Epidemic 2014–2015 in Monrovia Results from a Mobile Phone Survey. PLOS Neglected Tropical Diseases, 10(8), e0004899. https://doi.org/10.1371/journal.pntd.0004899

Labrique, A., Blynn, E., Ahmed, S., Gibson, D., Pariyo, G., & Hyder, A. A. (2017). Health surveys using mobile phones in developing countries : Automated active strata monitoring and other statistical considerations for improving precision and reducing

biases. Journal of Medical Internet Research, 19(5), e121. https://doi.org/10.2196/jmir.7329

Lamanna, C., Hachhethu, K., Chesterman, S., Singhal, G., Mwongela, B., Ng'endo, M., Passeri, S., Farhikhtah, A., Kadiyala, S., Bauer, J.-M., & Rosenstock, T. S. (2019). Strengths and limitations of computer assisted telephone interviews (CATI) for nutrition data collection in rural Kenya. PloS One, 14(1), e0210050. https://doi.org/10.1371/journal.pone.0210050

Lambrecht, I., van Asselt, J., Headey, D., Minten, B., Meza, P., Sabai, M., Sun, T. S., & Win, H. E. (2023). Can phone surveys be representative in low- and middle-income countries? An application to Myanmar. PloS One, 18(12), e0296292. https://doi.org/10.1371/journal.pone.0296292

Lanau, A., Grieve, T., Tengbeh, A. F., Enria, L., & Wayack-Pambé, M. (2023). "Since the market is closed, there is no more money, there is nothing we can do" : Voices of adolescent girls in Burkina Faso and Sierra Leone on poverty and COVID-19. Children and Youth Services Review, 155, 107232. https://doi.org/10.1016/j.childyouth.2023.107232

Lankoandé, Y. B., Masquelier, B., Zabre, P., Bangré, H., Duthé, G., Soura, A. B., Pison, G., & Ali, S. (2022). Estimating mortality from census data : A record-linkage study of the Nouna Health and Demographic Surveillance System in Burkina Faso. Demographic Research, 46, 653-680. https://doi.org/10.4054/DemRes.2022.46.22

Lau, C., Kumaresan, J., Sivaram, V., Muthoni, J., & Tabu, B. (2025). Age Heaping in CATI Surveys in Kenya and Nigeria. Survey Practice, 19 Special Issue. https://doi.org/10.29115/SP-2024-0030

Lau, C. Q., Cronberg, A., Marks, L., & Amaya, A. (2019). In Search of the Optimal Mode for Mobile Phone Surveys in Developing Countries. A Comparison of IVR, SMS, and

CATI in Nigeria. Survey Research Methods, 13(3), Article 3. https://doi.org/10.18148/srm/2019.v13i3.7375

Lavrakas, P., & Dutwin, D. (2016). Trends in Telephone Outcomes, 2008—2015. Survey Practice, 9(3). https://doi.org/10.29115/SP-2016-0017

Lavrakas, P. J., Shuttles, C. D., Steeh, C., & Fienberg, H. (2007). The State of Surveying Cell Phone Numbers in the United States : 2007 and Beyond. Public Opinion Quarterly, 71(5), 840-854. https://doi.org/10.1093/poq/nfm054

Lavraska, P. (2008). Encyclopedia of Survey Research Methods-SAGE Research Methods. https://methods.sagepub.com/reference/encyclopedia-of-survey-research-methods

Lawn, J. E., Cousens, S., & Zupan, J. (2005). 4 million neonatal deaths : When? Where? Why? The Lancet, 365(9462), 891-900. https://doi.org/10.1016/S0140-6736(05)71048-5

Leeuw, D., & Desiree, E. (1992). Data Quality in Mail, Telephone and Face to Face Surveys. T. https://eric.ed.gov/?id=ED374136

Leeuw, E. D. de, Hox, J. J., & Snijkers, G. (1995). The Effect of Computer-assisted Interviewing on Data Quality. A Review. Market Research Society. Journal., 37(4), 1.

L'Engle, K., Sefa, E., Adimazoya, E. A., Yartey, E., Lenzi, R., Tarpo, C., Heward-Mills, N. L., Lew, K., & Ampeh, Y. (2018). Survey research with a random digit dial national mobile phone sample in Ghana : Methods and sample quality. PloS One, 13(1), e0190902. https://doi.org/10.1371/journal.pone.0190902

Leo, B., Morello, R., Mellon, J., Peixoto, T., & Davenport, S. T. (2015). Do Mobile Phone Surveys Work in Poor Countries? https://doi.org/10.2139/ssrn.2597885

Leone, T., Sochas, L., & Coast, E. (2021). Depends Who's Asking : Interviewer Effects in Demographic and Health Surveys Abortion Data. Demography, 58(1), 31-50. https://doi.org/10.1215/00703370-8937468

Little, R. J. A. (1993). Post-Stratification : A Modeler's Perspective. Journal of the American Statistical Association, 88(423), 1001-1012. https://doi.org/10.2307/2290792

Liu, L., Oza, S., Hogan, D., Chu, Y., Perin, J., Zhu, J., Lawn, J. E., Cousens, S., Mathers, C., & Black, R. E. (2016). Global, regional, and national causes of under-5 mortality in 2000–15 : An updated systematic analysis with implications for the Sustainable Development Goals. The Lancet, 388(10063), 3027-3035. https://doi.org/10.1016/S0140-6736(16)31593-8

Lokotola, C. L., Mash, R., Sethlare, V., Shabani, J., Temitope, I., & Baldwin-Ragaven, L. (2024). Migration and primary healthcare in sub-Saharan Africa : A scoping review. African Journal of Primary Health Care & Family Medicine, 16(1), e1-e10. https://doi.org/10.4102/phcfm.v16i1.4507

Louart, S., Bonnet, E., & Ridde, V. (2021). Is patient navigation a solution to the problem of « leaving no one behind »? A scoping review of evidence from low-income countries. Health Policy and Planning, 36(1), 101-116. https://doi.org/10.1093/heapol/czaa093

Lyberg, L., Stange, M., Harkness, J., Mohler, P., Pennell, B.-E., & Japec, L. (2014). A review of quality issues associated with studying hard-to-survey populations. In B. Edwards, K. M. Wolter, N. Bates, R. Tourangeau, & T. P. Johnson (Éds.), Hard-to-Survey Populations (p. 82-108). Cambridge University Press. https://doi.org/10.1017/CBO9781139381635.007

Lynn, P., & Kaminska, O. (2013). The Impact of Mobile Phones on Survey Measurement Error. Public Opinion Quarterly, 77(2), 586-605. https://doi.org/10.1093/poq/nfs046

Lyons-Amos, M., & Stones, T. (2017). Trends in Demographic and Health Survey data quality : An analysis of age heaping over time in 34 countries in Sub Saharan Africa between 1987 and 2015. BMC Research Notes, 10, 760. https://doi.org/10.1186/s13104-017-3091-x

Maguire, K. B. (2009). Does mode matter? A comparison of telephone, mail, and in-person treatments in contingent valuation surveys. Journal of Environmental Management, 90(11), 3528-3533. https://doi.org/10.1016/j.jenvman.2009.06.005

Mahama, T. (2022). Bayesian Hierarchical modeling for small-area estimation of disease Burden. International Journal of Science and Research Archive, 7(2), Article 2. https://doi.org/10.30574/ijsra.2022.7.2.0295

Majebi, N. L., Adelodun, M. O., & Chinyere, E. (2020). Maternal Mortality and Healthcare Disparities : Addressing Systemic Inequities in Underserved Communities. International Journal of Engineering Inventions. https://chwcentral.org/wp-content/uploads/Maternal-Mortality-and-Healthcare-Disparities-Addressing-Systemic-Inequities-in-Underserved-Communities.pdf

Majnoonian, A., Tamamian, C., Ovanesian, M., & Al-Rousan, T. (2024). Food insecurity among displaced populations in Armenia during the 2020 Nagorno-Karabakh conflict. Frontiers in Public Health, 12, 1499523. https://doi.org/10.3389/fpubh.2024.1499523

Malembaka, E. B., Altare, C., Bigirinama, R. N., Bisimwa, G., Banywesize, R., Tabbal, N., & Boerma, T. (2021). The use of health facility data to assess the effects of armed conflicts on maternal and child health : Experience from the Kivu, DR Congo. BMC Health Services Research, 21(1), 195. https://doi.org/10.1186/s12913-021-06143-7

Mason, J. B., White, J. M., Heron, L., Carter, J., Wilkinson, C., & Spiegel, P. (2012). Child acute malnutrition and mortality in populations affected by displacement in the Horn of Africa, 1997-2009. International Journal of Environmental Research and Public Health, 9(3), 791-806. https://doi.org/10.3390/ijerph9030791

Masquelier, B., Eaton, J. W., Gerland, P., Pelletier, F., & Mutai, K. K. (2017). Age patterns and sex ratios of adult mortality in countries with high HIV prevalence. AIDS, 31 Suppl 1, S77-S85. https://doi.org/10.1097/QAD.0000000000001332

Masquelier, B., Kanyangarara, M., Pison, G., Kanté, A. M., Ndiaye, C. T., Douillot, L., Duthé, G., Sokhna, C., Delaunay, V., & Helleringer, S. (2021). Errors in reported ages and dates in surveys of adult mortality : A record linkage study in Niakhar (Senegal). Population Studies, 0(0), 1-19. https://doi.org/10.1080/00324728.2020.1854332

Masquelier, B., Menashe-Oren, A., & Reniers, G. (2023). An evaluation of truncated birth histories for the rapid measurement of fertility and child survival. Population Health Metrics, 21(1), 8. https://doi.org/10.1186/s12963-023-00307-9

Masquelier, B., Menashe-Oren, A., Schlüter, B.-S., Fall, A., & Helleringer, S. (2024). Improving old-age mortality estimation with parental survival histories in surveys. Demographic Research, 51, 1429-1470. https://doi.org/10.4054/DemRes.2024.51.45

Masquelier, B., Reniers, G., & Pison, G. (2014). Divergences in trends in child and adult mortality in sub-Saharan Africa : Survey evidence on the survival of children and siblings. Population Studies, 68(2), 161-177. https://doi.org/10.1080/00324728.2013.856458

Mathers, C., & Boerma, T. (2010). Mortality Measurement Matters : Improving Data Collection and Estimation Methods for Child and Adult Mortality. PLoS Medicine, 7(4), e1000265. https://doi.org/10.1371/journal.pmed.1000265

Mathiowetz, N., Brown, C., & Bound, J. (2002). Measurement Error in Surveys of the Low-Income Population. In Age Misreporting and Age-Selective Underenumeration : Sources, Patterns, and Consequences for Demographic Analysis. The National Academies Press. https://doi.org/10.17226/19649

McBride, O., Morgan, K., & McGee, H. (2012). Recruitment using mobile telephones in an Irish general population sexual health survey : Challenges and practical solutions. BMC Medical Research Methodology, 12(1), 45. https://doi.org/10.1186/1471-2288-12-45

Mehtar, S., AlMhawish, N., Shobak, K., Reingold, A., Guha-Sapir, D., & Haar, R. J. (2021). Measles in conflict-affected northern Syria : Results from an ongoing outbreak surveillance program. Conflict and Health, 15(1), 95. https://doi.org/10.1186/s13031-021-00430-0

Menashe-Oren, A., Bocquier, P., Ginsburg, C., Compaore, Y., & Collinson, M. (2023). The dynamic role of household structure on under-5 mortality in southern and eastern sub-Saharan Africa. Demographic Research, 49, 249-294.

Menashe-Oren, A., Masquelier, B., Schlüter, B.-S., & Helleringer, S. (2023). Old-Age Mortality in Data-Sparse Countries : Assessing Selection Bias in Estimates Using Parental Survival Histories. Population, 78(3), 457-478.

Mercer, L. D., Wakefield, J., Pantazis, A., Lutambi, A. M., Masanja, H., & Clark, S. (2015). SPACE-TIME SMOOTHING OF COMPLEX SURVEY DATA : SMALL AREA ESTIMATION FOR CHILD MORTALITY. The Annals of Applied Statistics, 9(4), 1889-1905.

Merdad, L., Hill, K., & Graham, W. (2013). Improving the Measurement of Maternal Mortality : The Sisterhood Method Revisited. PLoS ONE, 8(4), e59834. https://doi.org/10.1371/journal.pone.0059834

Micheletti, C., & Villavicencio, F. (2024). On the relationship between life expectancy, modal age at death, and the threshold age of the life table entropy. Demographic Research, 51, 763-788. https://doi.org/10.4054/DemRes.2024.51.24

Mikkelsen, L., Phillips, D. E., AbouZahr, C., Setel, P. W., de Savigny, D., Lozano, R., & Lopez, A. D. (2015). A global assessment of civil registration and vital statistics systems : Monitoring data quality and progress. The Lancet, 386(10001), 1395-1406. https://doi.org/10.1016/S0140-6736(15)60171-4

Millogo, O., Doamba, J. E. O., Sié, A., Utzinger, J., & Vounatsou, P. (2019). Geographical variation in the association of child, maternal and household health interventions with under-five mortality in Burkina Faso. PloS One, 14(7), e0218163. https://doi.org/10.1371/journal.pone.0218163

Morgan, R., Manganhe, Y., Monjane, C., Nakatabira, M., Kuo, H., Manhiça, C., Mandlate, F., Sengo, M., Uamba, M., Kante, A. M., Macicame, I., & Amouzou, A. (2025). Women's participation in mobile phone surveys in Mozambique : Findings from a qualitative study. Tropical Medicine & International Health, n/a(n/a). https://doi.org/10.1111/tmi.70006

Morris, T. P., White, I. R., & Royston, P. (2014). Tuning multiple imputation by predictive mean matching and local residual draws. BMC Medical Research Methodology, 14, 75. https://doi.org/10.1186/1471-2288-14-75

Morse, B., Grépin, K. A., Blair, R. A., & Tsai, L. (2016). Patterns of demand for non-Ebola health services during and after the Ebola outbreak : Panel survey evidence from Monrovia, Liberia. BMJ Global Health, 1(1), e000007. https://doi.org/10.1136/bmjgh-2015-000007

MSH, B. (2022). Annuaire statistique du Ministère de la Santé.

Muhyie, J. H., Yayeh, D., Kidanie, S. A., Metekia, W. A., & Tilahun, T. (2025). Synthesizing the impact of armed conflicts on food security, livelihoods and social dynamics in Amhara region, Ethiopia. BMC Nutrition, 11(1), 29. https://doi.org/10.1186/s40795-025-01013-5

Mulder, J., & Bruijne, M. de. (2019). Willingness of Online Respondents to Participate in Alternative Modes of Data Collection. Survey Practice, 12(1). https://doi.org/10.29115/SP-2019-0001

Munyuzangabo, M., Gaffey, M. F., Khalifa, D. S., Als, D., Ataullahjan, A., Kamali, M., Jain, R. P., Meteke, S., Radhakrishnan, A., Shah, S., Siddiqui, F. J., & Bhutta, Z. A. (2021). Delivering maternal and neonatal health interventions in conflict settings : A systematic review. BMJ Global Health, 5(Suppl 1). https://doi.org/10.1136/bmjgh-2020-003750

Muriuki, J., Hudson, D., & Fuad, S. (2023). The impact of conflict on food security : Evidence from household data in Ethiopia and Malawi. Agriculture & Food Security, 12(1), 41. https://doi.org/10.1186/s40066-023-00447-z

Nacher, M., Epelboin, L., Bonifay, T., Djossou, F., Blaizot, R., Couppié, P., Adenis, A., Lucarelli, A., Lambert, Y., Schaub, R., & Douine, M. (2024). Migration in French Guiana : Implications in health and infectious diseases. Travel Medicine and Infectious Disease, 57, 102677. https://doi.org/10.1016/j.tmaid.2023.102677

Nareeba, T., Dzabeng, F., Alam, N., Biks, G. A., Thysen, S. M., Akuze, J., Blencowe, H., Helleringer, S., Lawn, J. E., Mahmud, K., Yitayew, T. A., Fisker, A. B., Byass, P., Lawn, J. E., Waiswa, P., Blencowe, H., Yargawa, J., Akuze, J., Fisker, A. B., … and the Every Newborn-INDEPTH Study Collaborative Group. (2021). Neonatal and child mortality data in retrospective population-based surveys compared with prospective demographic surveillance : EN-INDEPTH study. Population Health Metrics, 19(1), 7. https://doi.org/10.1186/s12963-020-00232-1

Nations Unies & Division de statistique. (2003). Principes et recommandations pour un syst??me de statistiques de l'??tat civil. Nations Unies.

Neves, P. A. R., Gatica-Domínguez, G., Santos, I. S., Bertoldi, A. D., Domingues, M., Murray, J., & Silveira, M. F. (2020). Poor maternal nutritional status before and during pregnancy is associated with suspected child developmental delay in 2-year old Brazilian children. Scientific Reports, 10(1), 1851. https://doi.org/10.1038/s41598-020-59034-y

Ngo, N. V., Pemunta, N. V., Muluh, N. E., Adedze, M., Basil, N., & Agwale, S. (2020). Armed conflict, a neglected determinant of childhood vaccination : Some children are left behind. Human Vaccines & Immunotherapeutics, 16(6), 1454-1463. https://doi.org/10.1080/21645515.2019.1688043

Nguyen, G., Boath, A., & Heslehurst, N. (2023). Addressing inequalities and improving maternal and infant outcomes : The potential power of nutritional interventions across the reproductive cycle. Proceedings of the Nutrition Society, 82(3), 241-252. https://doi.org/10.1017/S002966512300006X

Niamba, L. (2019). Geographical and Gender Disparities in the Registration of Births, Marriages, and Deaths in the Nouna Health and Demographic Surveillance System, Burkina Faso. CENTRE OF EXCELLENCE for CRVS Systems, (1). https://crvssystems.ca/sites/default/files/assets/files/WorkingPaperSeries_Issue1_Niamba_e_WEB.pdf

Niamba, L., Gagnon, A., Adjiwanou, V., & Legrand, T. K. (2019). Arrangements résidentiels et santé des personnes âgées à Nouna (Burkina Faso) : Approches transversale et longitudinale. Cahiers québécois de démographie, 48(2), 157. https://doi.org/10.7202/1074180ar

Nikiema, P. R., & Dedewanou, F. A. (2024). The Impact of COVID-19 on Food Insecurity in Burkina Faso. https://publication.aercafricalibrary.org/handle/123456789/3693

Nsiah-Asamoah, C., Adjei, G., Agblorti, S., & Doku, D. T. (2022). Association of maternal characteristics with child feeding indicators and nutritional status of children under-two years in Rural Ghana. BMC Pediatrics, 22(1), 581. https://doi.org/10.1186/s12887-022-03651-1

OCHA. (2022, juillet 7). Burkina Faso : Situation des personnes déplacées internes (PDI) (30 juin 2022) | OCHA. https://www.unocha.org/publications/report/burkina-faso/burkina-faso-situation-des-personnes-deplacees-internes-pdi-30-juin-2022

Odwe, G., Khasakhala, A., Agwanda, T., Imbwaga, A., & Lyaga, Z. (2015). Mortality Decline in Kenya : A Reexamination of Recent Under-Five Mortality Estimate. International Journal of Population Research, 2015(1), 296437. https://doi.org/10.1155/2015/296437

Ogbu, T. J., Scales, S. E., de Almeida, M. M., van Loenhout, J. A. F., Speybroeck, N., & Guha-Sapir, D. (2022). Predictors of exceeding emergency under-five mortality thresholds using small-scale survey data from humanitarian settings (1999 - 2020) : Considerations for measles vaccination, malnutrition, and displacement status. Archives of Public Health = Archives Belges De Sante Publique, 80(1), 160. https://doi.org/10.1186/s13690-022-00916-0

O'hare, B. A. M., & Southall, D. P. (2007). First do no harm : The impact of recent armed conflict on maternal and child health in Sub-Saharan Africa. Journal of the Royal Society of Medicine, 100(12), 564-570. https://doi.org/10.1177/014107680710001201 5

OMS, B. F. (2023). Rapport de situation N° 21 : Réponse sanitaire à la crise humanitaire au Burkina Faso.

Ouedraogo, O., Siguré, S., Sanou, S., Kaboré, A., Dahany, M. M., & Diallo, S. (2024). Landscape analysis of healthcare workforce and resilience actions in the Sahelian context of high security challenge areas : The case of Burkina Faso. The International Journal of Health Planning and Management, 39(3), 933-944. https://doi.org/10.1002/hpm.3764

Ouedraogo, S. (2020). Estimation of older adult mortality from imperfect data : A comparative review of methods using Burkina Faso censuses. Demographic Research, 43, 1119-1154.

Oza, S., Cousens, S. N., & Lawn, J. E. (2014). Estimation of daily risk of neonatal death, including the day of birth, in 186 countries in 2013 : A vital-registration and modelling-based study. The Lancet. Global Health, 2(11), e635-644. https://doi.org/10.1016/S2214-109X(14)70309-2

Ozer, P., Dembele, A., Yameogo, S. S., Hut, E., & de Longueville, F. (2022). The impact of COVID-19 on the living and survival conditions of internally displaced persons in Burkina Faso. World Development Perspectives, 25, 100393. https://doi.org/10.1016/j.wdp.2022.100393

Pariyo, G., Greenleaf, A. R., Gibson, D., Ali, J., Selig, H., Labrique, A., Kibria, G. A. A., Khan, I., Masanja, H., Flora, M. S., Ahmed, S., & Hyder, A. (2019). Does mobile phone survey method matter? Reliability of computer-assisted telephone interviews and interactive voice response non-communicable diseases risk factor surveys in low and middle income countries. PloS one. https://doi.org/10.1371/journal.pone.0214450

Pattnaik, A., Mohan, D., Chipokosa, S., Wachepa, S., Katengeza, H., Misomali, A., & Marx, M. A. (2020). Testing the validity and feasibility of using a mobile phone-based method to assess the strength of implementation of family planning programs in Malawi. BMC Health Services Research, 20(1), 221. https://doi.org/10.1186/s12913-020-5066-1

Peisakhin, L., Stoop, N., & Windt, P. V. D. (2025). Who Hosts? The Correlates of Hosting the Internally Displaced. American Political Science Review, 119(3), 1143-1158. https://doi.org/10.1017/S0003055424000923

Pew Research Center. (2012, mai 15). Assessing the Representativeness of Public Opinion Surveys. Pew Research Center - U.S. Politics & Policy. https://www.pewresearch.org/politics/2012/05/15/assessing-the-representativeness-of-public-opinion-surveys/

Pison, G. (2005). Population observatories as sources of information on mortality in developing countries. Demographic Research, 13, 301-334. https://doi.org/10.4054/DemRes.2005.13.13

PMA. (2020). PMA Burkina Faso COVID-19 Dashboard French | PMA Data. https://www.pmadata.org/pma-burkina-faso-covid-19-dashboard-french

PMA. (2023). PMA Burkina Faso COVID-19 Dashboard French | PMA Data. https://www.pmadata.org/pma-burkina-faso-covid-19-dashboard-french

Program, I. of M. (US) C. on D. R. A. in the W. (2002). Evidence of Dietary Risk Among Low-Income Women and Children. In Dietary Risk Assessment in the WIC Program. National Academies Press (US). https://www.ncbi.nlm.nih.gov/books/NBK220566/

Pullum, T. W., & Staveteig, S. (2017). An Assessment of the Quality and Consistency of Age and Date Reporting in DHS Surveys, 2000-2015. DHS Methodological Reports No. 19. https://dhsprogram.com/pubs/pdf/mr19/mr19.pdf

RaMMPS. (2024, août 12). Mortality data collection via mobile phone surveys : Opportunities and challenges [Monograph]. London School of Hygiene and Tropical Medicine. Mortality Data Collection via Mobile Phone Surveys: Opportunities and Challenges. https://doi.org/10.17037/PUBS.04673293

Randall, S., & Coast, E. (2016). The quality of demographic data on older Africans. Demographic Research, 34, 143-174. https://doi.org/10.4054/DemRes.2016.34.5

Rasmussen, K. M., Yaktine, A. L., & Guidelines, I. of M. (US) and N. R. C. (US) C. to R. I. P. W. (2009). Consequences of Gestational Weight Gain for the Child. In Weight Gain During Pregnancy : Reexamining the Guidelines. National Academies Press (US). https://www.ncbi.nlm.nih.gov/books/NBK32816/

Renault, W. (2019, mars 12). Le Burkina Faso face à la menace djihadiste. Portail de l'IE. https://www.portail-ie.fr/univers/surete-et-gouvernance-des-risques/2019/le-burkina-faso-face-a-la-menace-djihadiste/

Reniers, G., Masquelier, B., & Gerland, P. (2011). Adult Mortality in Africa. In R. G. Rogers & E. M. Crimmins (Éds.), International Handbook of Adult Mortality (p. 151-170). Springer Netherlands. https://doi.org/10.1007/978-90-481-9996-9_7

Reniers, G., Romero-Prieto, J., Chasukwa, M., Muthema, F., Walters, S., Masquelier, B., Banda, J., Souza, E., & Dulani, B. (2025). Mobile phone survey estimates of perinatal mortality in Malawi : A comparison of data from truncated and full pregnancy histories. Tropical Medicine & International Health: TM & IH, 30(6), 521-530. https://doi.org/10.1111/tmi.14109

Requejo, J., Strong, K., Agweyu, A., Billah, S. M., Boschi-Pinto, C., Horiuchi, S., Jamaluddine, Z., Lazzerini, M., Maiga, A., McKerrow, N., Munos, M., Park, L., Schellenberg, J., & Weigel, R. (2022). Measuring and monitoring child health and wellbeing : Recommendations for tracking progress with a core set of indicators in the Sustainable Development Goals era. The Lancet Child & Adolescent Health, 6(5), 345-352. https://doi.org/10.1016/S2352-4642(22)00039-6

Rerimoi, A. J., Jasseh, M., Agbla, S. C., Reniers, G., Roca, A., & Timæus, I. M. (2019). Under-five mortality in The Gambia : Comparison of the results of the first demographic and health survey with those from existing inquiries. PLOS ONE, 14(7), e0219919. https://doi.org/10.1371/journal.pone.0219919

Revilla, M. (2012). Impact of the Mode of Data Collection on the Quality of Answers to Survey Questions Depending on Respondent Characteristics. Bulletin of Sociological Methodology/Bulletin de Méthodologie Sociologique, 116(1), 44-60. https://doi.org/10.1177/0759106312456510

Revilla, M. A., & Saris, W. E. (2013). A Comparison of the Quality of Questions in a Face-to-face and a Web Survey. International Journal of Public Opinion Research, 25(2), 242-253. https://doi.org/10.1093/ijpor/eds007

Roberts, C., Eva, G., Allum, N., & Lynn, P. (2010). Data quality in telephone surveys and the effect of questionnaire length : A cross-national experiment.

Roberts, C., Jäckle, A., & Lynn, P. (2006). Causes of Mode Effects : Separating out Interviewer and Stimulus Effects in Comparisons of Face-to-Face and Telephone Surveys. 8.

Robertson, L., Gregson, S., Madanhire, C., Walker, N., Mushati, P., Garnett, G., & Nyamukapa, C. (2008). Discrepancies between UN models and DHS survey estimates of maternal orphan prevalence : Insights from analyses of survey data from Zimbabwe. Sexually Transmitted Infections, 84(Supplement 1), i57-i62.

Romero Prieto, J., Verhulst, A., & Guillot, M. (2021). Estimating the infant mortality rate from DHS birth histories in the presence of age heaping. PLoS ONE, 16(11), e0259304. https://doi.org/10.1371/journal.pone.0259304

Rosenberg, W. L. (2024). Processes and Challenges Associated with Conducting Survey Research in Conflict Zones. Survey Practice, 17. https://doi.org/10.29115/SP-2023-0032

Rosenzweig, S. C. (2021). Age is measured with systematic measurement error in developing country surveys : A diagnosis and analysis of consequences. Research & Politics, 8(3), 20531680211044068. https://doi.org/10.1177/20531680211044068

Rossier, C., Soura, A., Baya, B., Compaoré, G., Dabiré, B., Dos Santos, S., Duthé, G., Gnoumou, B., Kobiané, J. F., Kouanda, S., Lankoandé, B., Legrand, T., Mbacke, C., Millogo, R., Mondain, N., Montgomery, M., Nikiema, A., Ouili, I., Pison, G., … Zourkaleini, Y. (2012). Profile : The Ouagadougou Health and Demographic

Surveillance System. International Journal of Epidemiology, 41(3), 658-666. https://doi.org/10.1093/ije/dys090

Sahar, A., Julio, P., David, S., Masquelier, B., Pullum, T. W., & Reniers, G. (2024). Sample Selection Bias in Adult Mortality Estimates from Mobile Phone Surveys. Evidence From 25 Low- And Middle-Income Countries. Uaps2024. https://uaps2024.popconf.org/abstracts/192202

Sahloul, M. Z., Monla-Hassan, J., Sankari, A., Kherallah, M., Atassi, B., Badr, S., Abbara, A., & Sparrow, A. (2016). War is the Enemy of Health. Pulmonary, Critical Care, and Sleep Medicine in War-Torn Syria. Annals of the American Thoracic Society, 13(2), 147-155. https://doi.org/10.1513/AnnalsATS.201510-661PS

Salami, B., Mogale, S., Ojo, F., Kariwo, M., Thompson, J., Okeke-Ihejirika, P., & Yohani, S. (2021). Health of African Refugee Children Outside Africa : A Scoping Review. Journal of Pediatric Nursing, 61, 199-206. https://doi.org/10.1016/j.pedn.2021.06.001

Sánchez-Páez, D. A., Masquelier, B., Menashe Oren, A., Baruwa, O., & Reniers, G. (2023). Measuring under-five mortality and fertility through mobile phone surveys : An assessment of selection bias in 34 low- and middle-income countries. PAA Annual Meeting. https://dial.uclouvain.be/pr/boreal/object/boreal:269071

Sánchez-Páez, D. A., Masquelier, B., Menashe-Oren, A., Baruwa, O. J., & Reniers, G. (2023a). Measuring under-5 mortality and fertility through mobile phone surveys : An assessment of selection bias in 34 low-income and middle-income countries. BMJ Open, 13(11), e071791. https://doi.org/10.1136/bmjopen-2023-071791

Sánchez-Páez, D. A., Masquelier, B., Menashe-Oren, A., Baruwa, O. J., & Reniers, G. (2023b). Measuring under-5 mortality and fertility through mobile phone surveys : An assessment of selection bias in 34 low-income and middle-income countries. BMJ Open, 13(11), e071791. https://doi.org/10.1136/bmjopen-2023-071791

Sangster, R. (2003). Do Current Methods Used to Improve Response to Telephone Surveys Reduce Nonresponse Bias? Bureau of Labor Statistics. https://www.bls.gov/osmr/research-papers/2003/st030290.htm

Särndal, C.-E., Swensson, B., & Wretman, J. (2007). Model Assisted Survey Sampling (Springer New York, NY). Springer New York, NY. https://link.springer.com/book/9780387406206

Sawadogo, N., Randall, S., & Bazié, F. (2019). Mobilités familiales face à l'isolement des personnes âgées au Burkina Faso. Gérontolie et société.

