Enhancing loco-regional adaptive governance for integrated chronic care through agent based modelling (ABM)

Authors

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Theoretical lenses

Using the lenses of complex adaptive system to study the health systems integration process

We used a complex adaptive system's lens to study the health systems integration process.

Complex adaptive systems (CAS) are made of "agents" that interact, adapt, learn from experience, self-organise, and behave unpredictably. CAS are open systems. As a consequence, they are influenced by the environment and influence it.

Complex adaptive systems features amongst other the following behavior: path dependency; emergent "order", ttransition phases, causal loops, scale-free networks

Generally, CAS seek equilibrium.

justification

Building competencies to govern health and social care at loco-regional level by taking into account tacit knowledge and cognitive heuristics

Many countries (including Belgium) are attempting to Move from existing segmented care to integrated care.

It is complex in the sense that the type and timeframe of changes are not always predictable.

It is disruptive in the sense that the process of change modifies but also is influenced by the nature of interactions between agents.

Building competences to govern the necessary changes towards integrated care should consider this, particularly at loco-regional level (for networks covering between 100 000 and 500 000 people). Acknowledging the tacit knowledge and cognitive heuristic of the stakeholders is key for that learning process.

Methods

Simulating the behavior of a loco-regional system with Netlogo© and sharing it with MPH students to progressivelly improve it

We applied components of ABM to assess how health systems adapts and move towards integrated care. ABM allows simulating the different behaviors of CAS.

The agent-based model was developed through a process where storytelling, concept maps, group voting process (with Wooclap ©) , object-oriented unified modelling language (UML) diagrams and computer simulation (using Netlogo ©) were iteratively used. With different groups of MPH d-students.

Story telling and UML was initially done with students following a course on "systemic approach in public health".

Based on that and on exchanges with the other authors, the main author developed progressively an ABM in Netlogo.

This was shown to student following an optional module on coordination and networks organization to improve its calibration

It was finally exchanged with 1st year MPH students to identify likely scenarios of changes and discuss it.

Aim

Making a « showcase » of ABM that foster sharing of tacit knowledge between stakeholders

The aim of this paper is to make a "showcase" of an agent-based model (ABM) that build on and make explicit tacit knowledge and cognitive heuristics between stakeholder to enhance loco-regional adaptive governance for improving integrated chronic care.

Results

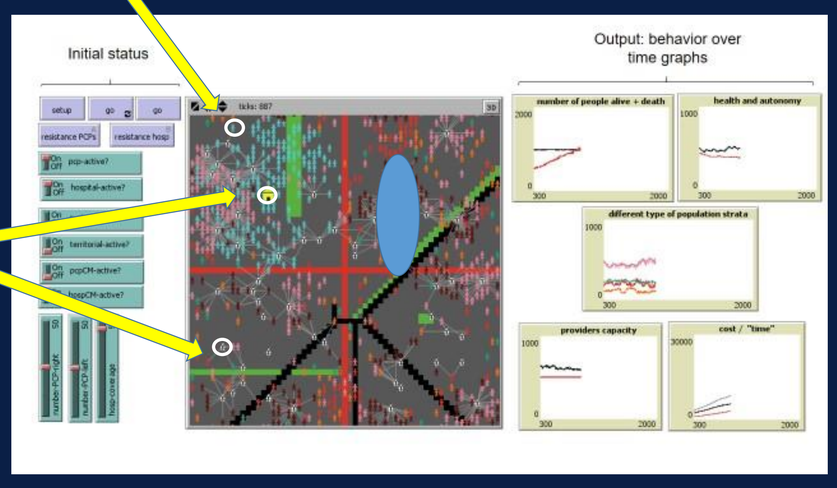
System components

People - population

- ✓ **Attributes:**
  - ❑ Color → health status (4 strata from healthier to sickest)
  - ❑ Autonomy
  - ❑ Health and autonomy evolve over time spontaneously (with some acute events)
- ✓ **Behavior:**
  - ❑ The use health services
  - → Depend from
    - → Their health (too high, no need)
    - → The geographical accessibiliy
    - → Autonomy (if too low, do not use spontaneously services)
  - → improve their health status
  - → Change their color
  - → Lead to ties with specific providers
  - ❑ If health status to low
  - → die and then new birth of person

Health care providers

- ✓ Attributes:
  - ❑ Hospitals (yellow house) or primary care providers (PCPs) (white person)
  - ❑ Capacities to care (motivation and competencies) not known (random value)
- ✓ Behavior:
  - ❑ Providing care
  - → Depend from their motivation, which depend from:
    - → their workload
    - → competition or collaborations
    - → imposed changes
  - → Increases cost
  - ❑ Get « bankrupted » (stop working)
  - → If motivation too low



Organisational features