Schmertmann, C., Queiroz, B. L., & Gonzaga, M. (2024). Data errors in mortality estimation : Formal demographic analysis of under-registration, under-enumeration, and age misreporting. Demographic Research, 51, 229-266. https://doi.org/10.4054/DemRes.2024.51.9

Schmidt, K., Gummer, T., & Roßmann, J. (2020). Effects of Respondent and Survey Characteristics on the Response Quality of an Open-Ended Attitude Question in Web Surveys. Methods, Data, Analyses, 14(1), Article 1. https://doi.org/10.12758/mda.2019.05

Schoumaker, B. (2015). Stalls in Fertility Transitions in Sub- Saharan Africa : Real or Spurious?

Sharma, S., Desai, S., Barik, D., & Sharma, O. P. (2024). Gone and forgotten? Predictors of birth history omissions in India. Demographic Research, 50, 929-966. https://doi.org/10.4054/DemRes.2024.50.32

Sharrow, D., Hug, L., You, D., Alkema, L., Black, R., Cousens, S., Croft, T., Gaigbe-Togbe, V., Gerland, P., Guillot, M., Hill, K., Masquelier, B., Mathers, C., Pedersen, J., Strong, K. L., Suzuki, E., Wakefield, J., & Walker, N. (2022). Global, regional, and national trends in under-5 mortality between 1990 and 2019 with scenario-based projections

until 2030 : A systematic analysis by the UN Inter-agency Group for Child Mortality Estimation. The Lancet Global Health, 10(2), e195-e206. https://doi.org/10.1016/S2214-109X(21)00515-5

Shirima, K., Mukasa, O., Schellenberg, J. A., Manzi, F., John, D., Mushi, A., Mrisho, M., Tanner, M., Mshinda, H., & Schellenberg, D. (2007). The use of personal digital assistants for data entry at the point of collection in a large household survey in southern Tanzania. Emerging Themes in Epidemiology, 4(1), 5. https://doi.org/10.1186/1742-7622-4-5

Shumilova, O., Tockner, K., Sukhodolov, A., Khilchevskyi, V., De Meester, L., Stepanenko, S., Trokhymenko, G., Hernández-Agüero, J. A., & Gleick, P. (2023). Impact of the Russia–Ukraine armed conflict on water resources and water infrastructure. Nature Sustainability, 6(5), 578-586. https://doi.org/10.1038/s41893-023-01068-x

Siegel, J. S., Swanson, D. A., & Shryock, H. S. (Éds.). (2004). The methods and materials of demography (2nd ed). Elsevier/Academic Press.

Sinclair, M. I., O'Toole, J. E., Malawaraarachchi, M. G., & Leder, K. S. (2012). Comparison of response rates and cost-effectiveness for a community-based survey : Postal, internet and telephone modes with generic or personalised recruitment approaches. BMC Medical Research Methodology, 12(Art. ID: 132), 1-8. https://doi.org/10.1186/1471-2288-12-132

Sinclair, M., O'Toole, J., Malawaraarachchi, M., & Leder, K. (2012). Comparison of response rates and cost-effectiveness for a community-based survey : Postal, internet and telephone modes with generic or personalised recruitment approaches. BMC Medical Research Methodology, 12(1), 132. https://doi.org/10.1186/1471-2288-12-132

Singer, E., & Ye, C. (2013). The Use and Effects of Incentives in Surveys. The ANNALS of the American Academy of Political and Social Science, 645(1), 112-141. https://doi.org/10.1177/0002716212458082

Soullier, N., Legleye, S., & Richard, J.-B. (2022). Moving towards a single-frame cell phone design in random digit dialing surveys : Considerations from a French general population health survey. BMC Medical Research Methodology, 22(1), 94. https://doi.org/10.1186/s12874-022-01573-1

Souza, E., Banda, J., Jamali, M., Muthema, F., Saikolo, J., Chasukwa, M., Tlhajoane, M., Dulani, B., Romero-Prieto, J., Reniers, G., & Helleringer, S. (2024). Interrogating the quality and completion of mortality mobile phone interviews conducted in Malawi during COVID-19 : An examination of interviewer–respondent interactions. Demographic Research, 51, 1471-1490. https://doi.org/10.4054/DemRes.2024.51.46

Staver, A. (2008). A Right for Forced Migrants? (51).

Steeh, C. (2008). Telephone Surveys. In International Handbook of Survey Methodology. Routledge.

Tabutin, D. (2006). Les systèmes de collecte des données en démographie. 52.

Tapsoba, A., Wardell, D. A., Zida, M., & Elias, M. (2021). Insécurité et COVID-19 au Burkina Faso : Opportunités et vulnérabilités des femmes de la chaîne de valeurs du karité. https://hdl.handle.net/10568/116775

Tariqujjaman, M., Hasan, M. M., Mahfuz, M., Hossain, M., & Ahmed, T. (2022). Association between Mother's Education and Infant and Young Child Feeding Practices in South Asia. Nutrients, 14(7), 1514. https://doi.org/10.3390/nu14071514

Timaeus, I. M. (1992). Estimation of adult mortality from paternal orphanhood : A reassessment and a new approach. Population Bulletin of the United Nations, (33), 47-63.

Timaeus, I. M. (2015). Estimation indirecte de la mortalité adulte à partir des proportions d'orphelins. In Moultrie TA, Dorrington RE, Hill AG, Hill K, Timaeus IM and Zaba B (eds). In Tools for Demographic Estimation. https://demographicestimation.iussp.org/fr/content/estimation-indirecte-de-la-mortalite-adulte-partir-des-proportions-dorphelins

Timaeus, I. M., & Jasseh, M. (2004). Adult mortality in sub-Saharan Africa : Evidence from Demographic and Health Surveys. Demography, 41(4), 757-772. https://doi.org/10.1353/dem.2004.0037

Torres Munguía, J. A., Bukar, M., Badu, F. Y. A., O'Neil, S., & Van Broeckhoven, K. (2023). The Prospects for Remote Assessment : A Comparison of Phone vs In-person Interviews in Nigeria. UNIDIR. https://doi.org/10.37559/MEAC/23/03

Torrisi, O., Banda, J., Reniers, G., & Helleringer, S. (2024). Revisiting the Recommended Duration of Interviews Conducted by Mobile Phone in Low- and Middle-income Countries : A Randomized Trial in Malawi. Field Methods, 1525822X241248906. https://doi.org/10.1177/1525822X241248906

Torrisi, O., Fisker, A. B., Fernandes, D. A. A., & Helleringer, S. (2025). Improving retrospective data on recent household deaths : A multi-arm randomized trial in Guinea-Bissau. International Journal of Epidemiology, 54(2), dyaf009. https://doi.org/10.1093/ije/dyaf009

Tourangeau, R., Edwards, B., Johnson, T. P., Wolter, K. M., & Bates, N. (Éds.). (2014). Hard-to-Survey Populations. Cambridge University Press. https://doi.org/10.1017/CBO9781139381635

Tran, A., Fang, T., Oranga, B., Kopper, R., & Kang, Y. (2025). Livelihood training, food production, and food security among vulnerable communities in Bangladesh. Agriculture & Food Security, 13(1), 58. https://doi.org/10.1186/s40066-024-00504-1

Tran, M. C., Labrique, A. B., Mehra, S., Ali, H., Shaikh, S., Mitra, M., Christian, P., & West, K. (2015). Analyzing the mobile « digital divide » : Changing determinants of household phone ownership over time in rural bangladesh. JMIR mHealth and uHealth, 3(1), e24. https://doi.org/10.2196/mhealth.3663

Triga, V. (2019). Does mode of administration impact on quality of data? Comparing a traditional survey versus an online survey via a Voting Advice Application. Survey Research Methods. https://www.academia.edu/40074536/Does_mode_of_administration_impact_on_quality_of_data_Comparing_a_traditional_survey_versus_an_online_survey_via_a_Voting_Advice_Application

Tsadik, M., Gebretnsae, H., Ayalew, A., Asgedom, A. A., Gebreyesus, A., Hagos, T., Abrha, M., Weldegerima, K., Abrha, B., Gebre, G., Hagos, M., Esayas, R., Gebregeorgis, M., Gesesew, H. A., & Mulugeta, A. (2023). Child health services and armed conflict in Tigray, North Ethiopia : A community-based study. Conflict and Health, 17(1), 47. https://doi.org/10.1186/s13031-023-00545-6

UCLouvain. (2024). Utilisation Responsable de l'Intelligence Artificielle Générative. Université Catholique de Louvain. https://oer.uclouvain.be/jspui/bitstream/20.500.12279/1079/1/IAGenerative_Groupe_de_Travail_UCLouvain_2024_06.pdf

UN IGME. (2022). Inter-agency child and maternal mortality estimates | Population Division. https://www.un.org/development/desa/pd/content/inter-agency-child-and-maternal-mortality-estimates

UN IGME. (2024). Levels & Trends in Child Mortality.

UN IGME. (2025). Burkina Faso (BFA)—Demographics, Health & Infant Mortality. UNICEF DATA. https://data.unicef.org/country/bfa/

UN. Population Division. (2011). UN. https://digitallibrary.un.org/record/3922186

UNHCR. (2025a). Refugee Data Finder. UNHCR. https://www.unhcr.org/external/component/header

UNHCR, A. (2025b). Burkina Faso. UNHCR Africa. https://www.unhcr.org/africa/countries/burkina-faso

UNICEF. (2022). Strategy and action plan of the Africa Programme on Accelerated Improvement of Civil Registration and Vital Statistics Systems for the period 2023–2027. Regional strategy and action plan for civil registration and vital statistics and achieving the commitments of the 2030 Agenda.

UNICEF. (2025a). Enregistrement des naissances en Afrique subsaharienne : Niveaux actuels et tendances. https://data.unicef.org/resources/birth-registration-in-sub-saharan-africa-current-levels-and-trends/

UNICEF. (2025b). MICS Plus datasets and reports. https://mics.unicef.org/mics-plus/mics-plus-results

United Nations. (2022). World Population Prospects—Population Division—United Nations. https://population.un.org/wpp/

United Nations. (2025, octobre 10). In Africa's Sahel, conflict and climate change force millions from their homes | The United Nations Office at Geneva. https://www.ungeneva.org/en/news-media/news/2025/10/111648/africas-sahel-conflict-and-climate-change-force-millions-their-homes

UNSD. (2024). Transforming our world : The 2030 Agenda for Sustainable Development | Department of Economic and Social Affairs. https://sdgs.un.org/2030agenda

UNSD. (2025). United Nations Statistics Division—Demographic and Social Statistics. https://unstats.un.org/unsd/demographic/crvs/globalcrvs.html?utm_source=chatgpt.com

Vaivada, T., Gaffey, M. F., Das, J. K., & Bhutta, Z. A. (2017). Evidence-based interventions for improvement of maternal and child nutrition in low-income settings : What's new? Current Opinion in Clinical Nutrition and Metabolic Care, 20(3), 204-210. https://doi.org/10.1097/MCO.0000000000000365

Van Malderen, C., Amouzou, A., Barros, A. J. D., Masquelier, B., Van Oyen, H., & Speybroeck, N. (2019). Socioeconomic factors contributing to under-five mortality in sub-Saharan Africa : A decomposition analysis. BMC Public Health, 19(1), 760. https://doi.org/10.1186/s12889-019-7111-8

van Heerden, A. C., Norris, S. A., & Richter, L. M. (2010). Using Mobile Phones for Adolescent Research in Low and Middle Income Countries : Preliminary Findings From the Birth to Twenty Cohort, South Africa. Journal of Adolescent Health, 46(3), 302-304. https://doi.org/10.1016/j.jadohealth.2009.09.008

Vehovar, V., Slavec, A., & Berzelak, N. (2012). Costs and Errors in Fixed and Mobile Phone Surveys. In L. Gideon (Éd.), Handbook of Survey Methodology for the Social Sciences (p. 277-295). Springer. https://doi.org/10.1007/978-1-4614-3876-2_16

Victora, C. G., Bahl, R., Barros, A. J. D., França, G. V. A., Horton, S., Krasevec, J., Murch, S., Sankar, M. J., Walker, N., Rollins, N. C., & Lancet Breastfeeding Series Group. (2016). Breastfeeding in the 21st century : Epidemiology, mechanisms, and lifelong effect. Lancet (London, England), 387(10017), 475-490. https://doi.org/10.1016/S0140-6736(15)01024-7

Victora, C. G., Christian, P., Vidaletti, L. P., Gatica-Domínguez, G., Menon, P., & Black, R. E. (2021). Revisiting maternal and child undernutrition in low-income and middle-income countries : Variable progress towards an unfinished agenda. Lancet (London, England), 397(10282), 1388-1399. https://doi.org/10.1016/S0140-6736(21)00394-9

Vinceti, M., Filippini, T., Rothman, K. J., Ferrari, F., Goffi, A., Maffeis, G., & Orsini, N. (2020). Lockdown timing and efficacy in controlling COVID-19 using mobile phone tracking. EClinicalMedicine, 25, 100457. https://doi.org/10.1016/j.eclinm.2020.100457

Vos, T., Lim, S. S., Abbafati, C., Abbas, K. M., Abbasi, M., Abbasifard, M., Abbasi-Kangevari, M., Abbastabar, H., Abd-Allah, F., Abdelalim, A., Abdollahi, M., Abdollahpour, I., Abolhassani, H., Aboyans, V., Abrams, E. M., Abreu, L. G., Abrigo, M. R. M., Abu-Raddad, L. J., Abushouk, A. I., … Murray, C. J. L. (2020). Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019 : A systematic analysis for the Global Burden of Disease Study 2019. The Lancet, 396(10258), 1204-1222. https://doi.org/10.1016/S0140-6736(20)30925-9

Wagner, Z., Heft-Neal, S., Bhutta, Z. A., Black, R. E., Burke, M., & Bendavid, E. (2018). Armed conflict and child mortality in Africa : A geospatial analysis. The Lancet, 392(10150), 857-865. https://doi.org/10.1016/S0140-6736(18)31437-5

Wak, G., Oladokun, S., Abubakari, S., Komesuor, J., Ansah, P., & Kwankye, S. (2024). Effect of Maternal Migration on Under-five Mortality in the Navrongo Hdss Area. https://doi.org/10.21203/rs.3.rs-4335587/v1

Wallis, A. B. (2018). Addressing Gaps in Maternal, Neonatal, and Child Health for Achieving SDG 2030 in West Africa. African Journal of Reproductive Health / La Revue Africaine de la Santé Reproductive, 22(4), 9-11.

Wang, D., Xu, Z., Pascual, U., Liu, L., Ahmad, W., & Jiang, D. (2025). Exploring the role of armed conflict in progress toward Sustainable Development Goals : Global patterns, regional differences, and driving mechanisms. Geography and Sustainability, 6(6), 100355. https://doi.org/10.1016/j.geosus.2025.100355

Ware, H. (1977). Language Problems in Demographic Field Work in Africa : The Case of the Cameroon Fertility Survey. 50.

Weinreb, A., Sana, M., & Stecklov, G. (2018). Strangers in the Field : A Methodological Experiment on Interviewer–Respondent Familiarity. Bulletin of Sociological Methodology/Bulletin de Méthodologie Sociologique, 137-138(1), 94-119. https://doi.org/10.1177/0759106318761562

WFP. (2023, juillet 3). Burkina Faso : Mise à jour de la situation, Mai 2023 - Burkina Faso | ReliefWeb. https://reliefweb.int/report/burkina-faso/burkina-faso-mise-jour-de-la-situation-mai-2023

WHO. (2023). WHO's Health Emergency Appeal, 2023. https://iris.who.int/bitstream/handle/10665/365635/WHO-WHE-EXR-2023.1-eng.pdf?sequence=1

WHO. (2025a). Burkina Faso Health data overview for Burkina Faso. Datadot. https://data.who.int/countries/854

WHO. (2025b). Civil registration and vital statistics (CRVS)—WHO. https://www.who.int/data/data-collection-tools/civil-registration-and-vital-statistics-(crvs)

WHO. (2025c). Civil registration : Why counting births and deaths is important. https://www.who.int/fr/news-room/fact-sheets/detail/civil-registration-and-vital-statistics

WHO, E. (2017). Stratégie régionale pour l'amélioration des systèmes d'enregistrement des actes et de statistiques d'état civil 2014-2019. Bureau régional de l'Organisation mondiale de la Santé pour la Méditerranée orientale. https://applications.emro.who.int/docs/EMROPUB_2017_FR_20162.pdf

World Bank. (2020). Suivi de l'impact de la pandémie de COVID-19 sur les ménages à Djibouti par des enquêtes téléphoniques à haute fréquence [Text/HTML]. World Bank.

https://www.banquemondiale.org/fr/country/djibouti/brief/monitoring-the-impact-of-covid-19-on-households-in-djibouti-through-high-frequency-phone-surveys

World Bank. (2021). World Bank Open Data. World Bank Open Data. https://data.worldbank.org

World Bank. (2022). Burkina Faso—Mobile Cellular Subscriptions (per 100 People)—2022 Data 2023 Forecast 1960-2020 Historical. https://tradingeconomics.com/burkina-faso/mobile-cellular-subscriptions-per-100-people-wb-data.html

World Bank. (2025). Survey of National Statistical Offices (NSOs) during COVID-19 [Text/HTML]. World Bank. https://www.worldbank.org/en/research/brief/survey-of-national-statistical-offices-nsos-during-covid-19

World Bank Group. (2016). Republic of Guinea : Socioeconomic Impact of Ebola Using Mobile Phone Survey. World Bank. https://doi.org/10.1596/24724

World Bank Group. (2020). Monitoring COVID-19 Impacts on Firms in Ethiopia : Results from a High-Frequency Phone Survey of Firms [Text/HTML]. World Bank. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/515671597673928629/Monitoring-COVID-19-Impacts-on-Firms-in-Ethiopia-Results-from-a-High-Frequency-Phone-Survey-of-Firms

World Bank Group. (2022). LSMS-Supported High-Frequency Phone Surveys on COVID-19 [Text/HTML]. World Bank. https://www.worldbank.org/en/programs/lsms/brief/lsms-launches-high-frequency-phone-surveys-on-covid-19

World Bank Group. (2024). Burkina Faso Vue d'ensemble [Text/HTML]. World Bank. https://www.banquemondiale.org/fr/country/burkinafaso/overview

Worldometer. (2025). Burkina Faso Population (2025). Worldometer. https://www.worldometers.info/world-population/burkina-faso-population/

WPP. (2022). World Population Prospects 2022 : Summary of Results. United Nations. https://doi.org/10.18356/9789210014380

WPP. (2023). Division des Nations Unies pour la population. 2009. World Population Prospects : The 2008 Revision (Perspectives relatives à la population mondiale : Révision de 2008). New York, Nations Unies, Département des affaires sociales et économiques. https://donnees.banquemondiale.org/indicator/SP.DYN.CDRT.IN?locations=SN

Yankey, O., Essah, M., & Amegbor, P. M. (2025). The COVID-19 pandemic and self-reported food insecurity among women in Burkina Faso : Evidence from the performance monitoring for action (PMA) COVID-19 survey data. BMC Women's Health, 25(1), 42. https://doi.org/10.1186/s12905-025-03565-x

Yaogo, M., & Zerbo, R. (2022). APPROCHE SOCIO-HISTORIQUE DE L'EVOLUTION DES POLITIQUES DE SANTE ET DE LA GRATUITE DES SOINS AU BURKINA FASO SOCIO-HISTORICAL APPROACH TO THE EVOLUTION OF HEALTH POLICIES AND FREE HEALTHCARE IN BURKINA FASO. 02(27).

Ye, Y., Wamukoya, M., Ezeh, A., Emina, J. B. O., & Sankoh, O. (2012). Health and demographic surveillance systems : A step towards full civil registration and vital statistics system in sub-Sahara Africa? BMC Public Health, 12(1), 741. https://doi.org/10.1186/1471-2458-12-741

Yougbaré, S., Ouedraogo, A. N., & Rouamba/Ouedraogo, B. V. C. (2022). COVID-19 Among Internally Displaced Persons in Burkina Faso : Psychosocial Impact and Intervention Strategies. Social Sciences, 11(1), Article 1. https://doi.org/10.11648/j.ss.20221101.15

Younoussi, Z. (2007). Les Determinants Demographiques Et Socio-Economiques Du Confiage Des Enfants Au Burkina Faso. African Population Studies, 22(2), Article 2. https://doi.org/10.11564/22-2-335

Yuen, A., Warsame, A., & Checchi, F. (2022). Exploring the temporal patterns and crisis-related risk factors for population displacement in Somalia (2016-2018). Journal of Migration and Health, 5, 100095. https://doi.org/10.1016/j.jmh.2022.100095

Zewudie, A. T., Gelagay, A. A., & Enyew, E. F. (2020). Determinants of Under-Five Child Mortality in Ethiopia : Analysis Using Ethiopian Demographic Health Survey, 2016. International Journal of Pediatrics, 2020, 7471545. https://doi.org/10.1155/2020/7471545

Zhang, Y., Gill, T. M., Bandeen-Roche, K., Becher, R. D., Davis-Plourde, K., & Zang, E. X. (2025). Obtaining Population-Based Estimates for Survey Data Using Bayesian Hierarchical Models with Poststratification. American journal of epidemiology, kwaf209. https://doi.org/10.1093/aje/kwaf209

11 Appendix

11.1 Appendix-questionnaires

Table 11.1 : RAMMPS Burkina Faso – Chef de ménage EHCVM

CONSENTEMENT

Bonjour, je m'appelle .... et je travaille pour l'Institut Supérieur des Sciences de la Population (ISSP) de l'Université Joseph Ki-Zerbo (UJKZ). Cet institut en collaboration avec l'Institut National de la Statistique et de la Démographie (INSD) entreprend une recherche sur l'impact de la Covid-19 sur l'état de santé des populations. Il s'agit plus précisément de mesurer la surmortalité liée à la Covid-19 en s'appuyant sur des enquêtes par téléphone. Nous avons obtenu votre numéro de téléphone à partir de l'enquête sur les conditions de vie des ménages réalisée par l'INSD entre Septembre 2018 et Juillet 2019. Votre participation à cette étude est volontaire. Vous pouvez interrompre l'entretien à tout moment et vous pouvez choisir de ne répondre à aucune des questions que je vous poserai. Toutes les informations que nous recueillerons au cours de cet entretien pourront être communiquées à des chercheurs, mais uniquement après avoir effacé votre nom, prénom et votre numéro de téléphone pour garantir votre anonymat. La durée moyenne de l'entretien devrait être de 20 minutes. Si vous terminez l'entretien, nous vous transférerons .... FCFA pour vous remercier d'avoir pris le temps de répondre à ces questions. A la fin de cet appel, je vous enverrai également un SMS contenant les coordonnées de l'équipe de recherche du projet ainsi que celles du comité d'éthique de la recherche en santé, au cas où vous auriez des questions ou des commentaires.

Avez-vous une question à me poser à ce stade ? 1.OUI 0.NON			
C1	Souhaitez-vous participer à cette étude ?	1.OUI 0.NON	Si "0" fin de l'entretien
VERIFIER : PAS DE CONSENTEMENT : Je regrette que vous ne souhaitiez pas poursuivre, mais je respecte votre décision et je vous souhaite une bonne journée. CONSENTEMENT : Merci d'avoir accepté de participer à cette étude, nous vous en sommes très reconnaissants ----------> L1			

INTRODUCTION + LANGUE

NUM	QUESTIONS	CATÉGORIES DE CODAGE	SAUT
L1	Puis-je savoir dans quelle langue pouvons-nous le mieux communiquer ?	1.Mooré 2.Fulfuldé (Peulh) 3.Gourmantchéma 4.Dioula (Bambara) 5.Bissa 6.Bwamou 7.Dagara 8.Gourounsi 9.Français 98.Autre langue à préciser:…….	Si l'enquêteur parle la langue de l'enquêté aller à la section suivante
INSTRUCTION : si la langue préférée n'est pas parlée par l'intervieweur, renseignez-vous sur le créneau horaire souhaité pour un rappel par un autre intervieweur.			
L2	Malheureusement, je ne peux pas très bien communiquer dans cette langue. Un de mes collègues qui parle .... peut-il vous rappeler ?	1. 7.00-09.00 2. 9.00-12.00 3. 12.00-14.00 4. 14.00-17.00 5. 17.00-20.00	
L3	Pourriez-vous également me donner votre nom et prénoms afin que je puisse transmettre cette information à mon collègue ?	0.NON 1.OUI NOM ……	

MODALITÉS D'ENTRETIEN

I1	Avant de commencer l'entretien, j'aimerais vous demander d'où vous prenez cet appel ?	1.DOMICILE 2.LIEU DE TRAVAIL 3.AUTRE LIEU : (préciser)....	
I2	Vous sentez-vous suffisamment à l'aise pour nous parler là où vous êtes en ce moment, ou préférez-vous que nous vous rappelions à un autre moment ?	1.CONTINUER 2.RAPPEL	Si "1" aller à E1
I3	À quel moment de la journée préférez-vous que nous vous rappelions ?	1. 7.00-09.00 2. 9.00-12.00 3. 12.00-14.00 4. 14.00-17.00 5. 17.00-20.00	FIN FIN FIN FIN FIN
DÉCLARATION DE CLÔTURE : OK, merci de nous faire part de votre disponibilité. L'un des membres de notre équipe vous rappellera sous peu.			

CARACTERISTIQUES SOCIO-DEMOGRAPHIQUES DU REPONDANT

En premier lieu, j'aimerais vous poser quelques questions sur vous-même et votre ménage.			
E1	Je voudrais d'abord vous demander votre nom et prénoms. Cela nous aidera au cas où notre conversation serait interrompue et où nous devrions vous rappeler.	NOM PRENOMS	
E2	INSTRUCTION : enregistrez le sexe ; en cas de doute, demandez : Puis-je confirmer que vous êtes un homme ou une femme ?	1.HOMME 2.FEMME	
E3	Quel est votre date de naissance ?? INSTRUCTION : Inscrire 99/99/9999 lorsque la date de naissance est inconnue et demandez une estimation.	J |___||____| M |___||____| A |___||____||___||____|	
E4	Habitez-vous toujours dans la région …. ? Sinon dans quelle région habitez-vous ? ?	1.BOUCLE DU MOUHOUN 2.CASCADES 3.CENTRE 4.CENTRE-EST 5.CENTRE-NORD 6.CENTRE-OUEST 7.CENTRE-SUD 8.EST 9.HAUTS-BASSINS 10.NORD 11.PLATEAU-CENTRAL 12.SAHEL 13.SUD-OUEST	
E5	Pouvez-vous me préciser votre province et commune de résidence ?		Liste déroulante
E6	S'agit-il d'une grande ville, une petite ville ou une zone rurale ?	1.OUAGADOUGOU 2.BOBO-DIOULASSO 3.AUTRE VILLE 4.MILIEU RURAL	
E7	Etes-vous bien le chef de ménage ?	1.OUI 0.NON	Si "1" aller à E9
E8	Sinon quel est votre lien de parenté avec le chef de ménage ?	1.FEMME OU MARI 2.FILS OU FILLE 3.GENDRE/BELLE-FILLE 4.PETIT-FILS/FILLE 5.PÈRE/MÈRE 6.FRÈRE OU SOEUR 7.AUTRE PARENT 8.SANS PARENTÉ	
E9	Avez-vous déjà été à l'école ?	1.Oui 0.Non	Si "0" aller à E11
E10	Quel est le niveau d'études le plus élevé que vous ayez suivi ?	1.PRIMAIRE 2.SECONDAIRE 3.SUPERIEUR	
E11	Quel est votre statut matrimonial actuel ?	1.MARIE OU EN UNION 2.VEUF 3.DIVORCE	

		4.SÉPARÉ 5.CELIBATAIRE	
E12	Quel est le principal matériau de construction du toit de votre logement ?	1.TOLE 2.CHAUME/PALME/FEUILLE 3.MOTTE DE TERRE 4.AUTRE à préciser 8.NSP	
E13	Votre ménage dispose-t-il d'une source d'alimentation électrique ?	1.OUI 0.NON	
E14	Quelle est la principale source d'approvisionnement en eau potable pour les membres du ménage ?	1.PUITS A POMPE/FORAGE 2.ROBINET PUBLIC/BORNE 3. FONTAINE 4.PUITS NON PROTÉGÉ 5.PUITS PROTÉGÉ 6.ROBINET DANS LE LOGEMENT 7.ROBINET DANS LA COUR/PARCELLE 8.SOURCE PROTÉGÉE 9.SOURCE NON PROTÉGÉE 10.AUTRE À PRÉCISER…. ;	

VACCINATION COVID-19 - RÉPONDANT

CV1	Les prochaines questions concernent l'épidémie de COVID-19 et les vaccins COVID. Avez-vous reçu au moins une dose d'un vaccin COVID-19 ?	1.UNE DOSE 2.DEUX DOSES 3.NON	Si « 3 » aller à CV3
CV2	Connaissez-vous le nom du vaccin que vous avez reçu ?	1.ASTRAZENECA 2.AUTRE A PRECSIER 8.NSP	Si "1" ou "2" Aller à la section suivante
CV3	Si un vaccin contre la COVID-19 vous était proposé, quelle serait la probabilité que vous acceptiez de vous faire vacciner ?	1.OUI, DÉFINITIVEMENT 2.PROBABLEMENT 3.PEU PROBABLE 4.CERTAINEMENT PAS 8.NE SAIT PAS	Si "1" ou "2" Aller à la section suivante
CV4	Quelle est la principale raison pour laquelle vous ne prendriez pas (ou douteriez de prendre) le vaccin ? INSTRUCTION : Ne pas passer en revue la liste des réponses possibles ; cocher simplement la réponse proposée par l'enquêté. Demandez ensuite : "Y a-t-il une autre raison .... ?"	1.J'ai déjà eu le COVID-19 et je crois que je suis immunisé. 2.Le vaccin n'est pas efficace 3.Le vaccin n'est pas sûr/causant des dommages/effets secondaires 4.Peut contracter le COVID-19 à cause du vaccin 5.Objections religieuses/croyances traditionnelles (préciser....) 6.Le risque de contracter le COVID-19 est faible 7.Le COVID-19 n'est pas grave et	

		ne met pas ma vie en danger 8.Allergique aux vaccins 9.Je n'aime pas les aiguilles 10.Je préfère attendre que les autres aient été vaccinés 11.Il y aura bientôt d'autres traitements efficaces 12.Ne veut pas du vaccin proposé, attendra un autre vaccin 13.Autre (précisez .....) 88.Aucune/NSP	

COMPOSITION DU MÉNAGE ET DÉCÈS AU COURS DES TROIS DERNIERS MOIS

HD1	Je voudrais maintenant vous poser quelques questions sur votre ménage. Combien de personnes vivent habituellement dans votre ménage ?	NOMBRE	si la personne vit seule aller à HD3
HD2	Parmi eux il y'a combien d'enfants de moins de 5 ans ? et de personnes de plus de 5 ans ?	NOMBRE < 5 ans |___| NOMBRE >=5 ans |___| VERIFIER LA COHERENCE AVEC HD1	
HD3	Avez-vous enregistré un ou plusieurs décès d'enfants de moins de cinq ans dans votre ménage au cours des 3 derniers mois ?	1.OUI 0.NON 8.NSP	Si "0" ou "8" aller à HD6
HD4	Si Oui, demandez le nombre	NOMBRE |___|	BOUCLE
HD5	Depuis combien de temps cet enfant (le premier, le deuxième,.....) est-il décédé ?	E1 JOURS |___| E1 MOIS |___| E2 JOURS |___| E2 MOIS |___| E3 JOURS |___| E3 MOIS |___|	
HD6	Avez-vous enregistré un ou plusieurs décès de personnes de plus de cinq ans dans votre ménage au cours des 3 derniers mois ?	1.OUI 0.NON 8.NSP	Si "0" ou "8" aller à PS1
HD7	Si Oui, demandez le nombre	NOMBRE |___|	
HD8	Depuis combien de temps cette personne (la première, la deuxième, …….) est-elle décédée ?	P1 JOURS |___| P1 MOIS |___| P2 JOURS |___| P2 MOIS |___| P3 JOURS |___|	

		P3 MOIS |___|	

SURVIE DES PARENTS

Je voudrais maintenant vous interroger sur la survie de vos parents biologiques	PS1. Votre mère (père) biologique est-elle encore en vie ?	PS2. Quel âge a-t-il/elle ? INSTRUCTION : enregistrer l'âge en années révolues	PS3. Où vit-il/elle ?	PS4. Votre mère (père) a-t-elle déjà reçu au moins une dose du vaccin COVID-19 ?	PS5. Quel âge avait votre mère (père) biologique lorsqu'elle (il) est décédé(e) ?	PS6. En quelle année est-elle décédée ?	PS7. En quel mois de l'année est-elle/il décédé ?	PS.8 Où résidait-il/elle avant la survenue du décès ?
	1.OUI 0.NON 8.NSP	ANNÉES 888. NSP	1.MÊME MÉNAGE 2.MÊME VILLAGE/VILLE 3.MEME REGION 4.AUTRE REGION (nom) :..... 5. CÔTE D'IVOIRE 6. AUTRE À PRÉCISER	0.NON 1.UNE DOSE 2.DEUX DOSES 8.NSP	ÂGE (ANNÉES RÉVOLUES) 888. NSP	ANNÉE	MOIS 88.NSP	1.MÊME MÉNAGE 2.MÊME VILLAGE/VILLE 3.MEME REGION 4.AUTRE REGION (nom) :..... 5. CÔTE D'IVOIRE 6. AUTRE À PRÉCISER
	Si « non » allez à PS5			Allez à la mère				
Père						SI < 2019 aller à (mère) mais si SI >= 2019, ALORS DEMANDER PS7		
Mère						SI < 2019 aller à la section suivante ; mais si SI >= 2019, ALORS DEMANDER PS7		

SURVIE DES FRÈRES ET SŒURS

SI LE REPONDANT EST UNE FEMME EN AGE DE PROCREER ⟶ SSH1

SINON ⟶ D1

SSH1	Maintenant, je voudrais vous poser quelques questions sur vos sœurs qui sont nées de votre mère biologique. Pouvez-vous me dire combien de sœurs vous avez ou avez eu au total ? Veuillez inclure les sœurs qui vivent avec vous, celles qui ne vivent pas avec vous et celles qui sont décédées INSTRUCTION : aider le répondant à dénombrer les sœurs en énumérant leurs noms. Ne pas inclure le répondant dans le calcul.	NOMBRE ..... 88.NE SAIT PAS	Si "0" aller à SSH6
SSH2	Combien de ces sœurs ne sont plus parmi nous aujourd'hui parce qu'elles sont décédées ?	NOMBRE 88.NE SAIT PAS	Si "0" aller à SSH6
SSH3	Combien de vos sœurs sont décédées depuis le début de l'année 2019 ?	NOMBRE 88.NE SAIT PAS	Si "0" ou "88" allez à SSH6
SSH4	Pouvez-vous me donner les noms et prénoms de ces sœurs décédées ?	S1 NOM : S2 NOM : S3 NOM :	
SSH5	En quelle année/mois (NOM) est-elle décédée ?	S1 Année : S1 Mois : Année S2 S2 Mois Année S3 : Mois S3 :	Cette question est posée pour chacune des sœurs décédées
SSH6	Maintenant, je voudrais vous poser quelques questions sur vos frères qui sont nés de votre mère biologique. Pouvez-vous me dire combien de frères vous avez ou avez eu au total ? Veuillez inclure les frères qui vivent avec vous, les sœurs qui ne vivent pas avec vous, et ceux qui sont décédés ? INSTRUCTION : aider le répondant à dénombrer les frères en énumérant leurs (prénoms).	NOMBRE 88.NE SAIT PAS	Si "0" Allez à la section suivante
SSH7	Combien de ces frères ne sont plus parmi nous aujourd'hui parce qu'ils sont décédés ?	NOMBRE 88.NE SAIT PAS	Si "0" Aller à la section suivante
SSH8	Combien de vos frères sont décédés au cours des trois dernières années ?	NOMBRE : 88.NE SAIT PAS	Si "0" ou "88" Aller à la section suivante
	Pouvez-vous me donner le prénom de ces frères ?	F1 NOM : F2 NOM : F3 NOM :	
SSH9	En quelle année/mois (NOM) est-il décédé ?	Année B1 : Mois B1 : B2 Année B2 Mois	Cette question est posée pour chacun des

		B3 Année : Mois B3 :	frères décédés

DÉTAILS DU DÉCÈS

Cette série de questions doit être posée pour tous les décès d'adultes identifiés par les questions sur la survie des parents et des frères et sœurs.

VERIFIER 1 : Décédée = femme en âge de procréer à D1 Femmes décédées ≠ en âge de procréer à D4 Hommes à D4			
D1	Est-ce que (NOM) était enceinte quand elle est décédée ?	1.OUI 0.NON 8.NSP	Si "0" ou "8" aller à D3
D2	Est-ce que (NOM) est décédée pendant l'accouchement ?	1.OUI 0.NON 8.NSP	
D3	Est-ce que (NOM) est décédée dans les deux mois suivant la fin d'une grossesse ou d'un accouchement ?	1.OUI 0.NON 8.NSP	
D4	Le décès de (NOM/Votre père/Votre mère) était-il dû à un acte de violence ?	1.OUI 0.NON 8.NSP	Si "1" aller à D9
D5	Le décès de (NOM) était-il dû à un accident ?	1.OUI 0.NON 8.NSP	Si "1" aller à D9
D6	Depuis combien de temps (NOM) souffrait-il de l'affection qui a entraîné sa mort ?	JOURS MOIS ANNÉES 888.NSP	
D7	Est-ce que (NOM) a ressenti des symptômes respiratoires, de rhume ou de grippe au cours des 2 semaines précédant son décès ? *INSTRUCTION :* Uniquement pour les décès survenus après mars 2021.	1.OUI 0.NON 8.NSP	Si "0" ou "8" aller à D9
D8	Quels symptômes respiratoires/de rhume/de grippe (NOM) a-t-il (elle) ressenti(e) avant son décès ? *INSTRUCTION :* Uniquement pour les décès survenus après mars 2021.	1.FIÈVRE PERSISTANTE 2.FRISSONS 3.MAUX DE TETE 4.DOULEUR MUSCULAIRE 5.TOUX SECHE 6.DIFFICULTÉS À RESPIRER 7.VERTIGES 8.NEZ QUI COULE 9.GORGE DOULOUREUSE 10.PERTE DU GOÛT ET DE L'ODORAT 11.AUTRE (préciser) 12.AUCUN DE CES SYMPTÔMES	Choix multiple
D9	Est-ce que [NOM] avait déjà reçu au moins une dose du vaccin COVID-19 avant son décès ? *INSTRUCTION :* Uniquement pour les décès survenus après en 2021.	0.NON 1.UNE DOSE 2.DEUX DOSES 8.NSP	Si "0" ou "8" allez à D11
D10	Combien de temps avant le décès [NOM] a-t-il reçu la (dernière dose) du vaccin ?	JOURS MOIS	

	INSTRUCTION : Uniquement pour les décès survenus en 2021.	88.NSP	
D11	Est-ce que (NOM) a été testé(e) pour la COVID-19 dans les 4 dernières semaines avant le décès ? *INSTRUCTION :* Uniquement pour les décès survenus à partir de 2020.	1.OUI 0.NON 8.NSP	
D12	Dans quelle mesure pensez-vous qu'il est probable que (NOM) ait eu la COVID-19 ? *INSTRUCTION :* Uniquement pour les décès survenus à partir de 2020.	1.TRÈS PROBABLE 2.ASSEZ PROBABLE 3.PEU PROBABLE 4.TRÈS IMPROBABLE 8.NE SAIT PAS	
D13	S'est-il/elle rendu(e) dans un centre de santé au cours des 2 dernières semaines précédant son décès ?	1.OUI 0.NON 8.NSP	Si "0" ou "8" aller à D16
D14	A-t-il/elle été hospitalisé(e) dans un centre de santé au cours des 2 dernières semaines précédant le décès ?	1.OUI 0.NON 8.NSP	
D15	Est-il/elle décédé(e) dans un centre de santé ?	1.OUI 0.NON 8.NSP	Si "1" ou "8" aller à D17
D16	Où est mort [NOM] ?	1.ACCUEIL 2.EN ROUTE VERS UN CENTRE DE SANTE 3. DOMICILE 4.AILLEURS (précisez)	
D17	Le décès de (NOM) a-t--il/elle été enregistré(e) à l'Etat-Civil ?	1.OUI 0.NON 8.NSP	
D18	Est-ce que [NOM] a été enterré dans le même village/ville où il/elle vivait ?	1.OUI 0.NON	Si "1" aller à D20
D19	Est-ce que [NOM] a été enterré dans la même région ?	1.OUI 0.NON	
D20	Est-ce que [NOM] a été enterré dans un cimetière, une concession familiale ou un autre lieu ?	1.CIMETIERE 2.CONCESSION FAMILIALE 3.AUTRE (préciser)	
VERIFIER (retour au module PS ou SSH)			

SELECTION D'UNE FEMME DE 15-49 ANS

Toujours dans l'optique de mieux appréhender l'impact de la Covid-19 sur vous et vos proches en matière de santé, nous souhaiterons interroger une femme de 15 à 49 ans de votre ménage. Nous lui poserons quelques questions sur l'historique des naissances vivantes essentiellement, la survie de ses parents et celle de ses frères et sœurs. Celle-ci sera sélectionnée de façon aléatoire après avoir énuméré la liste complète des femmes en âge de reproduction vivant dans votre ménage.

Pouvons-nous continuer l'entretien pour sélectionner une femme avec qui l'on pourra échanger ?
1.OUI : Continuer l'interview
0.NON : Fin de l'interview ALLEZ A DEBRIEFING

RW1	Combien de femmes de 15 à 49 ans vivent dans votre ménage ?	NOMBRE 88. NE SAIT PAS	FIN si 0

RW2	Pouvez-vous nous donner leurs prénoms ?	F1. NOM F1. PRENOMS F2. NOM F2. PRENOMS F3. NOM F3. PRENOMS F4. NOM F4. PRENOMS	
RW3	Pouvez-vous nous donner leur âge ?	F1. AGE en années révolus F2. AGE en années révolus F3. AGE en années révolus F4. AGE en années révolus	
SELECTION ALEATOIRE D'UNE FEMME DE 15-49 ANS			
RW4	Si (NOM) a moins de 18 ans : comme [NOM] est mineure, nous voudrions d'abord demander votre consentement avant de la contacter. Vous n'êtes pas obligé de donner votre permission ; c'est votre choix. Si vous décidez de ne pas autoriser l'enfant à participer, il n'y aura pas de pénalité pour vous ou votre enfant. Nous demanderons également à l'enfant si elle souhaite participer à l'étude. Nous devons avoir votre permission et l'accord de l'enfant pour inscrire votre enfant à l'étude. Consentez-vous à ce que [NOM] participe à l'étude ?	1.OUI 0.NON	Si « 0 » fin de l'entretien.
RW5	(NOM) dispose-t-elle d'un numéro de téléphone fonctionnel ? Si Oui précisez	1.OUI 0.NON 8.NSP	Si "0" aller à RW7
RW6	Nous avons choisi [NOM] et nous souhaiterons lui parler. Comme [NOM] dispose d'un numéro de téléphone, nous appellerons directement après avoir raccroché avec vous. Je vous remercie		
RW7	[NOM] ne dispose pas d'un numéro de téléphone. Permettez-vous qu'on lui parle maintenant si elle est disponible ?	1.OUI 0.NON 8.NSP	Si « 1 » aller au questionnaire « femme »
RW8	Est-ce possible de rappeler plus tard pour parler à [NOM]?	1.OUI 0.NON	Si « 0 » fin du questionnaire
RW9	A quelle heure peut-on vous rappeler ?	1. 7.00-09.00 2. 9.00-12.00 3. 12.00-14.00 4. 14.00-17.00 5. 17.00-20.00	

DÉCLARATION DE DÉBRIEFING

Contact_CM	Si « CM » demandez-lui ces numéros supplémentaires ; si « non », demandez-lui les numéros de téléphone du chef du ménage :	1er Numéro …… 2e Numéro …… 3e Numéro ……	

Ceci nous amène à la fin de l'interview. Au cours de notre conversation, nous avons parlé de la COVID-19, qui est une menace sanitaire sérieuse dans la plupart des pays du monde. Souhaitez-vous plus d'informations à ce sujet ou pensez-vous être suffisamment informé sur la COVID-19 et sur la manière dont vous et vos proches pouvez-vous protéger ? 1.OUI ; 0.NON
Comme promis au début de cette interview, nous allons transférer ..... en crédit d'appel.
Je vous enverrai également un SMS de suivi contenant les coordonnées de l'équipe de recherche du projet ainsi que celles du comité d'éthique de la recherche en santé, qui pourront répondre à toutes vos questions.
Nous vous remercions de votre participation et vous souhaitons une bonne fin de journée.

Table 11.2 : RAMMPS Burkina Faso – Femme en âge de reproduction EHCVM

CONSENTEMENT

Bonjour, je m'appelle .... et je travaille pour l'Institut Supérieur des Sciences de la Population (ISSP) de l'Université Joseph Ki-Zerbo (UJKZ). Cet institut en collaboration avec l'Institut National de la Statistique et de la Démographie (INSD) entreprend une recherche sur l'impact de la Covid-19 sur l'état de santé des populations. Il s'agit plus précisément de mesurer la surmortalité liée à la Covid-19 en s'appuyant sur des enquêtes par téléphone. Toutes les informations que nous recueillerons au cours de cet entretien pourront être communiquées à des chercheurs, mais uniquement après avoir effacé votre nom et votre numéro de téléphone pour garantir votre anonymat.

Nous avons obtenu votre numéro suite à un échange avec [NOM]. Votre participation à cette étude est volontaire. Vous pouvez interrompre l'entretien à tout moment et vous pouvez choisir de ne répondre à aucune des questions que je vous poserai.
La durée totale de l'entretien devrait être de 20 minutes. Si vous terminez l'entretien, nous vous transférerons .... FCFA pour vous remercier d'avoir pris le temps de répondre à ces questions. A la fin de cet appel, je vous enverrai également un SMS contenant les coordonnées de l'équipe de recherche du projet ainsi que celles du comité d'éthique de la recherche en santé, au cas où vous auriez des questions ou des commentaires.
Avez-vous une question à me poser à ce stade ? 1.OUI 0.NON

C1	Souhaitez-vous participer à cette étude ?	1.OUI 0.NON	Si "0" fin de l'entretien

VERIFIER :
PAS DE CONSENTEMENT : Je regrette que vous ne souhaitiez pas poursuivre, mais je respecte votre décision et je vous souhaite une bonne journée.
CONSENTEMENT : Merci d'avoir accepté de participer à cette étude, nous vous en sommes très reconnaissants -> L1

INTRODUCTION + LANGUE

NUM	QUESTIONS	CATÉGORIES DE CODAGE	SAUT
L1	Préférez-vous continuer avec le [LANGUE CM] ? 1. OUI 0. NON	1.Mooré 2.Fulfuldé (Peulh)	Si l'enquêteur

	Sinon dans quelle langue pouvons-nous le mieux communiqué ?	3.Gourmantchéma 4.Dioula (Bambara) 5.Bissa 6.Bwamou 7.Dagara 8.Gourounsi 9.Français 98.Autre langue à préciser:…….	parle la langue de l'enquêté aller à la section suivante
INSTRUCTION : si la langue préférée n'est pas parlée par l'intervieweur, renseignez-vous sur le créneau horaire souhaité pour un rappel par un autre intervieweur.			
L2	Malheureusement, je ne peux pas très bien communiquer dans cette langue. Un de mes collègues qui parle .... peut-il vous rappeler ?	1. 7.00-09.00 2. 9.00-12.00 3. 12.00-14.00 4. 14.00-17.00 5. 17.00-20.00	
L3	Pourriez-vous également me donner votre nom et prénoms afin que je puisse transmettre cette information à mon collègue ?	0.NON 1.OUI NOM ……	

MODALITÉS D'ENTRETIEN

I1	Avant de commencer l'entretien, j'aimerais vous demander d'où vous prenez cet appel. Est-ce à votre domicile, sur votre lieu de travail ou depuis un autre endroit ?	1.DOMICILE 2.LIEU DE TRAVAIL 3.AUTRE LIEU :	
I2	Vous sentez-vous suffisamment à l'aise pour nous parler là où vous êtes en ce moment, ou préférez-vous que nous vous rappelions à un autre moment ?	1.CONTINUER 2.RAPPEL 3. NE VEUT PAS	Si "1" aller à E1; Si "3" metre fin
I3	À quel moment de la journée préférez-vous que nous vous rappelions ?	1. 7.00-09.00 2. 9.00-12.00 3. 12.00-14.00 4. 14.00-17.00 5. 17.00-20.00	FIN FIN FIN FIN FIN
DÉCLARATION DE CLÔTURE : OK, merci de nous faire part de votre disponibilité. L'un des membres de notre équipe vous rappellera sous peu.			

CARACTERISTIQUES SOCIO-DEMOGRAPHIQUES DU REPONDANT

En premier lieu, j'aimerais vous poser quelques questions sur vous-même et votre ménage.			
E1	Quel âge aviez-vous à votre dernier anniversaire ? INSTRUCTION : enregistrer l'âge en années révolues. Demander une estimation si nécessaire.	ANNÉES ANNÉES (estimation) 888. NE SAIT PAS	
E2	Quel est votre lien de parenté avec le chef de ménage ?	1.CHEF DE MENAGE 2.FEMME OU MARI 3.FILS OU FILLE 4.GENDRE/BELLE-FILLE 5.PETIT-FILS/FILLE 6.PÈRE/MÈRE 7.FRÈRE OU SOEUR 8.AUTRE PARENT	

		9.SANS PARENTÉ	
E3	Avez-vous déjà été à l'école ?	1.Oui 0.Non	Si "0",aller E6
E4	Quel est le niveau d'études le plus élevé que vous ayez suivi : primaire, secondaire ou supérieur ?	1.PRIMAIRE 2.SECONDAIRE 3.SUPERIEUR	
E5	Quel est votre statut matrimonial actuel ?	1.MARIE OU EN UNION 2.VEUF 3.DIVORCE 4.SÉPARÉ 5.CELIBATAIRE	

VACCINATION COVID-19 – RÉPONDANT

CV1	Les prochaines questions concernent l'épidémie de COVID-19 et les vaccins COVID. Avez-vous reçu au moins une dose d'un vaccin COVID-19 ?	1.UNE DOSE 2.DEUX DOSES 3.NON	Si 3 aller à CV3
CV2	Connaissez-vous le nom du vaccin que vous avez reçu ?	1.ASTRAZENECA 2.AUTRE A PRECSIER 8.NSP	Si « 1 » ou « 2 » Aller à la section suivante
CV3	Si un vaccin contre la COVID-19 vous était proposé, quelle serait la probabilité que vous acceptiez de vous faire vacciner ?	1.OUI, DÉFINITIVEMENT 2.PROBABLEMENT 3.PEU PROBABLE 4.CERTAINEMENT PAS 8.NE SAIT PAS	Si « 1 » ou « 2 » Aller à la section suivante
CV4	Quelle est la principale raison pour laquelle vous ne prendriez pas (ou douteriez de prendre) le vaccin ? INSTRUCTION : Ne pas passer en revue la liste des réponses possibles ; cocher simplement la réponse proposée par l'enquêté. Demandez ensuite : "Y a-t-il une autre raison .... ?"	1.J'ai déjà eu le COVID-19 et je crois que je suis immunisé. 2.Le vaccin n'est pas efficace 3.Le vaccin n'est pas sûr/causant des dommages/effets secondaires 4.Peut contracter le COVID-19 à cause du vaccin 5.Objections religieuses/croyances traditionnelles (préciser....) 6.Le risque de contracter le COVID-19 est faible 7.Le COVID-19 n'est pas grave et ne met pas ma vie en danger 8.Allergique aux vaccins 9.Je n'aime pas les aiguilles 10.Je préfère attendre que les autres aient été vaccinés 11.Il y aura bientôt d'autres traitements efficaces 12.Ne veut pas du vaccin proposé, attendra un autre vaccin 13.Autre (précisez .....) 88.Aucune/NSP	

SURVIE DES PARENTS

PS VERIFIER •SI E2 = FRERE ou SOEUR ALLER A LA SECTION SUIVANTE •SINON E2 = FILLE D'UN CM DE SEXE FEMININ POSER UNIQUEMENT LES QUESTIONS SUR LA SURVIE DU PERE • SINON E2 = FILLE D'UN CM DE SEXE FEMININ POSER UNIQUEMENT LES QUESTIONS SUR LA SURVIE DE LA MERE								
Je voudrais maintenant vous interroger sur la survie de vos parents biologiques	PS1. Votre mère (père) biologique est-elle encore en vie ?	PS2. Quel âge a-t-il/elle ? INSTRUCTION : enregistrer l'âge en années révolues	PS3. Où vit-il/elle ?	PS4. Votre mère (père) a-t-elle déjà reçu au moins une dose du vaccin COVID-19 ?	PS5. Quel âge avait votre mère (père) biologique lorsqu'elle (il) est décédé(e) ?	PS6. En quelle année est-elle décédée ?	PS7. En quel mois de l'année est-elle/il décédé ?	PS8. PS.8 Où résidait-il/elle avant la survenue du décès ?
	1.OUI 0.NON 8.NSP	ANNÉES 888. NSP	1.MÊME MÉNAGE 2.MÊME VILLAGE/VILLE 3.MEME REGION 4.AUTRE REGION (nom) :..... 5. CÔTE D'IVOIRE 6. AUTRE À PRÉCISER	0.NON 1.UNE DOSE 2.DEUX DOSES 8.NSP	ÂGE (ANNÉES RÉVOLUES) 888. NSP	ANNÉE	MOIS 88.NSP	1.MÊME MÉNAGE 2.MÊME VILLAGE/VILLE 3.MEME REGION 4.AUTRE REGION (nom) :..... 5. CÔTE D'IVOIRE 6. AUTRE À PRÉCISER
	Si « non » allez à PS5			Allez à la mère				
Père						SI < 2019 aller à (mère) mais si SI >= 2019, ALORS DEMANDER PS7		
Mère						SI < 2019 aller à la section suivante ; mais si SI >= 2019, ALORS DEMANDER PS7		

SURVIE DES FRÈRES ET SŒURS

SSH1	Maintenant, je voudrais vous poser quelques questions sur vos sœurs qui sont nées de votre mère biologique. Pouvez-vous me dire combien de sœurs vous avez ou avez eu au total ? Veuillez inclure les sœurs qui vivent avec vous, celles qui ne vivent pas avec vous et celles qui sont décédées	NOMBRE ..... 88.NE SAIT PAS	Si "0" aller à SSH6

	INSTRUCTION : aider le répondant à dénombrer les sœurs en énumérant leurs noms. Ne pas inclure le répondant dans le calcul.		
SSH2	Combien de ces sœurs ne sont plus parmi nous aujourd'hui parce qu'elles sont décédées ?	NOMBRE 88.NE SAIT PAS	Si "0" aller à SSH6
SSH3	Combien de vos sœurs sont décédées depuis le début de l'année 2019 ?	NOMBRE 88.NE SAIT PAS	Si "0" ou "88" allez à SSH6
SSH4	Pouvez-vous me donner les noms et prénoms de ces sœurs décédées ?	S1 NOM : S2 NOM : S3 NOM :	
SSH5	En quelle année/mois (NOM) est-elle décédée ?	S1 Année : S1 Mois : Année S2 S2 Mois Année S3 : Mois S3 :	Cette question est posée pour chacune des sœurs décédées
SSH6	Maintenant, je voudrais vous poser quelques questions sur vos frères qui sont nés de votre mère biologique. Pouvez-vous me dire combien de frères vous avez ou avez eu au total ? Veuillez inclure les frères qui vivent avec vous, les sœurs qui ne vivent pas avec vous, et ceux qui sont décédés ? INSTRUCTION : aider le répondant à dénombrer les frères en énumérant leurs (prénoms).	NOMBRE 88.NE SAIT PAS	Si "0" Allez à la section suivante
SSH7	Combien de ces frères ne sont plus parmi nous aujourd'hui parce qu'ils sont décédés ?	NOMBRE 88.NE SAIT PAS	Si "0" Aller à la section suivante
SSH8	Combien de vos frères sont décédés au cours des trois dernières années ?	NOMBRE : 88.NE SAIT PAS	Si "0" ou "88" Aller à la section suivante
	Pouvez-vous me donner le prénom de ces frères ?	F1 NOM : F2 NOM : F3 NOM :	
SSH9	En quelle année/mois (NOM) est-il décédé ?	Année B1 : Mois B1 : B2 Année B2 Mois B3 Année : Mois B3 :	Cette question est posée pour chacun des frères décédés

HISTOIRE GENESIQUE RESUMEE

VERIFIER :			
HG1	Maintenant, j'aimerais vous interroger sur toutes les naissances vivantes que vous avez eues au cours de votre vie. Avez-vous déjà accouché d'un enfant né vivant ?	1.OUI 0.NON	Si "non" aller à la section suivante

HG2	Avez-vous des fils ou des filles auxquels vous avez donné naissance et qui vivent actuellement avec vous ?	1.OUI 0.NON	Si “0” aller à HG4
HG3	a. Combien de fils vivent avec vous ? b. Combien de filles vivent avec vous ?	Nombre de FILS Nombre de FILLES	
HG4	Avez-vous des fils ou des filles auxquels vous avez donné naissance et qui sont vivants mais ne vivent pas avec vous ?	1.OUI 0.NON	Si “0” aller à HG6
HG5	a. Combien de fils sont en vie mais ne vivent pas avec vous ? b. Et combien de filles sont en vie mais ne vivent pas avec vous ?	Nombre de FILS AILLEURS Nombre de FILLES AILLEURS	
HG6	a. Combien de garçons sont décédés ? b. Et combien de filles sont décédées ?	Nombre de GARCONS DECEDES Nombre de FILLES DECEDEES	
HG7	Pour être sûr d'avoir bien compris, vous avez eu au total [= HG3 + HG5 + HG7] naissances au cours de votre vie. Est-ce exact ?	1.OUI 0.NON	CORRIGER
HG8	Maintenant, j'aimerais vous poser quelques questions sur des naissances récentes. Je voudrais maintenant que vous pensiez au dernier enfant né vivant que vous avez eu. C'était une naissance unique ou multiple ?	1.SIMPLE 2.MULTIPLE	Si “1” aller à HG10
HG9	S’agissait-il d’une naissance de jumeaux, de triplés ou plus ?	NOMBRE	BOUCLE MP si naissance multiple
HG10	Quel nom a été donné à cet enfant ?		
HG11	Est-ce que (NOM/BÉBÉ) était un garçon ou une fille ?	1.GARÇON 2.FILLE	
HG12	Quel est le jour, le mois et l'année de naissance de (NOM) ?	JOUR MOIS ANNÉE	(Date de l'entretien - HG12 > 7 ans) FIN DU MODULE HG
HG13	Est-ce que (NOM) est encore en vie ?	1.EN VIE 2.DECEDE	Si “2” allez à HG15
HG14	Quel âge a (NOM) aujourd'hui ? INSTRUCTION : enregistrer les jours si moins d'un mois ; les mois complets si moins de deux ans, ou les années complètes si plus de deux ans.	JOURS MOIS ANNÉES	si HG13=1, aller à la section suivante
HG15	Quel âge avait (NOM) quand il/elle est décédé(e) ? INSTRUCTION : enregistrer les jours si moins d'un mois ; les mois complets si moins de deux ans, ou les années complètes si plus de deux ans.	JOURS MOIS ANNÉES	
HG VERIFIER 2 : SI boucle de naissance multiple incomplète à HG14 SINON (boucle de naissance multiple complète) à HG C3			

DÉTAILS DU DÉCÈS

Cette série de questions doit être posée pour tous les décès d'adultes identifiés par les questions sur la survie des parents et des frères et sœurs.

VERIFIER 1 : Décédée = femme en âge de procréer aller à D1 Femmes décédées ≠ en âge de procréer aller à D4			
D1	Est-ce que (NOM) était enceinte quand elle est décédée ?	1.OUI 0.NON 8.NSP	Si "0" ou "8" aller à D3
D2	Est-ce que (NOM) est décédée pendant l'accouchement ?	1.OUI 0.NON 8.NSP	
D3	Est-ce que (NOM) est décédée dans les deux mois suivant la fin d'une grossesse ou d'un accouchement ?	1.OUI 0.NON 8.NSP	
D4	Le décès de (NOM/Votre père/Votre mère) était-il dû à un acte de violence ?	1.OUI 0.NON 8.NSP	Si "1" aller à D9
D5	Le décès de (NOM) était-il dû à un accident ?	1.OUI 0.NON 8.NSP	Si "1" aller à D9
D6	Depuis combien de temps (NOM) souffrait-il de l'affection qui a entraîné sa mort ?	JOURS MOIS ANNÉES 888.NSP	
D7	Est-ce que (NOM) a ressenti des symptômes respiratoires, de rhume ou de grippe au cours des 2 semaines précédant son décès ? *INSTRUCTION :* Uniquement pour les décès survenus après mars 2021.	1.OUI 0.NON 8.NSP	Si "0" ou "8" aller à D9
D8	Quels symptômes respiratoires/de rhume/de grippe (NOM) a-t-il (elle) ressenti(e) avant son décès ? *INSTRUCTION :* Uniquement pour les décès survenus après mars 2021.	1.FIÈVRE PERSISTANTE 2.FRISSONS 3.MAUX DE TETE 4.DOULEUR MUSCULAIRE 5.TOUX SECHE 6.DIFFICULTÉS À RESPIRER 7.VERTIGES 8.NEZ QUI COULE 9.GORGE DOULOUREUSE 10.PERTE DU GOÛT ET DE L'ODORAT 11.AUTRE (préciser) 12.AUCUN DE CES SYMPTÔMES	Choix multiple
D9	Est-ce que [NOM] avait déjà reçu au moins une dose du vaccin COVID-19 avant son décès ? *INSTRUCTION :* Uniquement pour les décès survenus après en 2021.	0.NON 1.UNE DOSE 2.DEUX DOSES 8.NSP	Si "0" ou "8" allez à D11
D10	Combien de temps avant le décès [NOM] a-t-il reçu la (dernière dose) du vaccin ? *INSTRUCTION :* Uniquement pour les décès survenus après en 2021.	JOURS MOIS 88.NSP	
D11	Est-ce que (NOM) a été testé(e) pour la COVID-19 dans les 4 dernières semaines avant le décès ? *INSTRUCTION :* Uniquement pour les décès	1.OUI 0.NON 8.NSP	

	survenus à partir de 2020.		
D12	Dans quelle mesure pensez-vous qu'il est probable que (NOM) ait eu la COVID-19 ? *INSTRUCTION :* Uniquement pour les décès survenus à partir de 2020.	1.TRÈS PROBABLE 2.ASSEZ PROBABLE 3.PEU PROBABLE 4.TRÈS IMPROBABLE 8.NE SAIT PAS	
D13	S'est-il/elle rendu(e) dans un centre de santé au cours des 2 dernières semaines précédant son décès ?	1.OUI 0.NON 8.NSP	Si "0" ou "8" aller à D16
D14	A-t-il/elle été hospitalisé(e) dans un centre de santé au cours des 2 dernières semaines précédant le décès ?	1.OUI 0.NON 8.NSP	
D15	Est-il/elle décédé(e) dans un centre de santé ?	1.OUI 0.NON 8.NSP	Si "1" ou "8" aller à D17
D16	Où est mort [NOM] ?	1.ACCUEIL 2.EN ROUTE VERS UN CENTRE DE SANTE 3. DOMICILE 4.AILLEURS (précisez)	
D17	Le décès de (NOM) a-t--il/elle été enrégistré(e) à l'Etat-Civil ?	1.OUI 0.NON 8.NSP	
D18	Est-ce que [NOM] a été enterré dans le même village/ville où il/elle vivait ?	1.OUI 0.NON	Si "1" aller à D20
D19	Est-ce que [NOM] a été enterré dans la même région ?	1.OUI 0.NON	
D20	Est-ce que [NOM] a été enterré dans un cimetière, une concession familiale ou un autre lieu ?	1.CIMETIERE 2.CONCESSION FAMILIALE 3.AUTRE (préciser)	
VERIFIER (retour au module PS ou SSH)			

DÉCLARATION DE DÉBRIEFING

Contact_CM	Si « CM » demandez-lui ces numéros supplémentaires ; si « non », demandez-lui les numéros de téléphone du chef du ménage :	1er Numéro …… 2e Numéro …… 3e Numéro ……	
Ceci nous amène à la fin de l'interview. Au cours de notre conversation, nous avons parlé du COVID-19, qui est une menace sanitaire sérieuse dans la plupart des pays du monde. Souhaitez-vous plus d'informations à ce sujet ou pensez-vous être suffisamment informé sur le COVID-19 et sur la manière dont vous et vos proches pouvez-vous protéger ? 1.OUI ; 0.NON Comme promis au début de cette interview, nous allons transférer ..... en crédit d'appel. Je vous enverrai également un SMS de suivi contenant les coordonnées de l'équipe de recherche du projet ainsi que celles du comité d'éthique de la recherche en santé, qui pourront répondre à toutes vos questions. Nous vous remercions de votre participation et vous souhaitons une bonne fin de journée.			

Table 11.3 : RAMMPS Burkina Faso - projet de questionnaire RDD

INTRODUCTION + LANGUE

NUM	QUESTIONS	CATÉGORIES DE CODAGE	SAUT
L1	Bonjour, je m'appelle .... et je travaille pour l'Institut National de la Statistique et de la Démographie et l'Université de Ouagadougou. Avant d'expliquer la raison de mon appel, j'aimerais savoir dans quelle langue nous pouvons le mieux communiqué. Préférez-vous continuer sur ..... ?	1.Mooré 2.Fulfuldé (Peulh) 3.Gourmantchéma 4.Dioula (Bambara) 5.Bissa 6.Bwamou 7.Dagara 8.Gourounsi 9.Français 98.Autre langue à préciser:…….	Si l'enquêteur parle la langue de l'enquêté aller à la section suivante
INSTRUCTION : si la langue préférée n'est pas parlée par l'intervieweur, renseignez-vous sur le créneau horaire souhaité pour un rappel par un autre intervieweur.			
L2	Malheureusement, je ne peux pas très bien communiquer dans cette langue. Un de mes collègues qui parle .... peut-il vous rappeler ?	1. 7.00-09.00 2. 9.00-12.00 3. 12.00-14.00 4. 14.00-17.00 5. 17.00-20.00	
L3	Pourriez-vous également me donner votre prénom afin que je puisse transmettre cette information à mon collègue ?	0.NON 1.OUI NOM ……	

VÉRIFICATION DE L'ÉLIGIBILITÉ

Chaque mois, nous appelons 750 Burkinabés de tout le pays pour les inviter à réaliser une courte interview sur la surmortalité liée à la COVID-19 et votre numéro a été tiré au sort par un système de loterie. Comme nous voulons interviewer des hommes et des femmes de tous âges et de toutes les régions du pays, je voudrais d'abord vous demander votre âge et votre lieu de résidence actuel pour déterminer si vous pouvez être inclus dans l'étude.			
E1	Je voudrais d'abord vous demander votre nom et prénom ou votre surnom. Cela nous aidera au cas où notre conversation serait interrompue et où nous devrions vous rappeler.	NOM	
E2	INSTRUCTION : enregistrez le sexe ; en cas de doute, demandez : Puis-je confirmer que vous êtes un homme ou une femme ?	1.HOMME 2.FEMME	
E3	Quel âge aviez-vous à votre dernier anniversaire ? INSTRUCTION : enregistrer l'âge en années révolues. Demander une estimation si nécessaire.	ANNÉES ANNÉES (estimation) 888. NE SAIT PAS	
E4	Dans quelle région habitez-vous habituellement ?	1.BOUCLE DU MOUHOUN 2.CASCADES 3.CENTRE 4.CENTRE-EST 5.CENTRE-NORD 6.CENTRE-OUEST 7.CENTRE-SUD 8.EST	

		9.HAUTS-BASSINS 10.NORD 11.PLATEAU-CENTRAL 12.SAHEL 13.SUD-OUEST	
E5	Pouvez-vous me préciser votre province et commune de résidence ?		Liste déroulante
E6	L'endroit où vous séjournez habituellement est-il une grande ville, une petite ville ou une zone rurale ?	1.OUAGADOUGOU 2.BOBO-DIOULASSO 3.AUTRE VILLE 4.MILIEU RURAL	
VÉRIFICATION DE L'ÉLIGIBILITÉ : vérifier si le répondant répond aux critères d'inclusion (quota). • RÉPOND AUX CONDITIONS D'ADMISSIBILITÉ ☾ poursuivre l'entretien • NE RÉPOND PAS AUX CONDITIONS D'ADMISSIBILITÉ (région) ☾ interview future • NE RÉPOND PAS AUX CONDITIONS D'ÉLIGIBILITÉ (attributs démographiques) : ☾ vers un autre membre du ménage.			C1 E7 E8
E7	Malheureusement, nous avons déjà interviewé suffisamment de personnes de cette région ce trimestre-ci. Pouvons-nous conserver votre numéro de téléphone afin de pouvoir vous contacter à l'avenir ? Ces interviews durent généralement 20 minutes et si vous les réalisez, vous recevrez ..... FCFA en crédits d'appel pour vous remercier de votre temps. INSTRUCTION : terminer par des remerciements	1.OUI 0.NON	FIN FIN
E8	Malheureusement, nous avons déjà interrogé suffisamment d'hommes/femmes de votre groupe d'âge ce trimestre-ci, mais nous cherchons toujours à interroger [LISTE DES CRITÈRES D'ÉLIGIBILITÉ]. Y a-t-il quelqu'un dans votre ménage qui présente ces caractéristiques et à qui nous pourrions parler ?	1.OUI 0.NON 8.NSP	Si "1" aller à E10
E9	OK, merci de nous le faire savoir. Pouvons-nous conserver votre numéro de téléphone afin de pouvoir vous contacter à l'avenir ? Ces interviews durent en général 20 minutes et si vous les réalisez, vous recevrez ..... FCFA en crédit d'appel pour vous remercier de votre temps. INSTRUCTION : terminer par des remerciements	1.OUI 0.NON	FIN FIN
E10	Cette personne peut-elle venir au téléphone tout de suite, ou est-il préférable d'organiser un rappel ?	1.MAINTENANT 2.RAPPEL	Si "1" aller à C1
E11	Pouvez-vous me donner le nom et le prénom de cette personne ?		
E12	Pouvez-vous me donner le numéro de téléphone de cette personne ?	1.MEME 2.NUMÉRO	
E13	Quel serait le meilleur moment de la journée pour parler à cette personne ? INSTRUCTION : terminer par des remerciements	1. 7.00-09.00 2. 9.00-12.00 3. 12.00-14.00 4. 14.00-17.00 5. 17.00-20.00	FIN FIN FIN FIN

CONSENTEMENT

Je voudrais maintenant vous poser quelques questions sur la COVID-19 et sur la manière dont la pandémie a pu vous affecter, vous et vos proches. Votre participation à cette étude est volontaire. Vous pouvez interrompre l'entretien à tout moment et vous pouvez choisir de ne répondre à aucune des questions que je vous poserai. Toutes les informations que nous recueillerons au cours de cet entretien pourront être communiquées à des chercheurs, mais uniquement après

avoir effacé votre nom, prénom et votre numéro de téléphone pour garantir votre anonymat La durée totale de l'entretien devrait être de 20 minutes. Si vous terminez l'entretien, nous vous transférerons .... FCFA pour vous remercier d'avoir pris le temps de répondre à ces questions. A la fin de cet appel, je vous enverrai également un SMS contenant les coordonnées de l'équipe de recherche du projet ainsi que celles du comité d'éthique de la recherche en santé, au cas où vous auriez des questions ou des commentaires. Avez-vous une question à me poser à ce stade ? 1.OUI 0.NON			
C1	Souhaitez-vous participer à cette étude ?	1.OUI 0.NON	
VERIFIER : PAS DE CONSENTEMENT : Je regrette que vous ne souhaitiez pas poursuivre, mais je respecte votre décision et je vous souhaite une bonne journée. CONSENTEMENT : Merci d'avoir accepté de participer à cette étude, nous vous en sommes très reconnaissants -> I1			

MODALITÉS D'ENTRETIEN

I1	Avant de commencer l'entretien, j'aimerais vous demander d'où vous prenez cet appel. Est-ce à votre domicile, sur votre lieu de travail ou depuis un autre endroit ?	1.DOMICILE 2.LIEU DE TRAVAIL 3.AUTRE LIEU :	
I2	Vous sentez-vous suffisamment à l'aise pour nous parler là où vous êtes en ce moment, ou préférez-vous que nous vous rappelions à un autre moment ?	1.CONTINUER 2.RAPPEL	Si "1" aller à B1
I3	À quel moment de la journée préférez-vous que nous vous rappelions ?	1. 7.00-09.00 2. 9.00-12.00 3. 12.00-14.00 4. 14.00-17.00 5. 17.00-20.00	FIN FIN FIN FIN
DÉCLARATION DE CLÔTURE : OK, merci de nous faire part de votre disponibilité. L'un des membres de notre équipe vous rappellera sous peu.			

CONTEXTE

NON.	QUESTIONS ET FILTRES	CATÉGORIES DE CODAGE	SAUT
B1	En premier lieu, j'aimerais vous poser quelques questions supplémentaires sur vous-même et votre ménage. Etes-vous le chef du ménage dans lequel vous vivez ? si « non », quel est votre lien de parenté avec le chef de ce ménage ?	1.CHEF DE MENAGE 2.FEMME OU MARI 3.FILS OU FILLE 4.GENDRE/BELLE-FILLE 5.PETIT-FILS/FILLE 6.PÈRE/MÈRE 7.FRÈRE OU SOEUR 8.AUTRE PARENT 9.SANS PARENTÉ	
B2	Avez-vous déjà été à l'école ?	1.Oui 0.Non	Si "0" aller à B4
B3	Quel est le niveau d'études le plus élevé que vous ayez suivi : primaire, secondaire ou supérieur ?	1.PRIMAIRE 2.SECONDAIRE 3.SUPERIEUR	
B4	Quel est votre statut matrimonial actuel ?	1.MARIE OU EN UNION 2.VEUF 3.DIVORCE 4.SÉPARÉ 5.CELIBATAIRE	

B7	Quel est le principal matériau de construction du toit de votre maison ?	1.TOLE 2.CHAUME/PALME/FEUILLE 3.MOTTE DE TERRE 4.AUTRE à préciser 8.NSP	
B8	Votre ménage dispose-t-il d'une source d'alimentation électrique ?	1.OUI 0.NON	
B9	Quelle est la principale source d'approvisionnement en eau potable pour les membres du ménage ?	1.PUITS A POMPE/FORAGE 2.ROBINET PUBLIC/BORNE 3.FONTAINE 4.PUITS NON PROTÉGÉ 5.PUITS PROTÉGÉ 6.ROBINET DANS LE LOGEMENT 7.ROBINET DANS LA COUR/PARCELLE 8.SOURCE PROTÉGÉE 9.SOURCE NON PROTÉGÉE 10.AUTRE À PRÉCISER…. ;	

VACCINATION COVID-19 – RÉPONDANT

CV1	Les prochaines questions concernent l'épidémie de COVID-19 et les vaccins COVID. Avez-vous reçu au moins une dose d'un vaccin COVID-19 ?	1.UNE DOSE 2.DEUX DOSES 3.NON	Si « 3 » aller à CV3
CV2	Connaissez-vous le nom du vaccin que vous avez reçu ?	1.ASTRAZENECA 2.AUTRE A PRECSIER 8.NSP	Si "1" ou "2" Allez à la section suivante
CV3	Si un vaccin contre la COVID-19 vous était proposé, quelle serait la probabilité que vous acceptiez de vous faire vacciner ?	1.OUI, DÉFINITIVEMENT 2.PROBABLEMENT 3.PEU PROBABLE 4.CERTAINEMENT PAS 8.NE SAIT PAS	Si "1" ou "2 Aller à la section suivante
CV4	Quelle est la principale raison pour laquelle vous ne prendriez pas (ou douteriez de prendre) le vaccin ? INSTRUCTION : Ne pas passer en revue la liste des réponses possibles ; cocher simplement la réponse proposée par l'enquêté. Demandez ensuite : "Y a-t-il une autre raison .... ?"	1.J'ai déjà eu le COVID-19 et je crois que je suis immunisé. 2.Le vaccin n'est pas efficace 3.Le vaccin n'est pas sûr/causant des dommages/effets secondaires 4.Peut contracter le COVID-19 à cause du vaccin 5.Objections religieuses/croyances traditionnelles (préciser....) 6.Le risque de contracter le COVID-19 est faible 7.Le COVID-19 n'est pas grave et ne met pas ma vie en danger 8.Allergique aux vaccins 9.Je n'aime pas les aiguilles 10.Je préfère attendre que les autres aient été vaccinés 11.Il y aura bientôt d'autres traitements efficaces 12.Ne veut pas du vaccin proposé, attendra un autre vaccin	

		13.Autre (précisez .....) 88.Aucune/NSP	

COMPOSITION DU MÉNAGE ET DÉCÈS AU COURS DES TROIS DERNIERS MOIS

HD1	Je voudrais maintenant vous poser quelques questions sur votre ménage. Combien de personnes vivent habituellement dans votre ménage ?	NOMBRE	Si la personne vit seule, aller à HD3
HD2	Parmi eux il y'a combien d'enfants de moins de 5 ans ? et de personnes de plus de 5 ans ?	NOMBRE < 5 ans |___| NOMBRE >=5 ans |___| VERIFIER LA COHERENCE AVEC HD1	
HD3	Avez-vous enregistré un ou plusieurs décès d'enfants de moins de cinq ans dans votre ménage au cours des 3 derniers mois ?	1.OUI 0.NON 8.NSP	Si "0" ou "8" aller à HD7
HD4	Si Oui, demandez le nombre	NOMBRE |___|	BOUCLE
HD5	Depuis combien de temps cet enfant (le premier, le deuxième,.....) est-il décédé ?	E1 JOURS |___| E1 MOIS |___| E2 JOURS |___| E2 MOIS |___| E3 JOURS |___| E3 MOIS |___|	
HD6	Avez-vous enregistré un ou plusieurs décès de personnes de plus de cinq ans dans votre ménage au cours des 3 derniers mois ?	1.OUI 0.NON 8.NSP	Si "0" ou "8" aller à PS1
HD7	Si Oui, demandez le nombre	NOMBRE |___|	Boucle
HD8	Depuis combien de temps cette personne (la première, la deuxième, …….) est-elle décédée ?	P1 JOURS |___| P1 MOIS |___| P2 JOURS |___| P2 MOIS |___| P3 JOURS |___| P3 MOIS |___|	

SURVIE DES PARENTS

Je voudrais maintenant vous interroger sur la survie de vos parents biologiques	PS1. Votre mère (père) biologique est-elle encore en vie ?	PS2. Quel âge a-t-il/elle ? INSTRUCTION : enregistrer l'âge en années révolues	PS3. Où vit-il/elle ?	PS4. Votre mère (père) a-t-elle déjà reçu au moins une dose	PS5. Quel âge avait votre mère (père) biologique lorsqu'elle (il) est décédé(e) ?	PS6. En quelle année est-elle décédée ?	PS7. En quel mois de l'année est-elle/il décédé ?	PS.8. Où résidait-il/elle avant la survenue du décès ?

				du vaccin COVID-19 ?				
	1.OUI 0.NON 8.NSP	ANNÉES 888. NSP	1.MÊME MÉNAGE 2.MÊME VILLAGE/VILLE 3.MEME REGION 4.AUTRE REGION (nom) :..... 5. CÔTE D'IVOIRE 6. AUTRE À PRÉCISER	0.NON 1.UNE DOSE 2.DEUX DOSES 8.NSP	ÂGE (ANNÉES RÉVOLUES) 888. NSP	ANNÉE	MOIS 88.NSP	1.MÊME MÉNAGE 2.MÊME VILLAGE/VILLE 3.MEME REGION 4.AUTRE REGION (nom) :..... 5. CÔTE D'IVOIRE 6. AUTRE À PRÉCISER
	Si « non » allez à PS5			Allez à la mère				
Père						SI < 2019 aller à (mère) mais si SI >= 2019, ALORS DEMANDER PS7		
Mère						SI < 2019 aller à la section suivante ; mais si SI >= 2019, ALORS DEMANDER PS7		

SURVIE DES FRÈRES ET SŒURS

SSH1	Maintenant, je voudrais vous poser quelques questions sur vos sœurs qui sont nées de votre mère biologique. Pouvez-vous me dire combien de sœurs vous avez ou avez eu au total ? Veuillez inclure les sœurs qui vivent avec vous, celles qui ne vivent pas avec vous et celles qui sont décédées INSTRUCTION : aider le répondant à dénombrer les sœurs en énumérant leurs noms. Ne pas inclure le répondant dans le calcul.	NOMBRE 88.NE SAIT PAS	Si "0" aller à SSH6
SSH2	Combien de ces sœurs ne sont plus parmi nous aujourd'hui parce qu'elles sont décédées ?	NOMBRE 88.NE SAIT PAS	Si "0" aller à SSH6

SSH3	Combien de vos sœurs sont décédées depuis le début de l'année 2019 ?	NOMBRE 88.NE SAIT PAS	Si "0" ou "88" aller à SSH6
SSH4	Pouvez-vous me donner les noms et prénoms de ces sœurs décédées ?	S1 NOM : S2 NOM : S3 NOM :	
SSH5	En quelle année/mois (NOM) est-elle décédée ?	S1 Année : S1 Mois : Année S2 S2 Mois Année S3 : Mois S3 :	Cette question est posée pour chacune des soeurs décédées
SSH6	Maintenant, je voudrais vous poser quelques questions sur vos frères qui sont nés de votre mère biologique. Pouvez-vous me dire combien de frères vous avez ou avez eu au total ? Veuillez inclure les frères qui vivent avec vous, les sœurs qui ne vivent pas avec vous, et ceux qui sont décédés ? INSTRUCTION : aider le répondant à dénombrer les frères en énumérant leurs (prénoms).	NOMBRE 88.NE SAIT PAS	Si "0" Allez à la section suivante
SSH7	Combien de ces frères ne sont plus parmi nous aujourd'hui parce qu'ils sont décédés ?	NOMBRE 88.NE SAIT PAS	Si "0" Aller à la section suivante
SSH8	Combien de vos frères sont décédés au cours des trois dernières années ?	NOMBRE : 88.NE SAIT PAS	Si "0" ou "88" Aller à la section suivante
	Pouvez-vous me donner le prénom de ces frères ?	F1 NOM : F2 NOM : F3 NOM :	
SSH9	En quelle année/mois (NOM) est-il décédé ?	Année B1 : Mois B1 : B2 Année B2 Mois B3 Année : Mois B3 :	Cette question est posée pour chacun des frères décédés

HISTOIRE GENESIQUE RESUMEE

VERIFIER : Répondant = femme en âge de procréer ↳ HG1 Répondante ≠ femme en âge de procréer ↳ DEBRIEFING			
HG1	Maintenant, j'aimerais vous interroger sur toutes les naissances vivantes que vous avez eues au cours de votre vie. Avez-vous déjà accouché d'un enfant né vivant ?	1.OUI 0.NON	Si "non" aller à la section suivante

HG2	Avez-vous des fils ou des filles auxquels vous avez donné naissance et qui vivent actuellement avec vous ?	1.OUI 0.NON	Si “0” aller à HG4
HG3	a. Combien de fils vivent avec vous ? b. Combien de filles vivent avec vous ?	Nombre de FILS Nombre de FILLES	
HG4	Avez-vous des fils ou des filles auxquels vous avez donné naissance et qui sont vivants mais ne vivent pas avec vous ?	1.OUI 0.NON	Si “0” aller à HG6
HG5	a. Combien de fils sont en vie mais ne vivent pas avec vous ? b. Et combien de filles sont en vie mais ne vivent pas avec vous ?	Nombre de FILS AILLEURS Nombre de FILLES AILLEURS	
HG6	a. Combien de garçons sont décédés ? b. Et combien de filles sont décédées ?	Nombre de GARCONS DECEDES Nombre de FILLES DECEDEES	
HG7	Pour être sûr d'avoir bien compris, vous avez eu au total [= HG3 + HG5 + HG7] naissances au cours de votre vie. Est-ce exact ?	1.OUI 0.NON	CORRIGER
HG8	Maintenant, j'aimerais vous poser quelques questions sur des naissances récentes. Je voudrais maintenant que vous pensiez au dernier enfant né vivant que vous avez eu. C'était une naissance unique ou multiple ?	1.SIMPLE 2.MULTIPLE	Si “1” aller à HG10
HG9	S’agissait-il d’une naissance de jumeaux, de triplés ou plus ?	NOMBRE	BOUCLE MP si naissance multiple
HG10	Quel nom a été donné à cet enfant ?		
HG11	Est-ce que (NOM/BÉBÉ) était un garçon ou une fille ?	1.GARÇON 2.FILLE	
HG12	Quel est le jour, le mois et l'année de naissance de (NOM) ?	JOUR MOIS ANNÉE	(Date de l'entretien - HG12 > 7 ans) FIN DU MODULE HG
HG13	Est-ce que (NOM) est encore en vie ?	1.EN VIE 2.DECEDE	Si “2” aller à HG15
HG14	Quel âge a (NOM) aujourd'hui ? INSTRUCTION : enregistrer les jours si moins d'un mois ; les mois complets si moins de deux ans, ou les années complètes si plus de deux ans.	JOURS MOIS ANNÉES	Si HG13=1, aller à la section suivante
HG15	Quel âge avait (NOM) quand il/elle est décédé(e) ? INSTRUCTION : enregistrer les jours si moins d'un mois ; les mois complets si moins de deux ans, ou les années complètes si plus de deux ans.	JOURS MOIS ANNÉES	
HG VERIFIER 2 : SI boucle de naissance multiple incomplète ↬ HG14 SINON (boucle de naissance multiple complète) ↬ HG C3			

DÉTAILS DU DÉCÈS

Cette série de questions doit être posée pour tous les décès d'adultes identifiés par les questions sur la survie des parents et des frères et sœurs.

VERIFIER 1 : Décédée = femme en âge de procréer aller à D1 Femmes décédées ≠ en âge de procréer aller à D4			
D1	Est-ce que (NOM) était enceinte quand elle est décédée ?	1.OUI 0.NON 8.NSP	Si "0" ou "8" aller à D3
D2	Est-ce que (NOM) est décédée pendant l'accouchement ?	1.OUI 0.NON 8.NSP	
D3	Est-ce que (NOM) est décédée dans les deux mois suivant la fin d'une grossesse ou d'un accouchement ?	1.OUI 0.NON 8.NSP	
D4	Le décès de (NOM/Votre père/Votre mère) était-il dû à un acte de violence ?	1.OUI 0.NON 8.NSP	Si "1" aller à D9
D5	Le décès de (NOM) était-il dû à un accident ?	1.OUI 0.NON 8.NSP	Si "1" aller à D9
D6	Depuis combien de temps (NOM) souffrait-il de l'affection qui a entraîné sa mort ?	JOURS MOIS ANNÉES 888.NSP	
D7	Est-ce que (NOM) a ressenti des symptômes respiratoires, de rhume ou de grippe au cours des 2 semaines précédant son décès ? *INSTRUCTION :* Uniquement pour les décès survenus après mars 2021.	1.OUI 0.NON 8.NSP	Si "0" ou "8" aller à D9
D8	Quels symptômes respiratoires/de rhume/de grippe (NOM) a-t-il (elle) ressenti(e) avant son décès ? *INSTRUCTION :* Uniquement pour les décès survenus après mars 2021..	1.FIÈVRE PERSISTANTE 2.FRISSONS 3.MAUX DE TETE 4.DOULEUR MUSCULAIRE 5.TOUX SECHE 6.DIFFICULTÉS À RESPIRER 7.VERTIGES 8.NEZ QUI COULE 9.GORGE DOULOUREUSE 10.PERTE DU GOÛT ET DE L'ODORAT 11.AUTRE (préciser) 12.AUCUN DE CES SYMPTÔMES	Choix multiple
D9	Est-ce que [NOM] avait déjà reçu au moins une dose du vaccin COVID-19 avant son décès ? *INSTRUCTION :* Uniquement pour les décès survenus après en 2021.	0.NON 1.UNE DOSE 2.DEUX DOSES 8.NSP	Si "0" ou "8" allez à D11
D10	Combien de temps avant le décès [NOM] a-t-il reçu la (dernière dose) du vaccin ? *INSTRUCTION :* Uniquement pour les décès survenus après en 2021.	JOURS MOIS 88.NSP	
D11	Est-ce que (NOM) a été testé(e) pour la COVID-19 dans les 4 dernières semaines avant le décès ? *INSTRUCTION :* Uniquement pour les décès	1.OUI 0.NON 8.NSP	

	survenus à partir de 2020.		
D12	Dans quelle mesure pensez-vous qu'il est probable que (NOM) ait eu la COVID-19 ? *INSTRUCTION :* Uniquement pour les décès survenus à partir de 2020.	1.TRÈS PROBABLE 2.ASSEZ PROBABLE 3.PEU PROBABLE 4.TRÈS IMPROBABLE 8.NE SAIT PAS	
D13	S'est-il/elle rendu(e) dans un centre de santé au cours des 2 dernières semaines précédant son décès ?	1.OUI 0.NON 8.NSP	Si "0" ou "8" aller à D17
D14	A-t-il/elle été hospitalisé(e) dans un centre de santé au cours des 2 dernières semaines précédant le décès ?	1.OUI 0.NON 8.NSP	
D15	Est-il/elle décédé(e) dans un centre de santé ?	1.OUI 0.NON 8.NSP	Si "1" ou "8" aller à D18
D16	Où est mort [NOM] ?	1.ACCUEIL 2.EN ROUTE VERS UN CENTRE DE SANTE 3. DOMICILE 4.AILLEURS (précisez)	
D17	Le décès de (NOM) a-t--il/elle été enregistré(e) à l'Etat-Civil ?	1.OUI 0.NON 8.NSP	
D18	Est-ce que [NOM] a été enterré dans le même village/ville où il/elle vivait ?	1.OUI 0.NON	Si "1" aller à D21
D19	Est-ce que [NOM] a été enterré dans la même région ?	1.OUI 0.NON	
D20	Est-ce que [NOM] a été enterré dans un cimetière, une concession familiale ou un autre lieu ?	1.CIMETIERE 2.CONCESSION FAMILIALE 3.AUTRE (préciser)	
VERIFIER (retour au module PS ou SSH)			

DÉCLARATION DE DÉBRIEFING

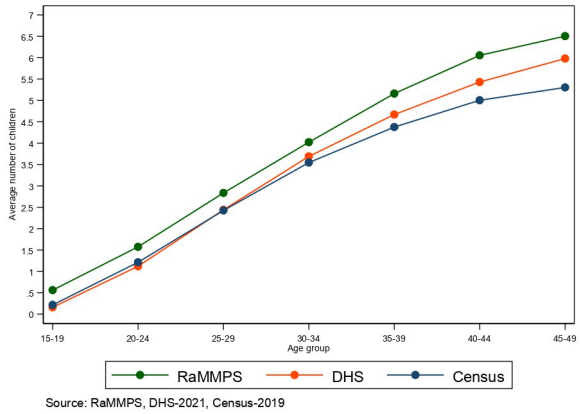
Contact_CM	Si « CM » demandez-lui ces numéros supplémentaires ; si « non », demandez-lui les numéros de téléphone du chef du ménage :	1er Numéro …… 2e Numéro …… 3e Numéro ……	

Ceci nous amène à la fin de l'interview. Au cours de notre conversation, nous avons parlé de la COVID-19, qui est une menace sanitaire sérieuse dans la plupart des pays du monde. Souhaitez-vous plus d'informations à ce sujet ou pensez-vous être suffisamment informé sur la COVID-19 et sur la manière dont vous et vos proches pouvez-vous protéger ? 1.OUI ; 0.NON Comme promis au début de cette interview, nous allons transférer ..... en crédit d'appel. Je vous enverrai également un SMS de suivi contenant les coordonnées de l'équipe de recherche du projet ainsi que celles du comité d'éthique de la recherche en santé, qui pourront répondre à toutes vos questions. Nous vous remercions de votre participation et vous souhaitons une bonne fin de journée.

11.2 Appendix chapter 4

Figure 11.1 : Mean number of children ever born and surviving in the RaMMPS survey, DHS 2010 and 2019 census

Mean number of children ever born in the RaMMPS survey, DHS 2010, and 2019–2020 census, by age of women.



Mean number of surviving children in the RaMMPS survey, DHS 2010, and 2019–2020 census, by age of women

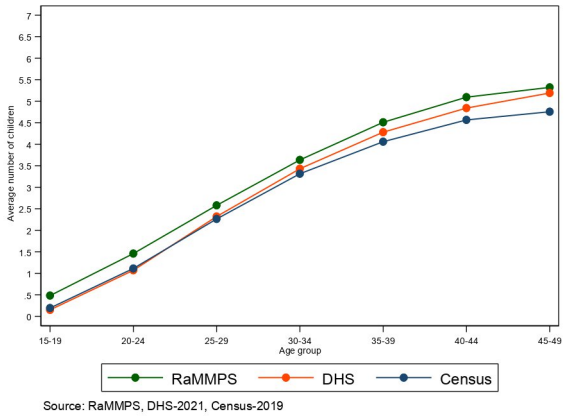


Figure 11.2. Trends in under-5 mortality according to the RaMMPS survey, 2021 DHS, 2019–2020 census, and UN IGME 2020 estimates.

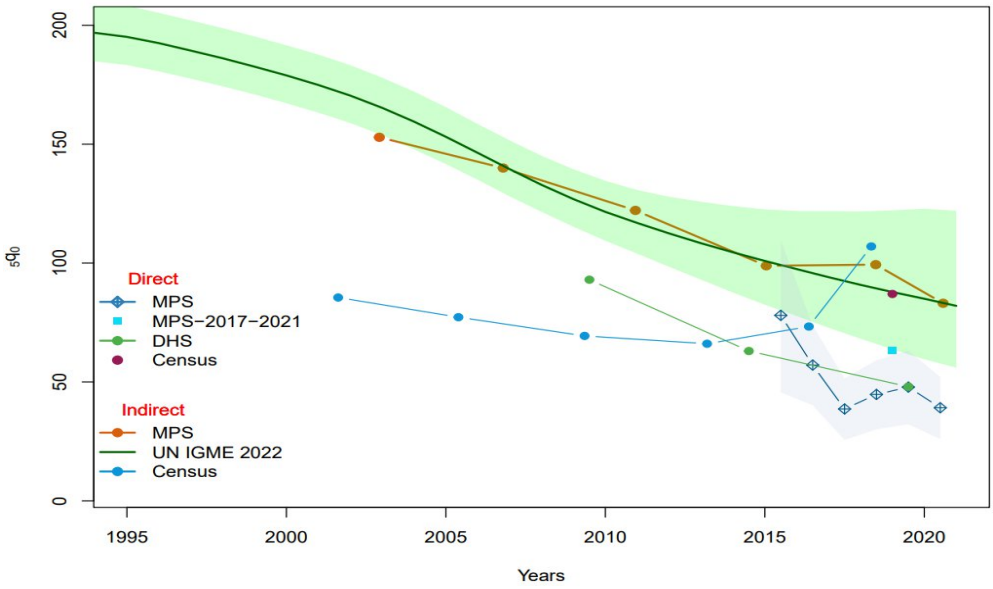


Table 11.4. Mean number of siblings ever born by age group of respondent and study arm, compared to the 2010 DHS.

Age group	EHCVM	RDD	Both arms combined	DHS
18–20 yrs	6.0	5.8	5.9	6.5
20–24 yrs	5.8	5.8	5.8	6.7
25–29 yrs	6.1	6.1	6.1	6.9
30–34 yrs	6.3	6.4	6.4	6.8
35–39 yrs	6.7	6.5	6.6	6.8
40–44 yrs	7.0	6.5	6.8	6.6
45–49 yrs	6.9	6.6	6.7	6.4
Total	6.4	6.2	6.3	6.7

Note: EHCVM: Enquête harmonisée sur les conditions de vie des ménages; RDD: random digit dialing; MPS: mobile phone survey; DHS: Demographic and Health Survey.

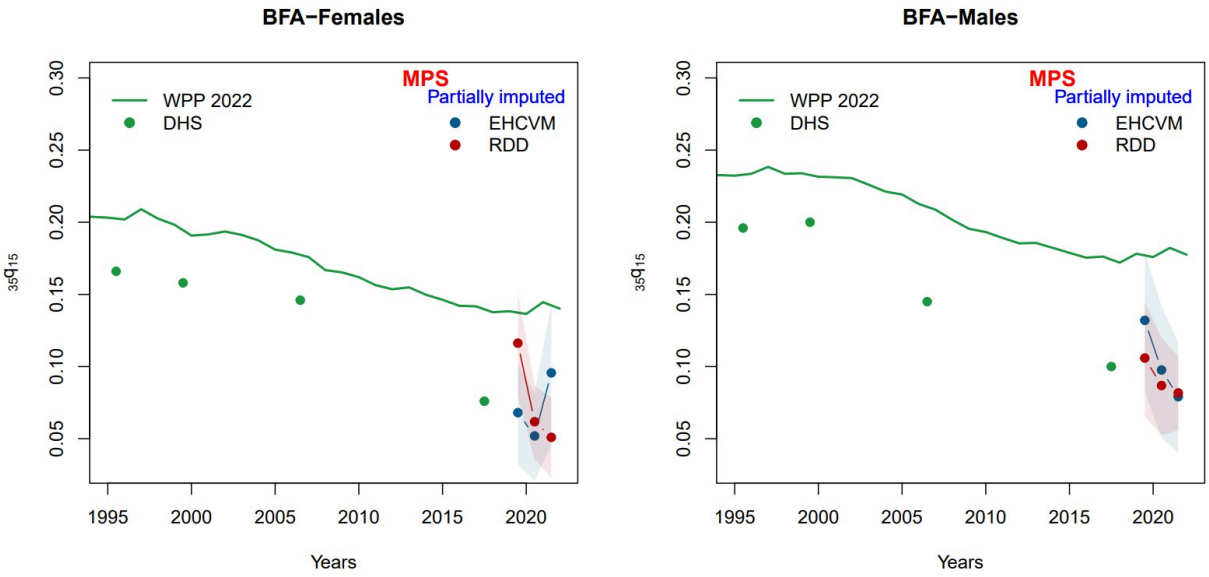
Table 11.5. Distribution of sibling survival status by sibling sex and time since death, per survey.

Respondent age group	Proportion of surviving brothers	Proportion of deceased brothers	Proportion of deceased brothers < 3 years	Proportion of surviving sisters	Proportion of deceased sisters	Proportion of deceased sisters < 3 years
EHCVM						
18–20 yrs	84.7	15.3	1.0	88.8	11.2	0.3
20–24 yrs	83.1	16.9	0.4	85.4	14.7	0.2
25–29 yrs	82.5	17.5	0.5	84.7	15.3	0.5
30–34 yrs	82.9	17.1	0.8	84.5	15.5	0.6
35–39 yrs	78.5	21.6	0.8	81.3	18.7	0.6
40–44 yrs	73.9	26.1	1.9	78.5	21.5	0.4

45–49 yrs	74.8	25.2	1.0	79.6	20.4	0.3
Total	80.1	19.9	0.8	82.8	17.2	0.5
RDD						
18–20 yrs	85.4	14.6	0.8	86.4	13.6	1.1
20–24 yrs	86.9	13.2	0.8	87.7	12.3	0.7
25–29 yrs	84.8	15.2	0.8	88.3	11.7	0.7
30–34 yrs	83.4	16.6	0.9	84.4	15.6	0.3
35–39 yrs	78.7	21.3	1.1	80.1	19.9	0.8
40–44 yrs	76.5	23.5	0.6	83.3	16.7	0.7
45–49 yrs	76.2	23.8	1.1	74.4	25.6	1.2
Total	82.0	18.1	0.9	84.5	15.5	0.6
DHS						
18–20 yrs	83.4	16.6	1.3	84.5	15.4	1.2
20–24 yrs	82.8	17.2	0.9	84.4	15.6	0.9
25–29 yrs	80.4	19.6	0.8	84.0	15.9	0.8
30–34 yrs	78.1	21.9	0.9	81.0	19.0	0.8
35–39 yrs	74.6	25.4	1.2	78.2	21.8	0.8
40–44 yrs	71.6	28.5	1.3	74.6	25.4	0.9
45–49 yrs	66.2	33.7	1.6	72.3	27.6	1.0
Total	78.5	21.5	1.1	81.3	18.7	0.9

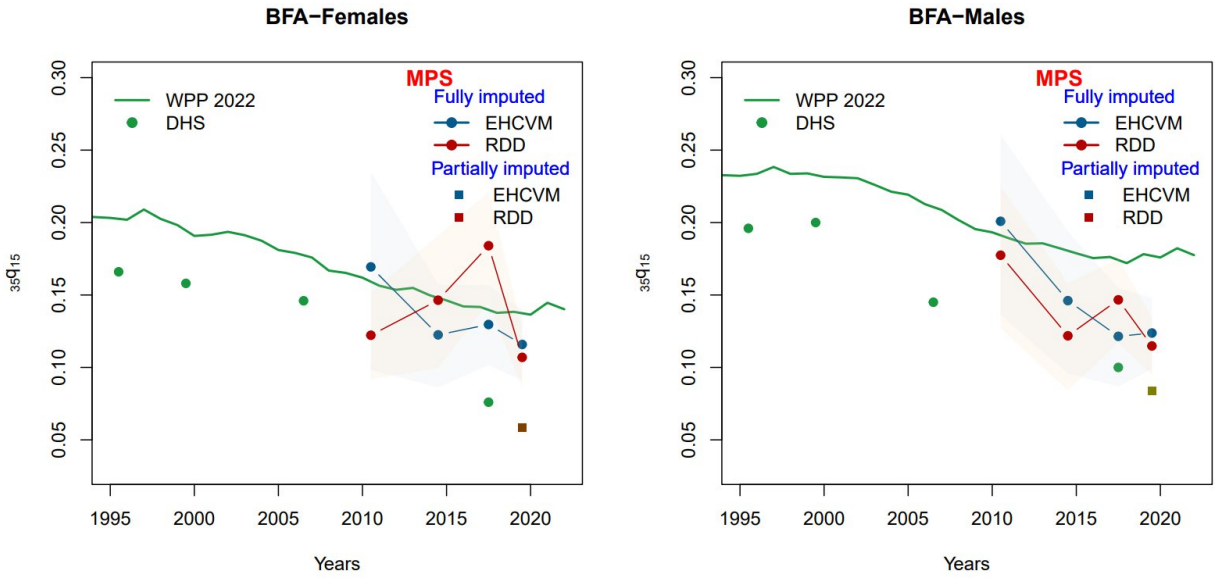
Note: EHCVM: Enquête harmonisée sur les conditions de vie des ménages; RDD: random digit dialing; DHS: Demographic and Health Survey.

Figure 11.3. Trends in adult mortality ($_{35}q_{15}$) according to sibling survival histories in the RaMMPS survey per year or DHS and in the World Population Prospects.



Note: Imputation based on the 2021 DHS.

Figure 11.4. Trends in adult mortality (35q15) according to sibling survival histories in the RaMMPS survey or DHS and in the WPP.



Note: The imputation in this graph is performed using data on full sibling survival histories from the DHS 2010.

11.3 Estimating sub-national mortality rates for the provinces of Kinshasa and North-Kivu

Because the adult mortality rates from the WPP refer to the national level, while the sibling-based estimates in DRC refer to two provinces only, we re-scaled the WPP estimates to obtain a reference for Kinshasa and North Kivu. We proceeded as follows:

(i) we used the Brass logit system (which has two parameters α – capturing the level of mortality – and β – capturing the age pattern) and assumed that β equals to 1;

(ii) we calculated under-five mortality for Kinshasa and North Kivu from the latest DHS conducted in DRC, and computed *Y(5)*, as the logit of survivorship, as follows:

$Y(5) = -0.5 \ln(l_5/(1-l_5))$.

(iii) we calculated the logits of the l_x values in the reference (national) life table from the WPP.

(iv) We estimated the adult mortality levels in Kinshasa and North Kivu, using the formula below;

$$ {}_nq_{15} = 1 - \frac{1 + \exp(2(Y(5) + \beta(Y^s(15) - Y^s(5))))}{1 + \exp(2(Y(5) + \beta(Y^s(15+n) - Y^s(5))))} \ . $$

where β is set at 1, *Y(5)* refers to the logits of the DHS-based survivorship in childhood and $Y^s(5)$, $Y^s(15)$ and $Y^s(15 + n)$ refer to the logits of the survivorship for various age groups in the national WPP life table serving as our reference. This amount to assuming that the age pattern

of mortality in the WPP life table also applies to the two provinces, but the level of mortality is defined by the province-specific estimates of under-five mortality in the DHS.

Table 11.6: Estimates of the probability $_{35}q_{15}$ over the period 0-3 years before data collection, by source and sex of respondent and 95% confidence intervals per country (‰), based on partial imputation

Country			**Male mortality**	**Female mortality**	**Both sexes combined**	**Relative difference with DHS (%)**			**Relative difference with WPP (%)**		
	source	Sex of resp	$_{35}q_{15}$ [IC]	$_{35}q_{15}$ [IC]	$_{35}q_{15}$ [IC]	Male mortality	Female mortality	Both sexes	Male mortality	Female mortality	Both sexes
Burkina Faso	Both arms combined	Male	85 [66 – 103]	58 [42 – 74]	71 [62.1 – 79.1]	-12	-13	-14	-52	-58	-55
		Female	78 [59 – 93]	65 [49 – 80]		-20	-3		-56	-53	
		Both	81 [68 – 98]	60 [46 – 67]		-16	-10		-54	-57	
	EHCVM	Male	101 [70 – 132]	57 [32 – 82]	69 [55.6 – 81.9]	4	-15	-17	-43	-59	-56
		Female	59 [34 – 83]	58 [31 – 85]		-39	-13		-67	-58	
		Both	82 [67 – 107]	55 [38 – 67]		-15	-18		-54	-60	
	RDD	Male	72 [53 – 90]	58 [40 – 77]	71 [60.6 – 81.9]	-26	-13	-14	-60	-58	-55
		Female	88 [63 – 112]	70 [49 – 90]		-9	4		-51	-49	
		Both	79 [66 – 99]	64 [45 – 75]		-19	-4		-56	-54	
	DHS-2021		97 [83 – 110]	67 [55 – 80]	83 [73.4 – 92.1]						
	WPP		178	138	158						
Kinshasa	Male		46 [27 – 64]	67 [40 – 93]	57 [45.3 – 68.0]	-70	-25	-53	-63	-43	-53
	Female		72 [43 – 99]	35 [12 – 57]		-53	-61		-42	-70	
	Both		57 [40 – 73]	52 [35 – 70]		-62	-42		-54	-56	
North-Kivu	Male		71 [41 – 99]	40 [21 – 59]	47 [36.2 – 58.0]	-51	-74	-68	-25	-53	-48
	Female		57 [28 – 86]	25 [6 – 43]		-61	-72		-40	-71	
	Both		66 [44 – 86]	35 [21 – 49]		-55	-61		-31	-59	
Kinshasa	DHS-2013		151 [103 – 197]	90 [55 – 124]	122 [90.6 – 153.0]						
	WPP		123	118	121						
North-Kivu	DHS-2013		145 [85 – 202]	154 [83 – 220]	149 [106.7 – 90.3]						
	WPP		95	85	90						
Malawi	Male				147 [120.5 – 72.9]			-16			-16
	Female				107 [78.7 – 136.1]			-38			-38
	Both				131 [111.4 – 50.0]			-25			-25
	DHS-2015		204 [183.3 –	144 [126.4 –	175 [161.1 – 87.8]						

		224.3]	161.7]							
	WPP	222	130	176						

Note: EHCVM : Enquête Harmonisée sur les Conditions de Vie des Ménages ; RDD : Random Digit Dialing ; WPP : World Population Prospects ; DHS : Demographic and Health Survey

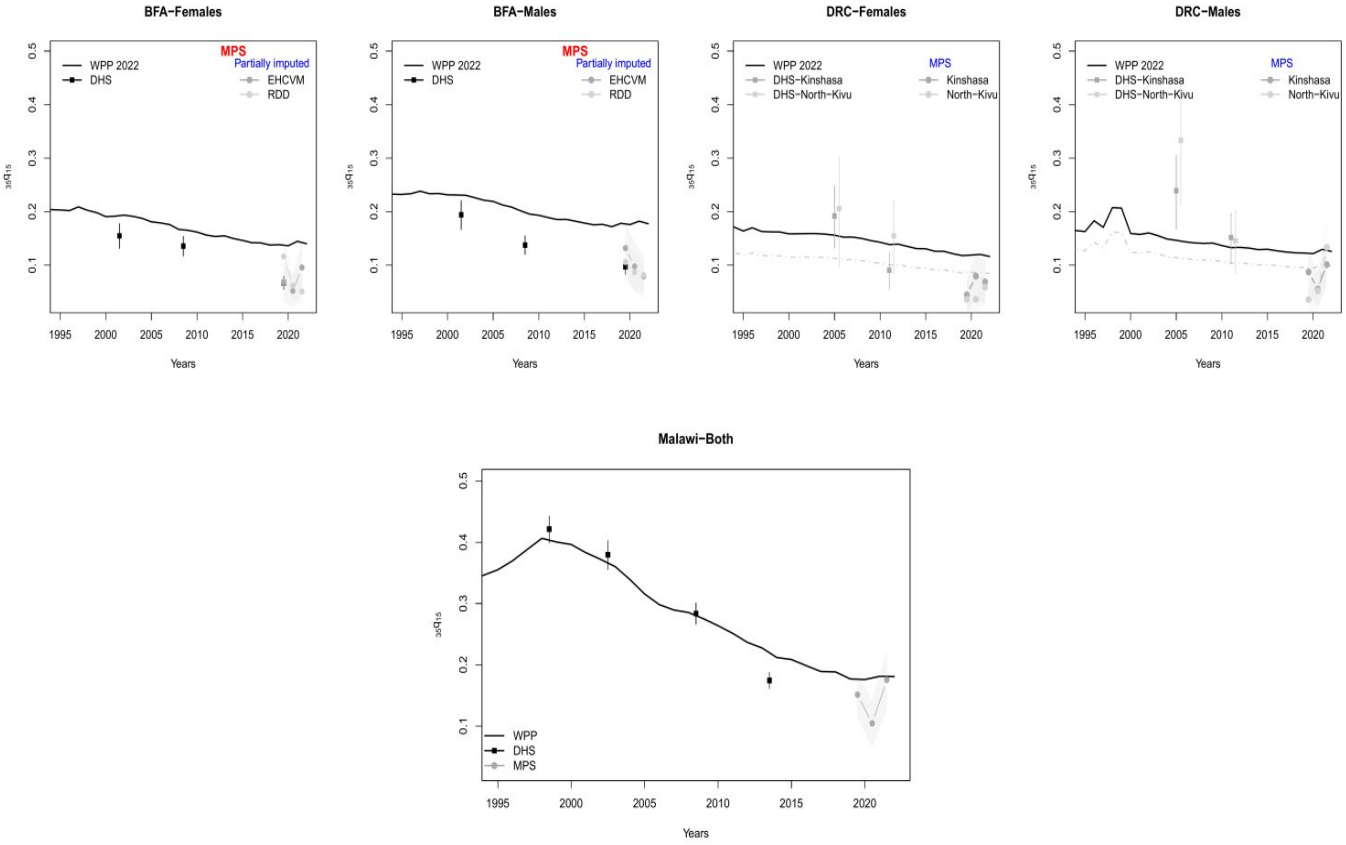
Table 11.7: Estimates of the probability $_{35}q_{15}$ over the period 0-3 years before data collection, by source and sex of respondent and 95% confidence intervals per country (deaths before age 50 for 1000 adolescents aged 15), based on complete imputation

Country			**Men**	**Women**	**Both**	**Relative difference with DHS (%)**			**Relative difference with WPP (%)**		
	source	***Sex of resp***	***35q15 [IC]***	***35q15 [IC]***	***35q15 [IC]***	***Men***	***Women***	***Both***	***Men***	***Women***	***Both***
Burkina Faso	Both arms combined	Male	161 [138 - 183]	102 [82 - 121]	154 [143 – 166]	66	52	85	-10	-26	-3
		Female	223 [194 - 252]	130 [108 - 152]		130	94		25	-6	
		Both	190 [174 - 207]	115 [102 - 129]		96	72		7	-17	
	EHCVM	Male	168 [128 - 206]	111 [81 - 139]	165 [148 – 183]	73	66	99	-6	-20	4
		Female	246 [198 - 288]	141 [102 - 177]		154	110		38	2	
		Both	205 [176 - 233]	124 [102 - 144]		111	85		15	-10	
	RDD	Male	155 [125 - 185]	99 [69 - 128]	148 [132 – 163]	60	48	78	-13	-28	-6
		Female	210 [171 - 246]	124 [97 - 151]		116	85		18	-10	
		Both	180 [157 - 203]	111 [92 - 130]		86	66		1	-20	
	DHS-2021		97 [83 - 110]	67 [55 - 80]	83 [73.4 – 92.1]						
	WPP		178	138	158						
Kinshasa	Male		65 [42 - 88]	47 [26 - 68]	57 [45 – 68]	-57	-47	-53	-47	-60	-53
	Female		61 [35 - 86]	53 [27 - 78]		-60	-41		-50	-55	
	Both		63 [46 - 80]	50 [33 - 66]		-58	-44		-49	-58	
North-Kivu	Male		71 [42 - 99]	66 [38 - 93]	72 [57 – 87]	-51	-57	-52	-25	-22	-20
	Female		89 [46 - 131]	73 [36 - 108]		-38	-53		-6	-14	
	Both		76 [53 - 98]	68 [45 - 91]		-48	-56		-20	-20	
Kinshasa	DHS-2013		151 [103 - 197]	90 [55 - 124]	122 [90.6 – 153.0]						
	WPP		123	118	121						
North-Kivu	DHS-2013		145 [85 - 202]	154 [83 - 220]	149 [106.7 – 90.3]						
	WPP		95	85	90						
Malawi	Male				165			-6			-6

			[135 – 194]		
Female			193 [148 – 237]	10	10
Both			177 [152 – 200]	1	1
DHS-2015	204 [183 – 224]	[126 – 162]	175 [161 – 187]		
WPP	222	130	176		

Note: EHCVM : Enquête Harmonisée sur les Conditions de Vie des Ménages ; RDD : Random Digit Dialing ; WPP : World Population Prospects ; DHS : Demographic and Health Survey

Figure 11.5: Trends in adult mortality ($_{35}q_{15}$) according to SSH in the MPS survey (using partial imputation) or DHS surveys and in the World Population Prospects



11.4 Appendix-Chapter 5

Table 11.8: age reporting discrepancies of respondents in the HDSS and MPS: analysis based on selected respondent characteristics

	> 10	10-6	5-3	0-2	3-5	6-10	10 ou +	
	%	%	%	%	%	%	%	Effectif
Age group								
15-19 yrs	3.8	1.4	3.3	91.1	0.5	0.0	0.0	213
20-24 yrs	2.2	1.0	7.5	84.8	4.1	0.4	0.0	492
25-29 yrs	1.3	2.5	7.1	81.1	6.6	1.3	0.3	396
30-34 yrs	1.4	2.8	7.5	74.8	9.9	3.3	0.2	424
35-39 yrs	1.5	2.3	5.9	70.6	12.8	6.7	0.2	476
40-44 yrs	1.9	2.4	5.9	69.0	10.7	8.0	2.1	374
45-49 yrs	0.5	2.5	9.4	60.4	13.4	10.4	3.5	202
50-54 yrs	3.1	5.1	7.1	66.3	10.2	6.1	2.0	98
55-59 yrs	3.6	5.5	5.5	61.8	12.7	7.3	3.6	55
60-64 yrs	4.3	6.4	2.1	61.7	17.0	6.4	2.1	47
Gender								
Men	1.9	2.8	8.3	77.2	6.2	3.0	0.8	907
Women	1.9	2.2	5.8	74.5	9.9	4.8	0.9	1,87
Place of residence								
Formal	2.3	2.4	6.1	78.9	6.4	3.3	0.6	1,076

Informal	1.6	2.4	6.9	73.1	10.2	4.8	1.0	1,701
Education								
None	3.2	3.8	8.1	60.6	14.6	7.9	1.7	972
Primary	1.7	1.7	7.5	77.7	7.5	3.5	0.3	636
Secondary	1.1	1.7	5.2	85.4	4.7	1.6	0.4	946
Superior	0.0	0.9	3.6	90.6	3.6	1.3	0.0	223
Place of interview								
Domicile	2.0	2.0	6.7	74.1	9.6	4.7	0.8	1,78
Lieu de travail	1.9	2.5	6.1	77.1	7.6	4.2	0.7	594
Lieu public	2.3	5.4	5.4	73.6	7.8	3.9	1.6	129
Circulation	4.2	0.0	12.5	79.2	4.2	0.0	0.0	24
Pas a la maison	0.8	2.8	7.2	81.1	6.0	1.2	0.8	249
Autre lieu(Preciser)	0.0	100.0	0.0	0.0	0.0	0.0	0.0	1
Total	1.9	2.4	6.6	75.4	8.7	4.2	0.8	2,777

Figures

Figure 11.6: Flow chart of the study enrollment process for women of reproductive age

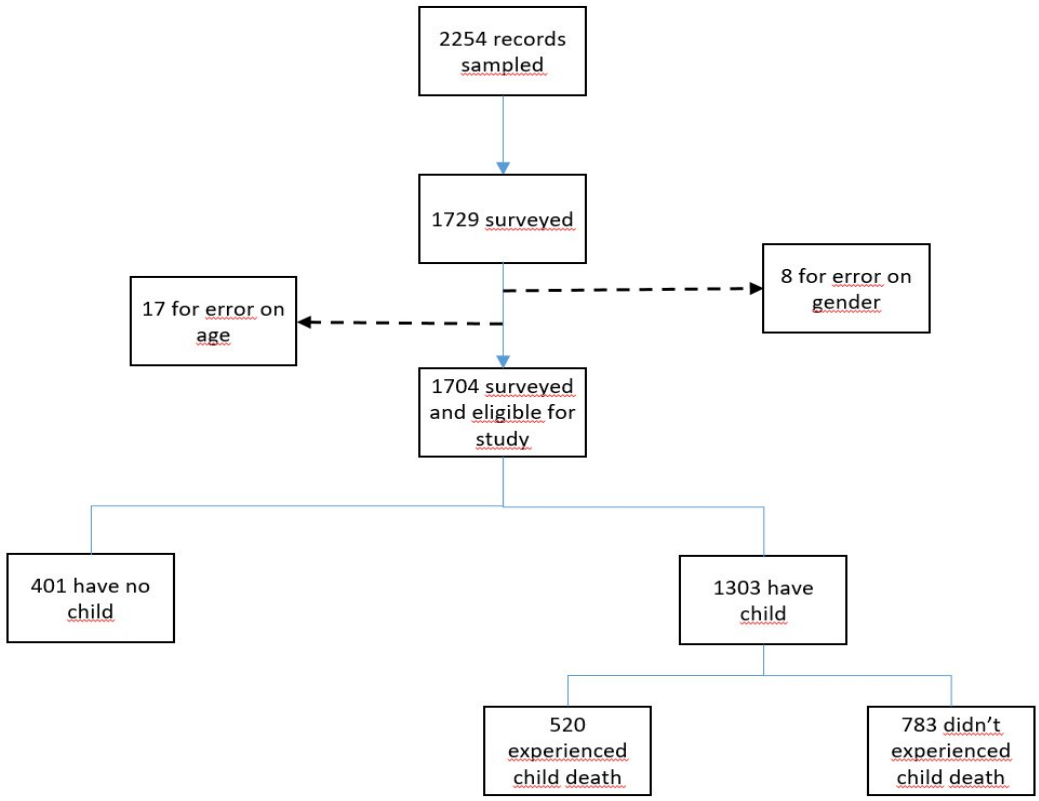


Figure 11.7: Flow chart of the study enrollment process for sibling survival histories

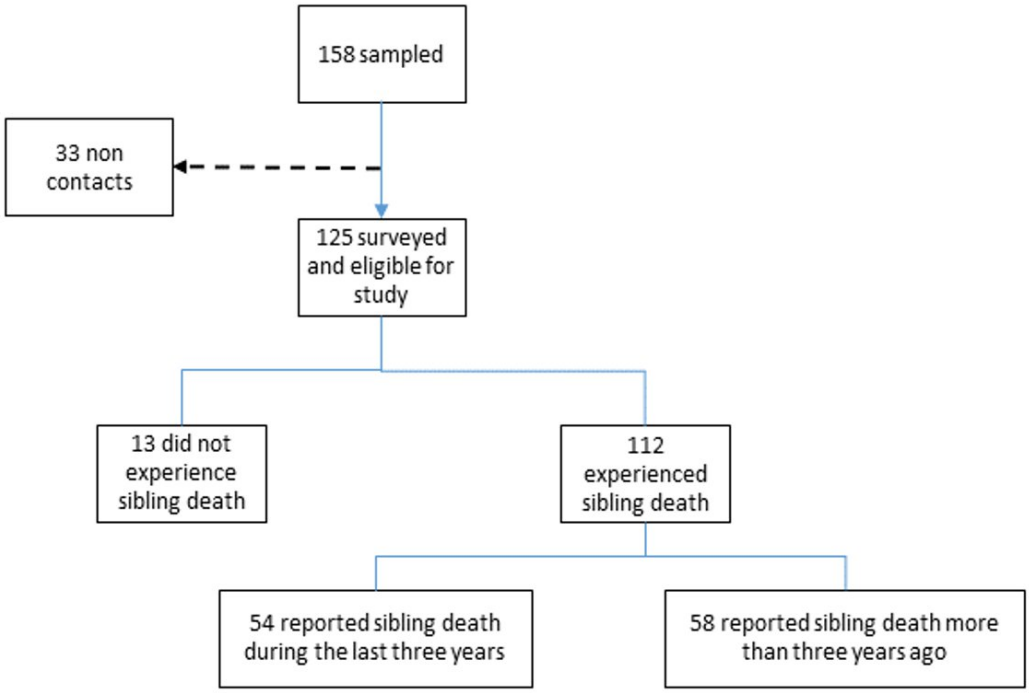


Figure 11.8: Flow chart of the study enrollment process for parental survival histories

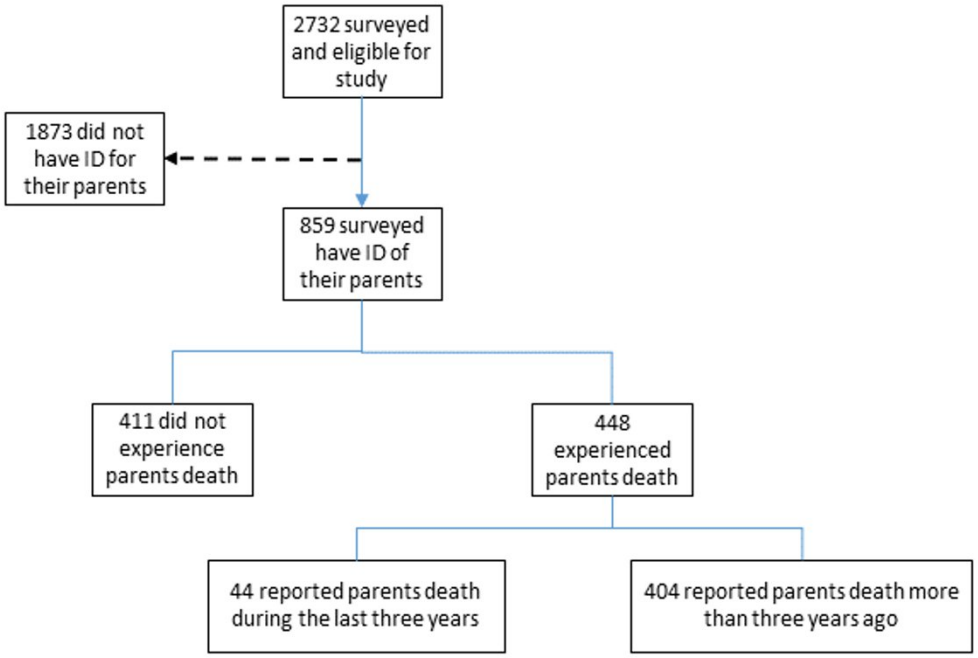


Figure 11.9: Coefficients from logistic regression: factors associated with child names matching

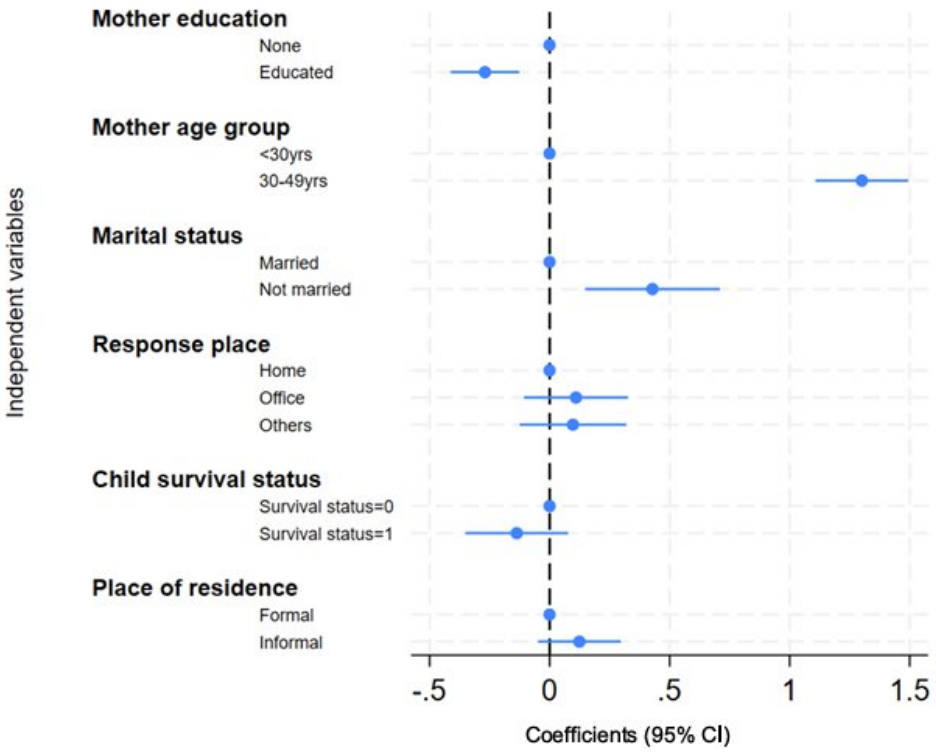


Figure 11.10: Adjusted risk coefficients for any difference in current age of respondent at the time of interview

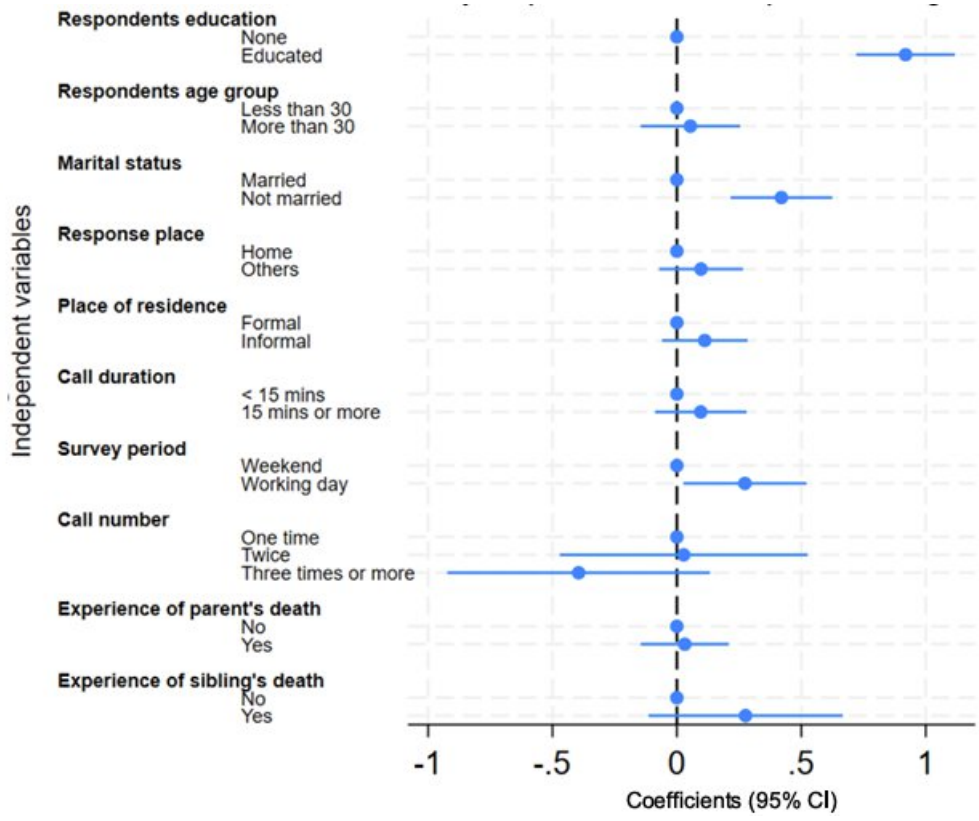


Figure 11.11: adjusted risk coefficients for over estimation in current age of respondent at the time of interview

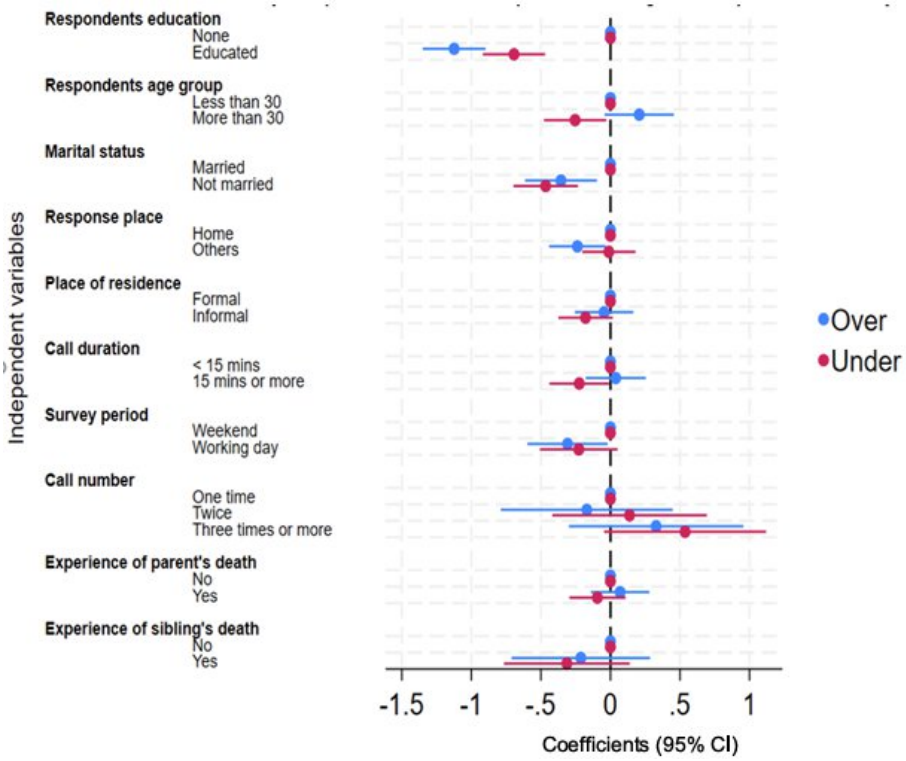


Figure 11.12: Logistic regression results identifying factors associated with under or over reporting of children ever born in SBH module

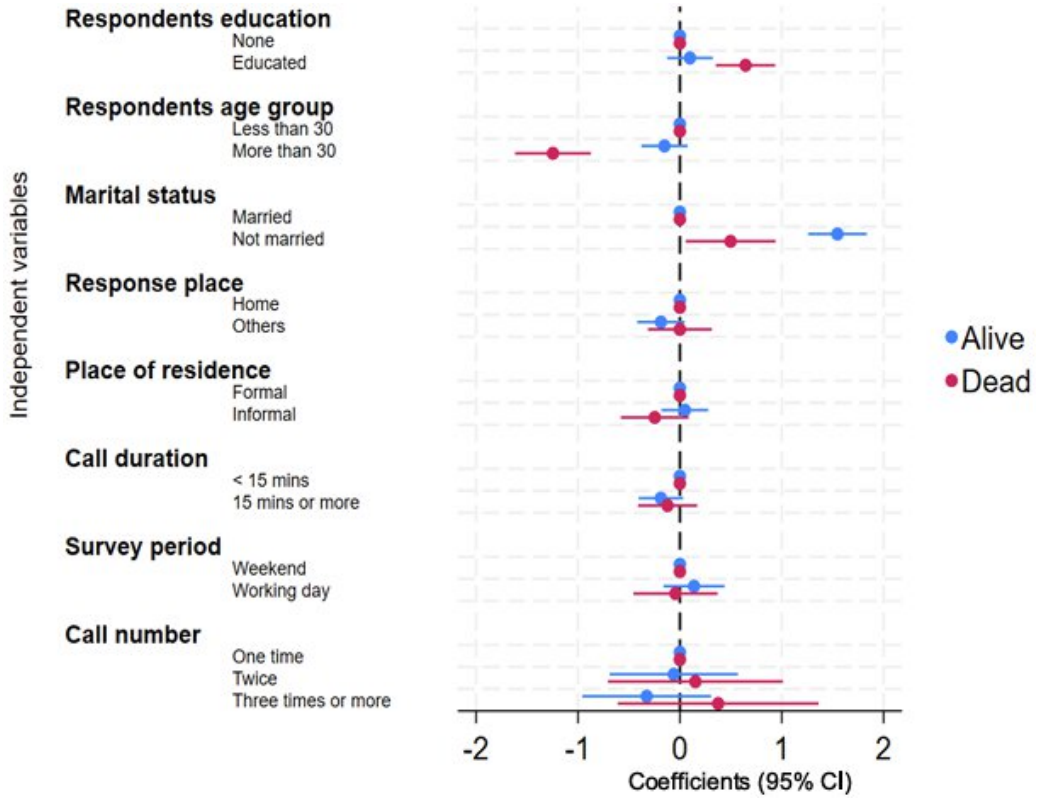


Figure 11.13: Coefficients from logistic regression: factors associated with any displacement in child DoD

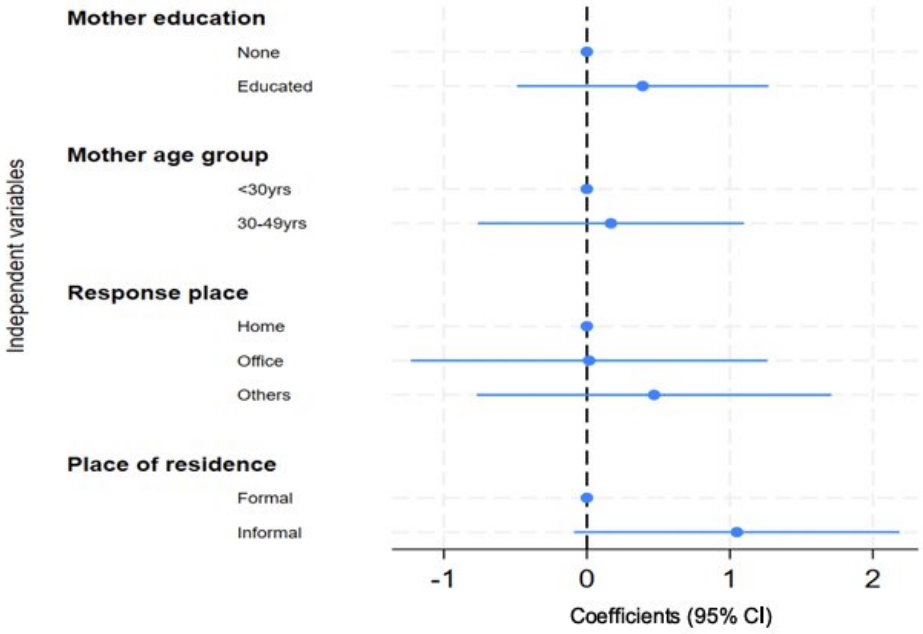


Figure 11.14: Coefficients from logistic regression: factors associated with any displacement in child DoB and DoD

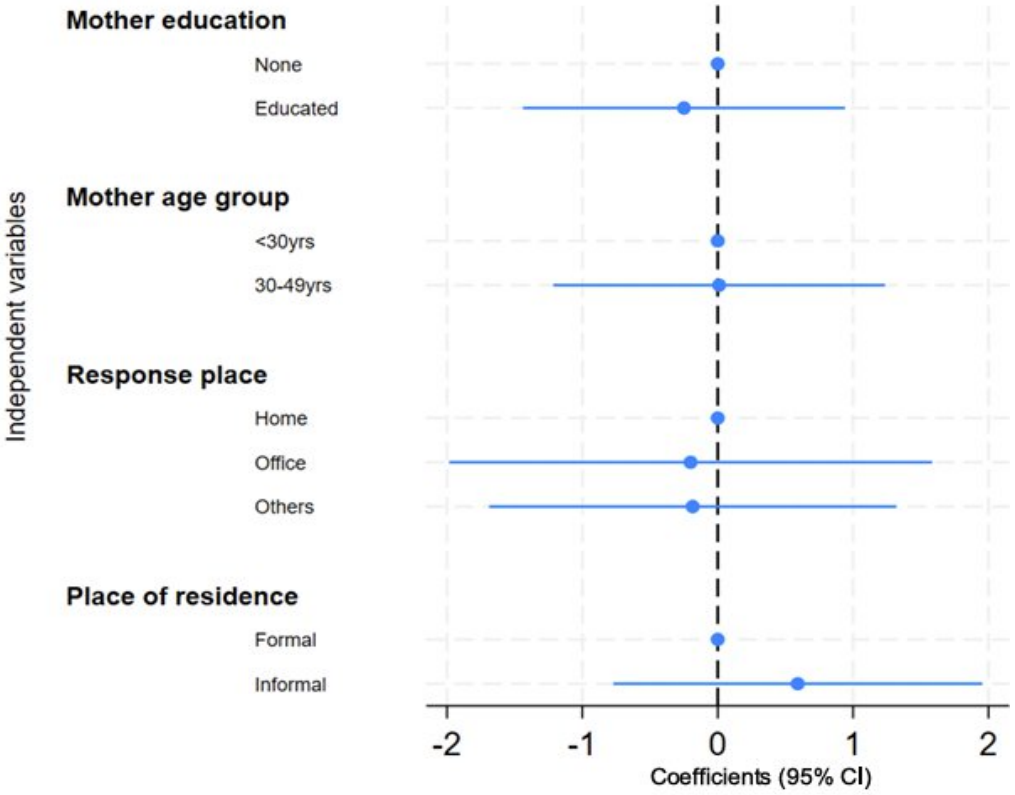


Figure 11.15: Coefficients from logistic regression: factors associated with any displacement in parent's age at death

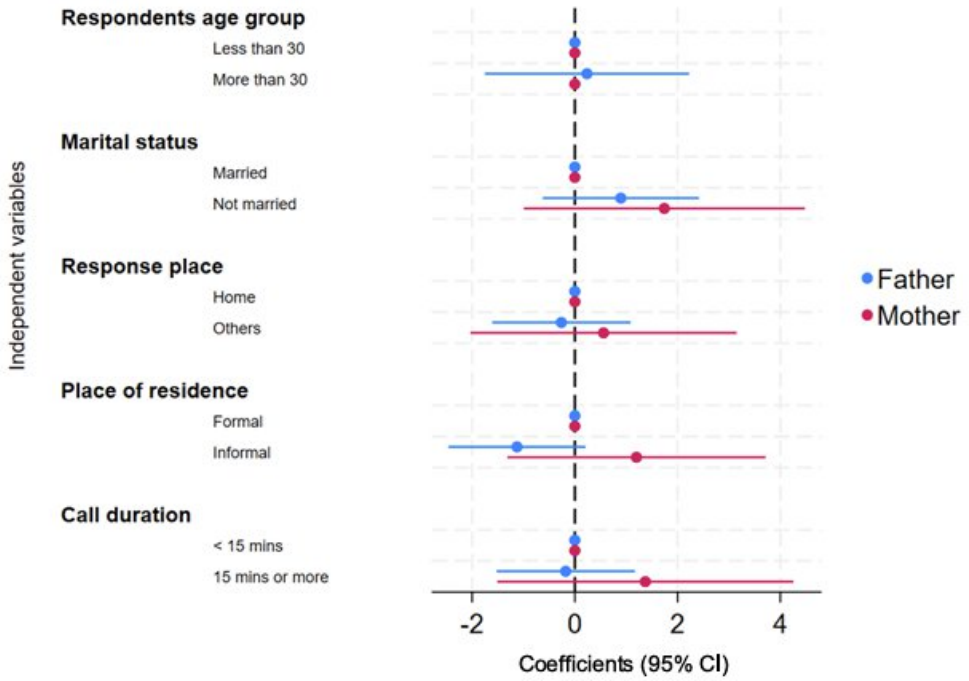


Figure 11.16: Coefficients from logistic regression: factors associated with any displacement in parent's current age

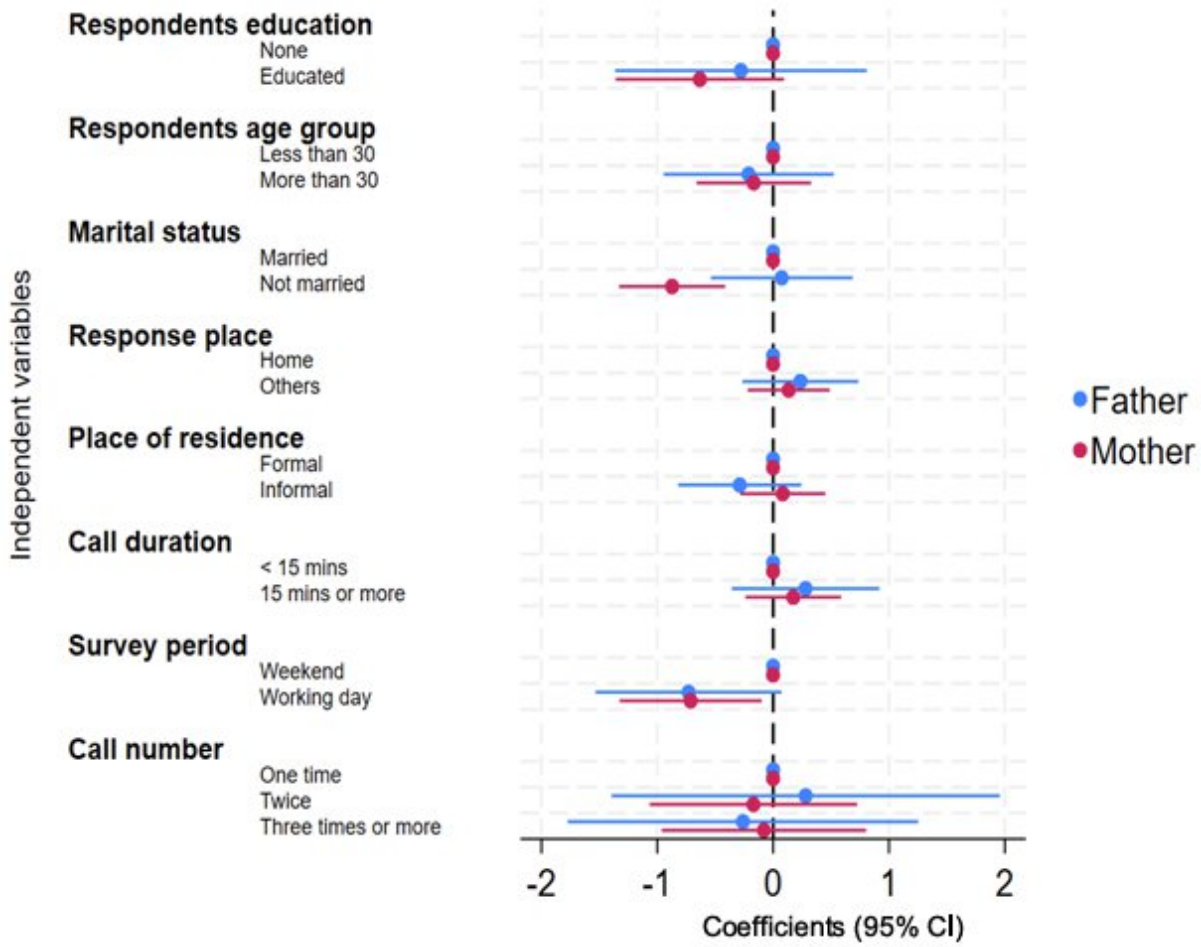


Figure 11.17: Comparison of Under-5 mortality levels obtained from raw data (Standard) with those estimated after imputing error patterns from MPS into the original dataset by year

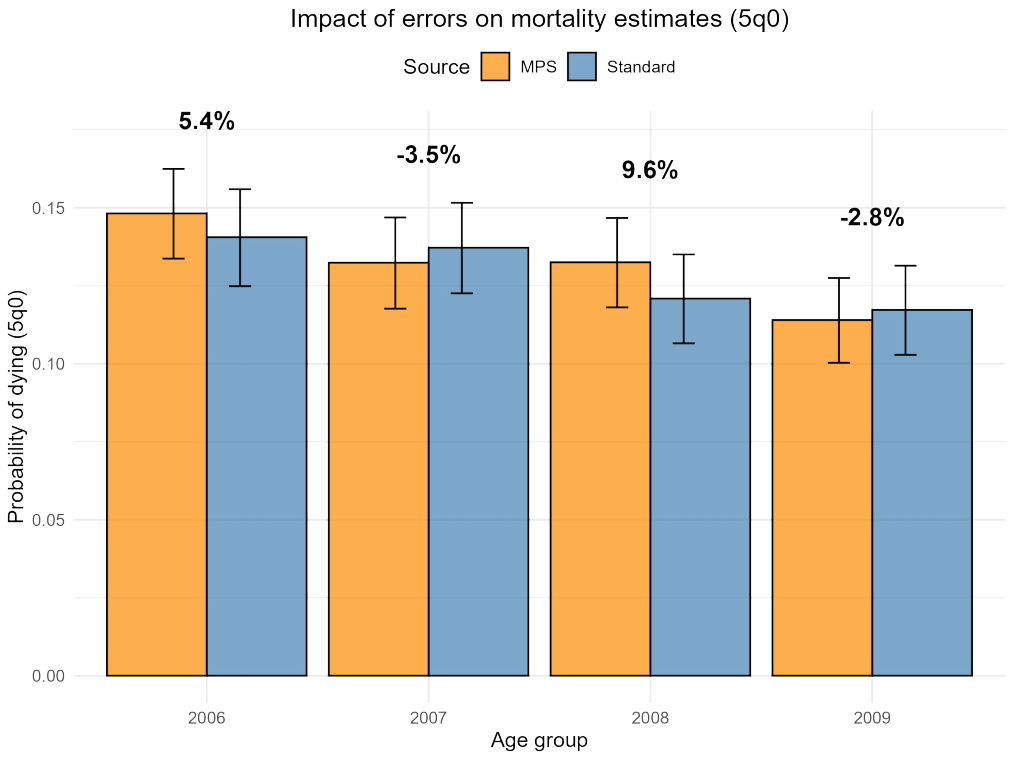


Figure 11.18: Comparison of child mortality levels obtained from raw data (Standard) with those estimated after imputing error patterns from MPS into the original dataset by year

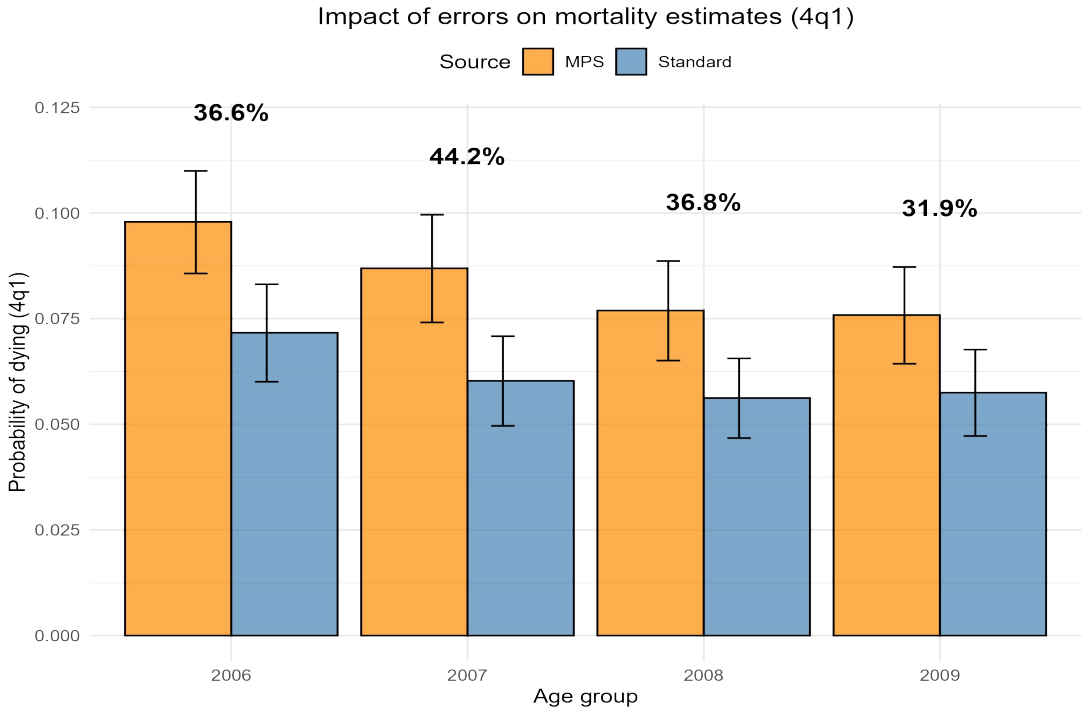


Figure 11.19: Comparison of infant mortality levels obtained from raw data (Standard) with those estimated after imputing error patterns from MPS into the original dataset by year

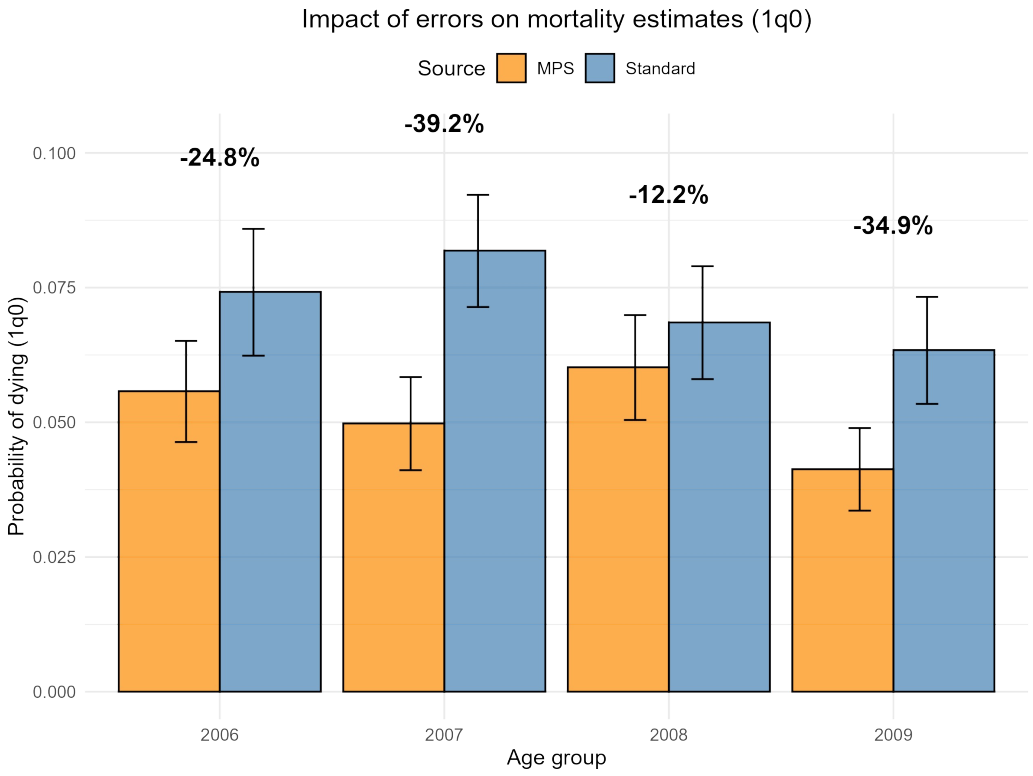


Figure 11.20: Comparison of adult mortality (25q25, 20q30 and 35q15) levels obtained from raw data (Standard) with those estimated after imputing error patterns from MPS into the original dataset by sex

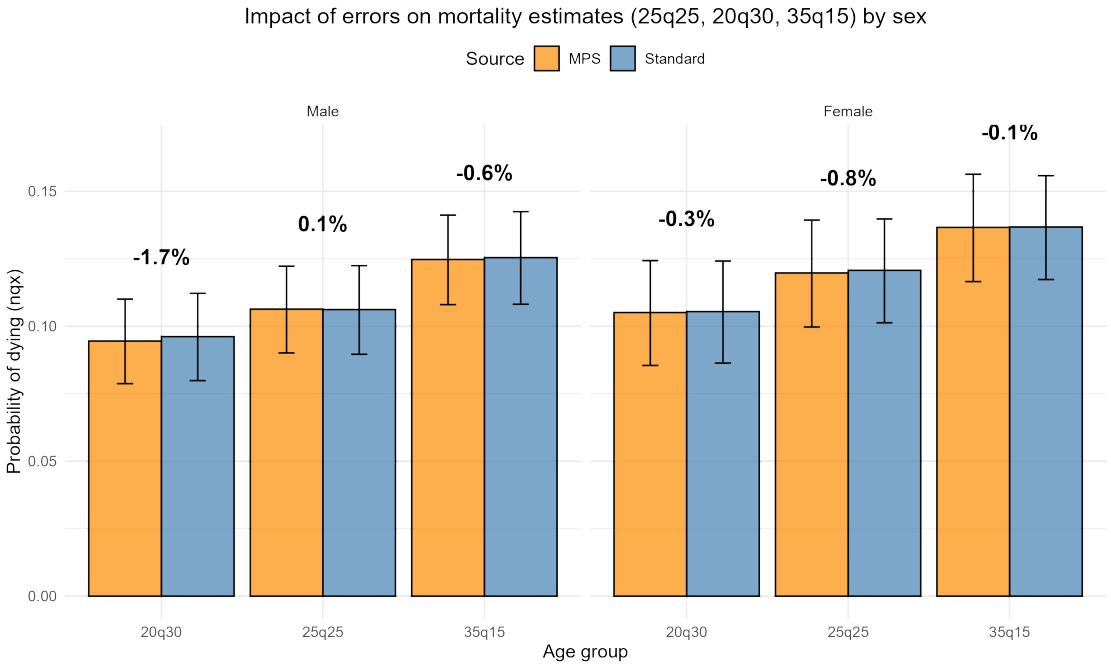


Figure 11.21: Comparison of adult mortality (45q15) levels obtained from raw data (Standard) with those estimated after imputing error patterns from MPS into the original dataset by sex and per year

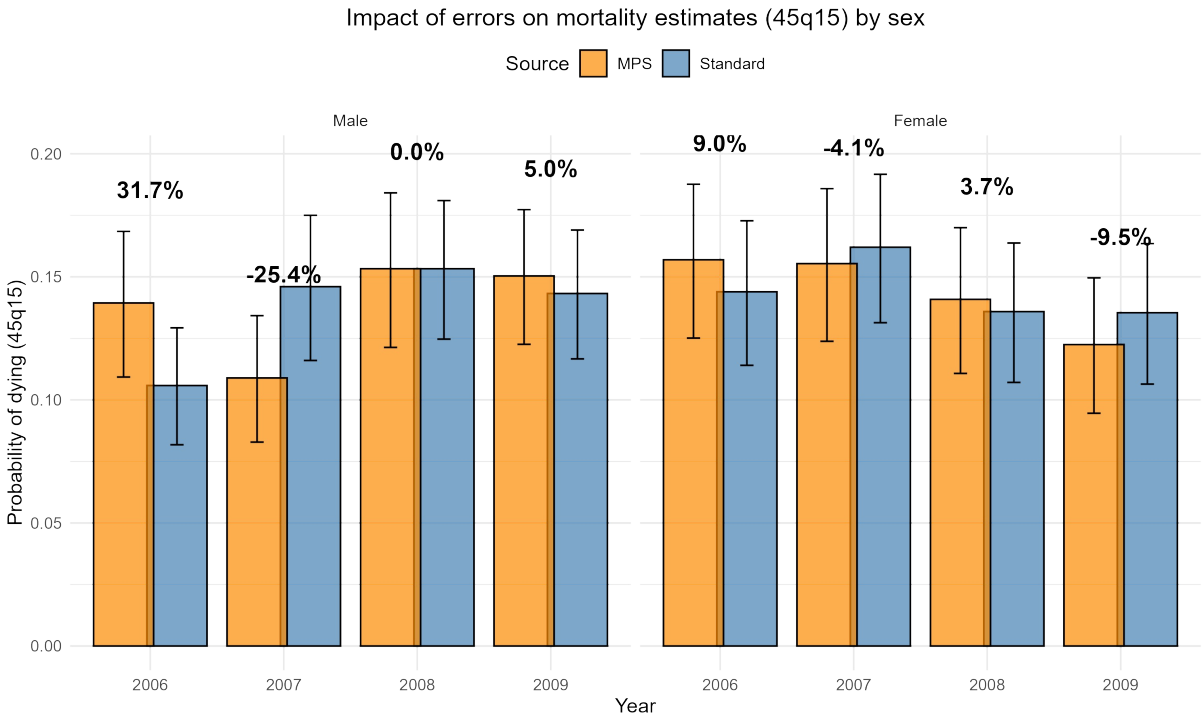


Figure 11.22: Comparison of adult mortality (35q15) levels obtained from raw data (Standard) with those estimated after imputing error patterns from MPS into the original dataset by sex and per year

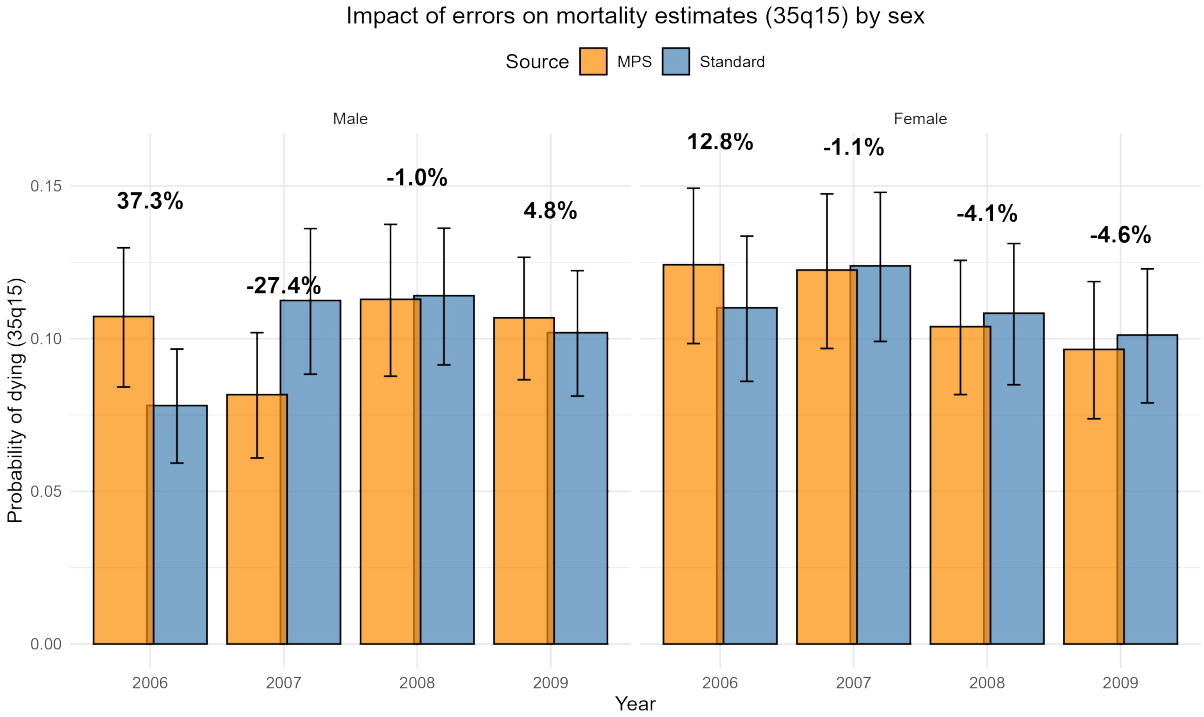


Figure 11.23: Comparison of old age mortality (20q60) levels obtained from raw data (Standard) with those estimated after imputing error patterns from MPS into the original dataset by sex and per year

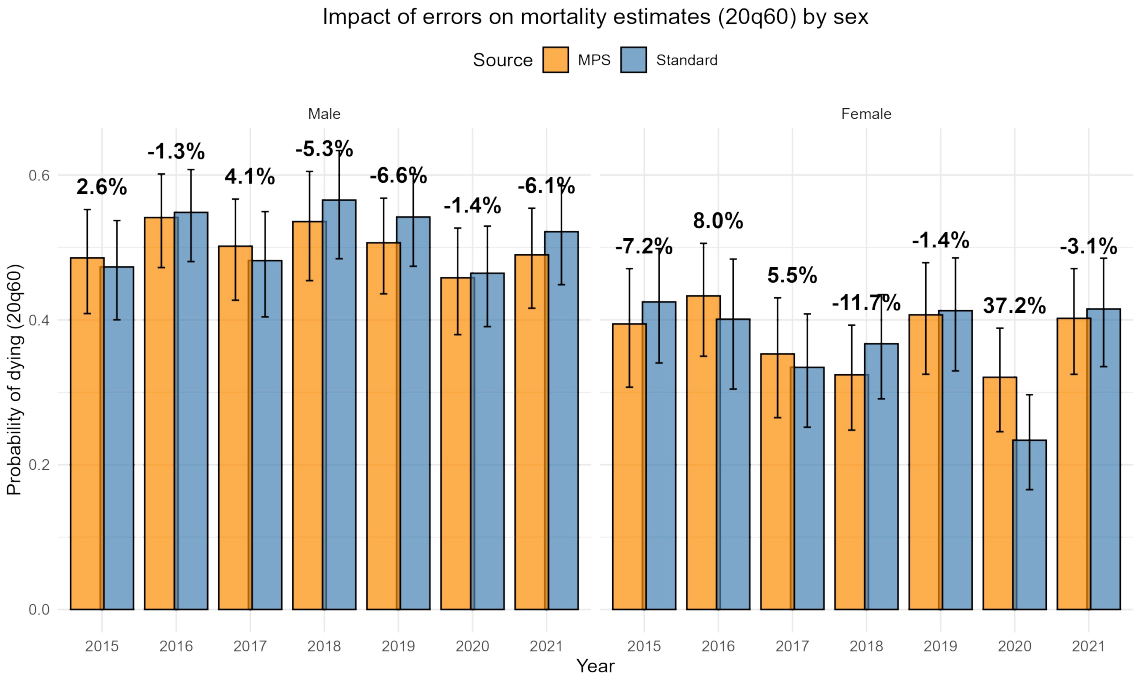


Figure 11.24: Comparison of old age mortality (30q50) levels obtained from raw data (Standard) with those estimated after imputing error patterns from MPS into the original dataset by sex and per year

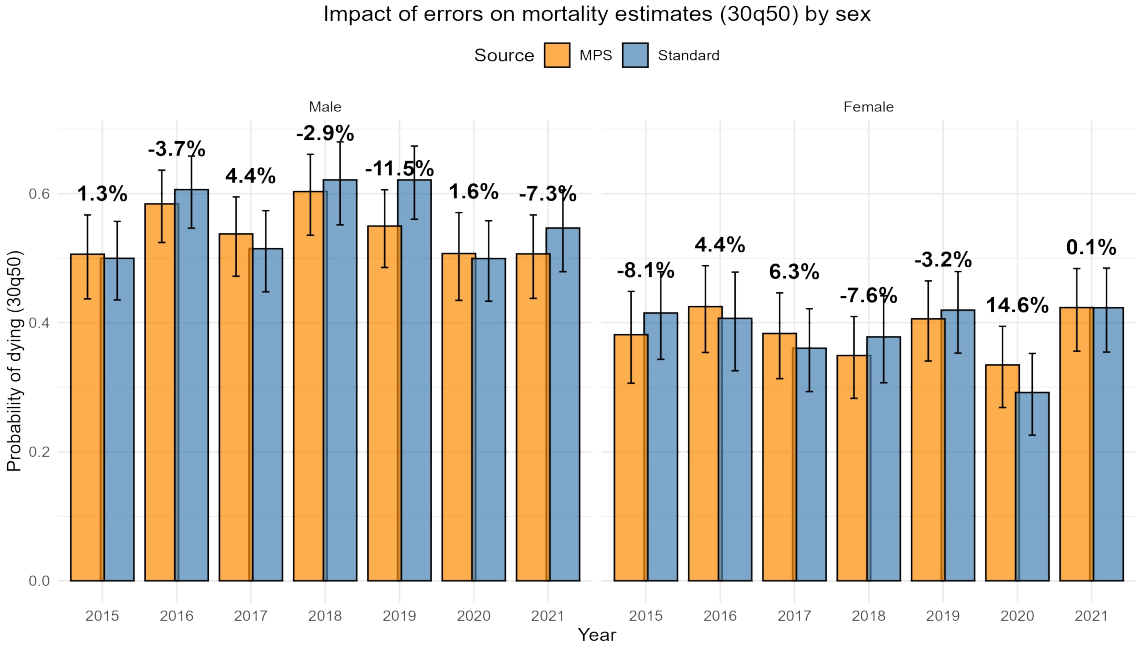


Figure 11.25: Age reporting discrepancies of respondents in the HDSS and MPS

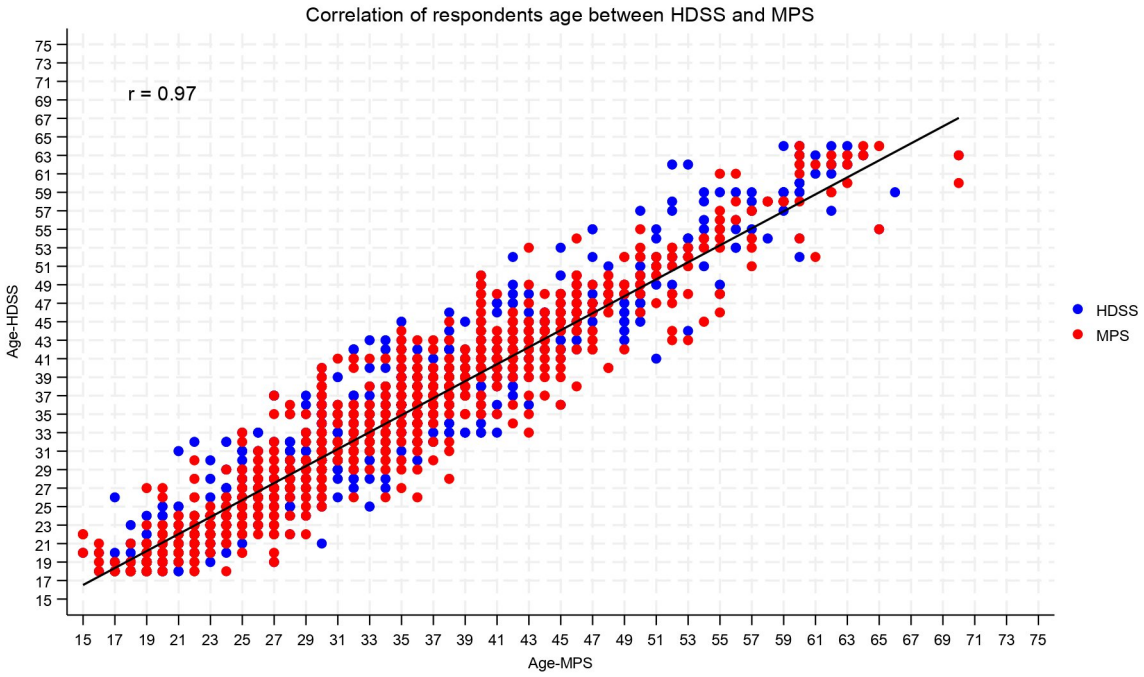


Figure 11.26: Age reporting discrepancies of respondents in the HDSS and MPS

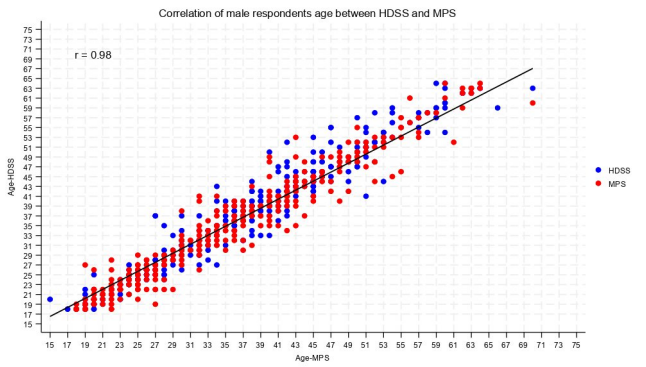
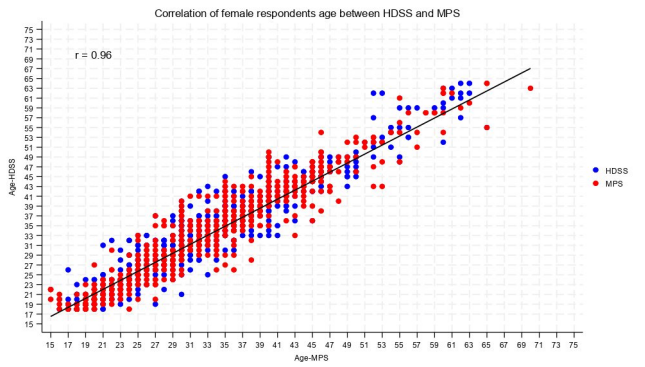
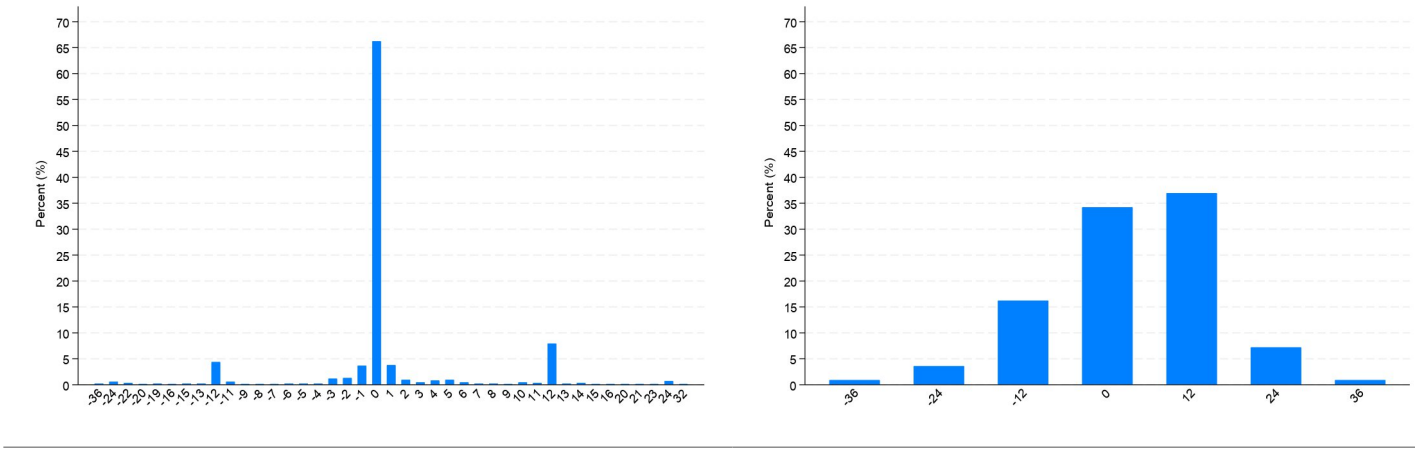
Male	**Female**
	

Figure 11.27: Displacement in months between survey data and HDSS data for date of birth and age at death

DoB	**DoD**



11.5 Appendix chapter 6

Tables

Table 11.9: Comparison of women's characteristics by conflict status in the MPS, DHS and the census

	Conflict						**Non conflict**					
	MPS			DHS		Census	MPS			DHS		Census
	Unwgt	Weighted		Weighted			Unwgt	Weighted		Weighted		
	%	%	95% CI	%	95% CI	%	%	%	95% CI	%	95% CI	%
Respondents age group												
15-29 yrs	48.3	54.4	[52.5-56.2]	54.4	[53.1-55.6]	59.5	49.6	61.8	[60.3-63.4]	56.0	[54.9-57.1]	58.5
30-49 yrs	51.7	45.6	[43.8-47.5]	45.6	[44.4-46.9]	40.5	50.4	38.2	[36.6-39.7]	44.0	[42.9-45.1]	41.5
Education												
None	55.5	70.7	[69.0-72.4]	69.4	[68.3-70.5]	77.4	41.9	64.1	[62.5-65.6]	50.0	[48.9-51.1]	59.2
Primary	14.5	19.8	[18.4-21.4]	12.0	[11.2-12.9]	17.1	16.3	25.1	[23.7-26.6]	15.9	[15.1-16.7]	27.5
Secondary & higher	30.0	9.5	[8.5-10.5]	18.6	[17.7-19.5]	5.4	41.8	10.8	[9.9-11.7]	34.1	[33.0-35.2]	13.3
Marital status												
Married	80.1	83.0	[81.6-84.4]	79.2	[78.2-80.2]	75.7	74.8	79.4	[78.1-80.7]	68.2	[67.1-69.2]	65.8
Widowed	2.6	3.4	[2.8-4.2]	1.3	[1.0-1.6]	1.8	2.6	3.3	[2.8-4.0]	1.8	[1.5-2.0]	2.1
Divorced/sep	0.9	0.9	[0.6-1.4]	1.1	[0.9-1.3]	0.8	1.0	0.8	[0.6-1.2]	2.3	[2.0-2.7]	1.0
Single	16.3	12.6	[11.5-13.9]	18.4	[17.4-19.4]	21.7	21.6	16.4	[15.2-17.7]	27.7	[26.7-28.8]	31.0
Place of residence												
Urban	30.6	19.7	[18.3-21.2]	16.6	[15.9-17.4]	14.3	48.9	38.4	[36.8-40.0]	44.2	[43.1-45.3]	42.9
Rural	69.4	80.3	[78.8-81.7]	83.4	[82.6-84.1]	85.7	51.1	61.6	[60.0-63.2]	55.8	[54.7-56.9]	57.1

Household size												
1-4 pers	15.6	15.5	[14.2-16.9]	14.6	[13.7-15.5]	28.8	25.3	28.1	[26.7-29.6]	21.3	[20.4-22.3]	30.8
5-8 pers	41.1	38.4	[36.6-40.2]	42.2	[41.0-43.5]	38.5	47.2	42.4	[40.8-44.1]	45.4	[44.3-46.5]	42.4
9 pers&+	43.3	46.2	[44.3-48.0]	43.2	[41.9-44.5]	32.7	27.4	29.4	[27.9-31.0]	33.3	[32.3-34.3]	26.8
HH has electricity												
Yes	63.5	44.6	[42.8-46.5]	12.8	[12.1-13.6]	42.2	82.3	65.3	[63.7-66.9]	32.4	[31.4-33.5]	67.4
No	36.5	55.4	[53.5-57.2]	87.2	[86.4-87.9]	57.8	17.7	34.7	[33.1-36.3]	67.6	[66.5-68.6]	32.6
Dwelling has durable roofing material												
Yes	84.3	77.0	[75.3-78.5]	82.7	[81.6-83.6]	72.5	95.0	90.9	[89.9-91.9]	90.2	[89.6-90.9]	88.4
No	15.7	23.0	[21.5-24.7]	17.3	[16.4-18.4]	27.5	5.0	9.1	[8.1-10.1]	9.8	[9.1-10.4]	11.6
Household has access to an improved source of drinking water												
Yes	80.5	73.9	[72.2-75.5]	27.5	[26.4-28.7]	59.5	90.4	82.8	[81.5-84.0]	34.3	[33.2-35.4]	76.1
No	19.5	26.1	[24.5-27.8]	72.5	[71.3-73.6]	40.5	9.6	17.2	[16.0-18.5]	65.7	[64.6-66.8]	23.9

Table 11.10: Comparison of women's characteristics according to regional context of their place of residence using RaMMPS data

	Conflict						**Non conflict**					
	RDD			EHCVM			RDD			EHCVM		
	Unw	Weighted		Unw	Weighted		Unw	Weighted		Unw	Weighted	
	%	%	95% CI	%	%	95% CI	%	%	95% CI	%	%	95% CI
Respondents age group												
15-29 yrs	48.8	54.0	[51.7-56.2]	47.2	46.0	[42.5-49.5]	49.0	57.0	[54.9-59.1]	51.0	54.5	[51.4-57.6]
30-49 yrs	51.2	46.0	[43.8-48.3]	52.8	54.0	[50.5-57.5]	51.0	43.0	[40.9-45.1]	49.0	45.5	[42.4-48.6]
Education												
None	55.5	68.0	[65.9-70.1]	55.6	68.1	[64.8-71.2]	39.7	67.4	[65.4-69.3]	48.0	54.5	[51.4-57.6]
Primary	14.3	12.3	[10.9-13.9]	14.9	12.8	[10.6-15.3]	15.9	12.5	[11.2-14.0]	17.3	16.3	[14.1-18.7]
Secondary	27.1	18.2	[16.5-20.0]	27.5	18.8	[16.3-21.7]	34.3	16.3	[14.8-17.8]	31.1	25.5	[22.9-28.2]
Higher	3.1	1.5	[1.0-2.1]	2.0	0.4	[0.1-0.9]	10.1	3.8	[3.2-4.6]	3.6	3.8	[2.7-5.2]
Marital status												
Married	81.1	83.2	[81.5-84.9]	78.1	83.7	[81.0-86.1]	74.6	79.4	[77.7-81.1]	75.4	79.6	[77.0-81.9]
Widowed	3.6	3.8	[3.0-4.7]	0.5	0.5	[0.2-1.2]	3.2	4.6	[3.8-5.6]	1.0	0.7	[0.4-1.5]
Divorced/sep	1.0	1.1	[0.7-1.7]	0.7	0.3	[0.1-1.0]	1.0	0.8	[0.5-1.2]	0.9	0.7	[0.3-1.3]

Single	14.3	11.9	[10.5-13.5]	20.6	15.5	[13.1-18.2]	21.3	15.2	[13.7-16.8]	22.6	19.0	[16.7-21.5]
Place of residence												
urban	20.5	10.0	[8.8-11.3]	51.8	16.0	[13.9-18.4]	45.8	33.9	[32.0-35.8]	57.1	37.4	[34.5-40.4]
rural	79.5	90.0	[88.7-91.2]	48.2	84.0	[81.6-86.1]	54.2	66.1	[64.2-68.0]	42.9	62.6	[59.6-65.5]
Household size												
1-4 members	19.3	23.0	[21.1-25.0]	8.0	8.9	[7.2-11.1]	29.2	39.5	[37.5-41.6]	15.1	23.7	[21.2-26.5]
5-8 members	41.1	39.5	[37.3-41.7]	41.0	36.2	[32.9-39.6]	47.2	38.9	[36.8-41.0]	47.3	43.2	[40.1-46.3]
9 members &+	39.6	37.6	[35.4-39.8]	51.1	54.9	[51.4-58.3]	23.6	21.6	[19.9-23.4]	37.7	33.1	[30.2-36.0]
HH has electricity												
Yes	17.7	11.0	[9.6-12.4]	24.0	9.9	[8.1-12.1]	35.9	22.4	[20.8-24.2]	32.4	19.6	[17.3-22.2]
No	82.3	89.0	[87.6-90.4]	76.0	90.1	[87.9-91.9]	64.1	77.6	[75.8-79.2]	67.6	80.4	[77.8-82.7]
Dwelling has durable roofing material												
Yes	85.8	77.7	[75.7-79.5]	81.3	70.7	[67.4-73.8]	95.0	87.0	[85.4-88.4]	94.9	90.6	[88.5-92.2]
No	14.2	22.3	[20.5-24.3]	18.7	29.3	[26.2-32.6]	5.0	13.0	[11.6-14.6]	5.1	9.4	[7.8-11.5]
Household has access to an improved source of drinking water												
Yes	80.0	67.8	[65.6-69.9]	81.6	70.5	[67.3-73.6]	91.1	75.6	[73.6-77.4]	88.6	78.1	[75.4-80.5]
No	20.0	32.2	[30.1-34.4]	18.4	29.5	[26.4-32.7]	8.9	24.4	[22.6-26.4]	11.4	21.9	[19.5-24.6]

11.6 Appendix chapter 7

Figure 11.28:Households by experience of food insecurity 2020-2024

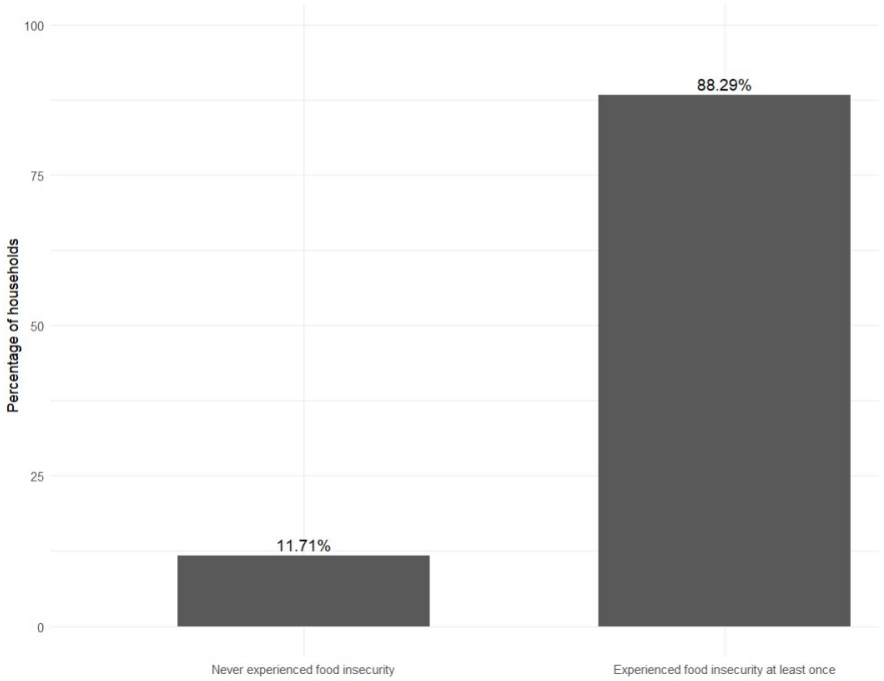


Figure 11.29: Households that transitioned into food insecurity within 2020 and 2024

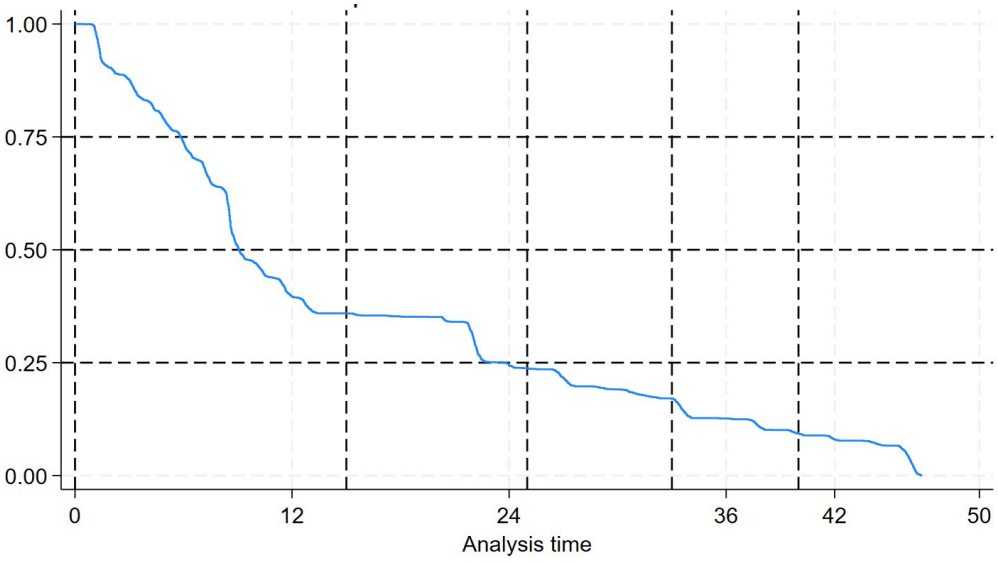


Figure 11.30 : Kaplan-Meier curve for time to food insecurity by households size

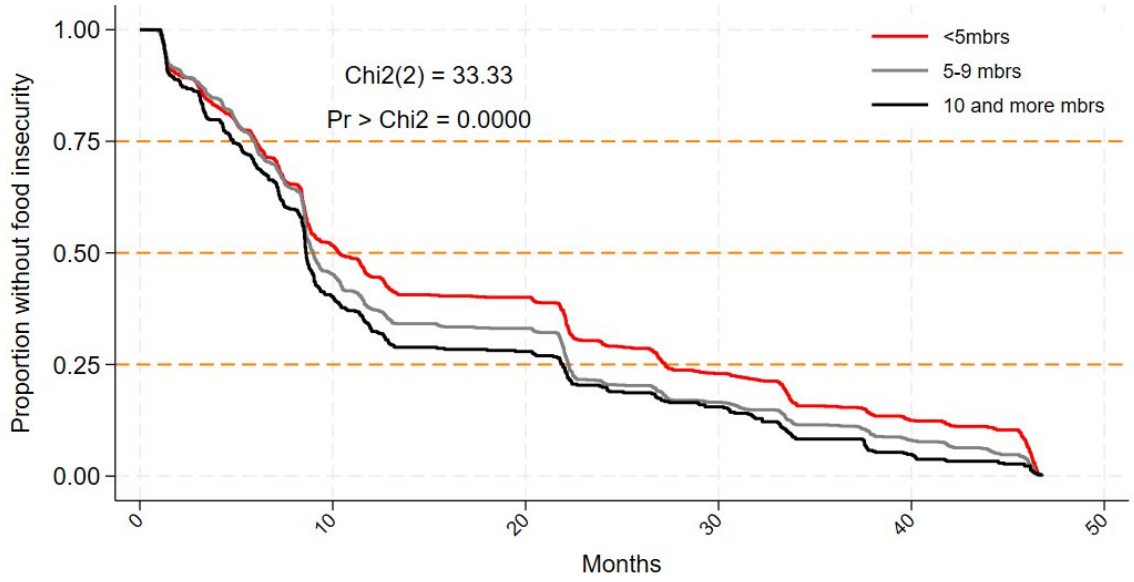


Figure 11.31: Kaplan-Meier curve for time to food insecurity by place of residence

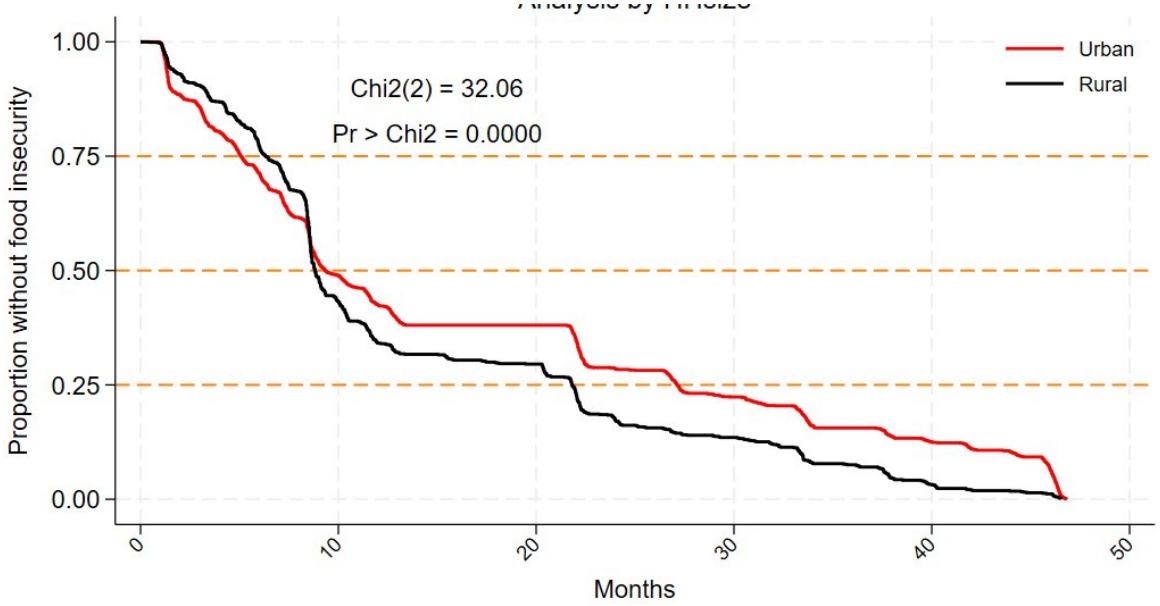


Figure 11.32: Kaplan-Meier curve for time to food insecurity by household's composition

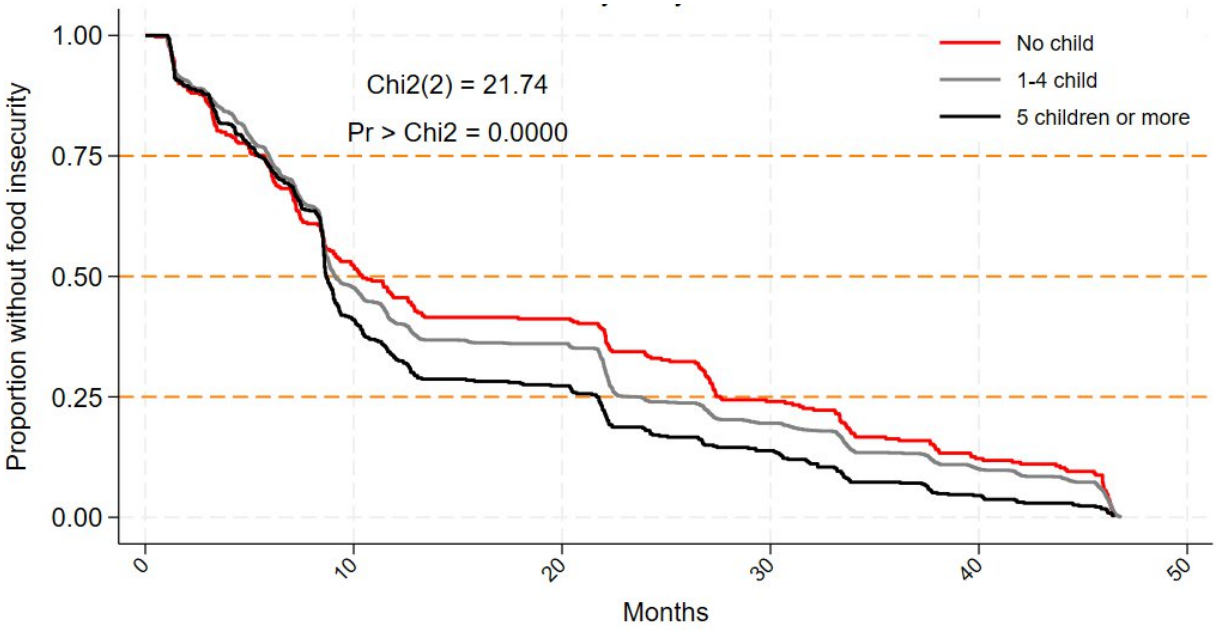
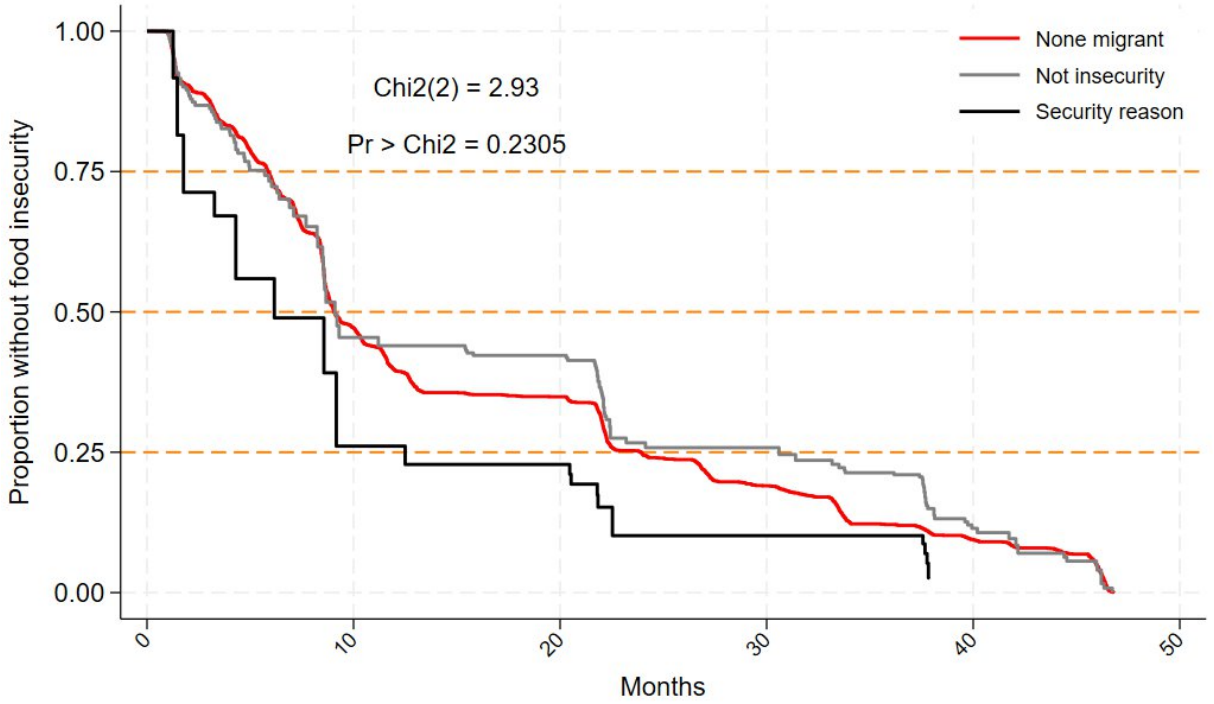


Figure 11.33: Kaplan-Meier curve for time to food insecurity by household's migration status



12 Lists of abbrevations

Abbreviation	Definition
ACLED	Armed Conflict Location and Event Data
AAPOR	American Association for Public Opinion Research
AOR	Adjusted Odds Ratio
CATI	Computer Assisted Telephone Interview
CI	Confidence Interval
COVID-19	Coronavirus Disease 2019
CRVS	Civil Registration and Vital Statistics
DHS	Demographic and Health Survey
EHCVM	Enquête Harmonisée sur les Conditions de Vie des Ménages
F2F	Face-to-Face (survey)
GBD	Global Burden of Disease
HDSS	Health and Demographic Surveillance System
HFPS	High-Frequency Phone Survey
HR	Hazard Ratio
IDP	Internally Displaced Person
INSD	National Institute of Statistics and Demography (Burkina Faso)
IRR	Incidence Rate Ratio
LMICs	Low- and Middle-Income Countries
LSMS	Living Standards Measurement Study
LSMS-HFPS	Living Standards Measurement Study – High-Frequency Phone Survey
MICS	Multiple Indicator Cluster Survey
MoH	Ministry of Health
MPS	Mobile Phone Survey
OR	Odds Ratio
RGPH	Recensement Général de Population et de l'Habitat
RDD	Random Digit Dialing
RaMMPS	Rapid Monitoring of Mobile MPS
SD	Standard Deviation
SSA	Sub-Saharan Africa
U5MR	Under-Five Mortality Rate
UN	United Nations
UN IGME	United Nations Inter-Agency Group for Child Mortality Estimation
UNICEF	United Nations Children's Fund
WHO	World Health Organization
WFP	World Food Programme

13 Summary (English)

Reliable mortality statistics are essential for monitoring population health, guiding public policies, and tracking progress toward international development goals. In LMICs, however, incomplete CRVS systems continue to limit the availability of timely and comprehensive mortality data. As a result, mortality levels and trends are primarily derived from population censuses and large-scale F2F surveys, which are costly, infrequent, and increasingly difficult to implement in contexts affected by insecurity, epidemics, or logistical constraints.

In recent years, the rapid expansion of mobile phone coverage has created new opportunities for data collection through MPS. These surveys offer advantages in terms of speed, cost, and operational flexibility, particularly in crisis settings. Nevertheless, concerns remain regarding their representativeness and data quality, especially for the measurement of mortality. This doctoral thesis examines the implications of using MPS for estimating mortality levels and trends in LMICs, using Burkina Faso as a case study.

Drawing on a comparative analytical framework, the thesis combines data from population censuses, DHS, HDSS, HFPS, and mortality-focused MPS implemented under the RaMMPS programme. The analysis investigates how survey mode affects mortality estimates through four main mechanisms: (1) selection bias related to mobile phone ownership and survey participation, (2) differences in estimated mortality levels and trends, (3) reporting errors including age misreporting, date misreporting, and death omission and (4) the capacity of MPS to capture excess child mortality and its household-level determinants in conflict-affected areas.

The results show that mobile phone ownership and reachability are associated with socio-demographic characteristics linked to mortality, leading to underrepresentation of rural, poorer, less-educated, and older populations in MPS samples. As a consequence, mortality estimates derived from MPS tend to be biased downward, particularly for adult and older-age mortality. While post-stratification weighting improves alignment with population benchmarks, it does not fully eliminate selection bias.

Comparisons of mortality levels indicate that child mortality estimates derived from MPS can be consistent with F2F surveys and UN model-based estimates when indirect methods are applied. In contrast, adult and older-age mortality estimates derived from MPS are lower than reference values. Validation analyses using HDSS data reveal that age and date misreporting in MPS are modest and comparable to those observed in F2F surveys. Death omission, however, emerges as the primary driver of mortality underestimation, particularly for adult mortality indicators.

Importantly, the thesis demonstrates that MPS offer an advantage in conflict-affected settings. In regions partially or entirely excluded from F2F surveys due to insecurity, MPS capture excess child mortality that remains invisible in conventional survey estimates. Further analyses show that this excess mortality is driven mainly by indirect household-level mechanisms, notably food insecurity and the hosting of internally displaced persons, rather than by direct exposure to violence.

In sum, this thesis concludes that MPS are neither a substitute for CRVS systems nor for traditional F2F surveys, but a complementary data collection tool. When carefully designed and combined with appropriate analytical adjustments, MPS can play a critical role in mortality monitoring, particularly in fragile contexts where conventional data collection systems fail to reach the most vulnerable populations.

14 Résumé (Français)

La disponibilité de statistiques fiables sur la mortalité est essentielle pour le suivi de l'état de santé des populations, l'élaboration des politiques publiques et le pilotage des objectifs internationaux de développement. Dans les pays à revenu faible et intermédiaire, cependant, l'incomplétude des systèmes d'état civil limite la production régulière et exhaustive de données sur les décès. En conséquence, les niveaux et tendances de la mortalité reposent principalement sur les recensements de population et les grandes enquêtes ménages en face-à-face, qui sont coûteux, peu fréquents et de plus en plus difficiles à mettre en œuvre dans les contextes marqués par l'insécurité, les crises sanitaires ou les contraintes logistiques.

Dans ce contexte, l'expansion rapide de la téléphonie mobile a ouvert de nouvelles perspectives pour la collecte de données à travers les enquêtes téléphoniques. Ces enquêtes présentent des avantages en termes de rapidité, de coûts et de flexibilité opérationnelle, en particulier dans les situations de crise. Toutefois, leur capacité à produire des estimations fiables de la mortalité reste débattue, en raison de problèmes potentiels de représentativité et de qualité des données.

Cette thèse doctorale analyse les implications de l'utilisation des enquêtes par téléphone portable pour l'estimation des niveaux et des tendances de la mortalité dans les pays à revenu faible moyen et intermédiaire, en prenant le Burkina Faso comme étude de cas. Elle s'appuie sur un cadre analytique comparatif combinant des données issues des recensements de population, des Enquêtes Démographiques et de Santé (EDS), des systèmes de surveillance démographique et sanitaire (HDSS), des enquêtes téléphoniques à haute fréquence (HFPS) et des enquêtes téléphoniques spécifiques à la mortalité mises en œuvre dans le cadre du programme RaMMPS.

L'analyse examine les effets du mode de collecte sur les estimations de mortalité à travers quatre mécanismes principaux : (1) les biais de sélection liés à la possession et à l'accessibilité du téléphone portable, (2) les différences de niveaux et de tendances de mortalité estimés selon le mode d'enquête, (3) les erreurs de déclaration, notamment les erreurs d'âge, de datation et les omissions de décès, et (4) la capacité des enquêtes téléphoniques à capter la surmortalité infantile et ses déterminants au niveau des ménages dans les zones affectées par les conflits.

Les résultats montrent que la possession et l'accessibilité du téléphone portable sont associées à des caractéristiques sociodémographiques liées au risque de mortalité, ce qui conduit à une sous-représentation des populations rurales, pauvres, peu instruites et âgées dans les échantillons d'enquêtes téléphoniques. En conséquence, les estimations de mortalité issues de ces enquêtes tendent à sous-estimer les niveaux réels de mortalité, en particulier pour la

mortalité adulte et aux âges élevés. Les ajustements par pondération améliorent la comparabilité avec les données de référence, sans toutefois éliminer complètement les biais de sélection.

Les comparaisons de niveaux de mortalité indiquent que les estimations de la mortalité des enfants obtenues à partir des enquêtes téléphoniques peuvent être globalement cohérentes avec celles issues des enquêtes en face-à-face et des modèles des Nations Unies, lorsque des méthodes indirectes sont utilisées. En revanche, les estimations de la mortalité adulte et aux âges avancés sont nettement plus faibles. Les analyses de validation fondées sur les données HDSS montrent que les erreurs d'âge et de datation sont généralement limitées et comparables à celles observées dans les enquêtes en face-à-face. En revanche, l'omission des décès apparaît comme la principale source de sous-estimation de la mortalité, en particulier pour les indicateurs de mortalité adulte.

Enfin, la thèse met en évidence la valeur ajoutée spécifique des enquêtes téléphoniques dans les contextes d'insécurité. Dans les régions partiellement ou totalement exclues des enquêtes en face-à-face, les enquêtes téléphoniques révèlent une surmortalité infantile qui reste invisible dans les estimations conventionnelles. Cette surmortalité est principalement liée à des mécanismes indirects au niveau des ménages, notamment l'insécurité alimentaire et l'accueil de personnes déplacées internes, plutôt qu'à l'exposition directe à la violence.

En conclusion, cette thèse montre que les enquêtes téléphoniques ne constituent ni un substitut aux systèmes d'état civil ni un remplacement des enquêtes en face-à-face, mais un outil complémentaire. Lorsqu'elles sont soigneusement conçues et associées à des ajustements analytiques appropriés, elles peuvent jouer un rôle central dans le suivi de la mortalité, en particulier dans les contextes fragiles où les systèmes traditionnels de collecte de données peinent à atteindre les populations les plus vulnérables.

15 Note related to the use of IA

The following generative artificial intelligence tools were used during the conception and writing of this thesis, in accordance with the conclusions and recommendations of the working group of the Université catholique de Louvain dated 4 July 2024 (UCLouvain, 2024):

- **DeepL** was used to translate selected paragraphs from some of the referenced articles in order to facilitate their comprehension and use in this work.
- **ChatGPT** was used to propose alternative formulations for a limited number of paragraphs; these suggestions were subsequently revised and adapted to the style and academic standards of this thesis.
- **ChatGPT** was also used to assist in structuring ideas which, after verification and documentation, were reworked before being incorporated into the manuscript.
- **EditGPT** was used for text reformulation and linguistic improvement of drafted sections.

I remain fully responsible for the content, interpretations, and conclusions presented in this thesis.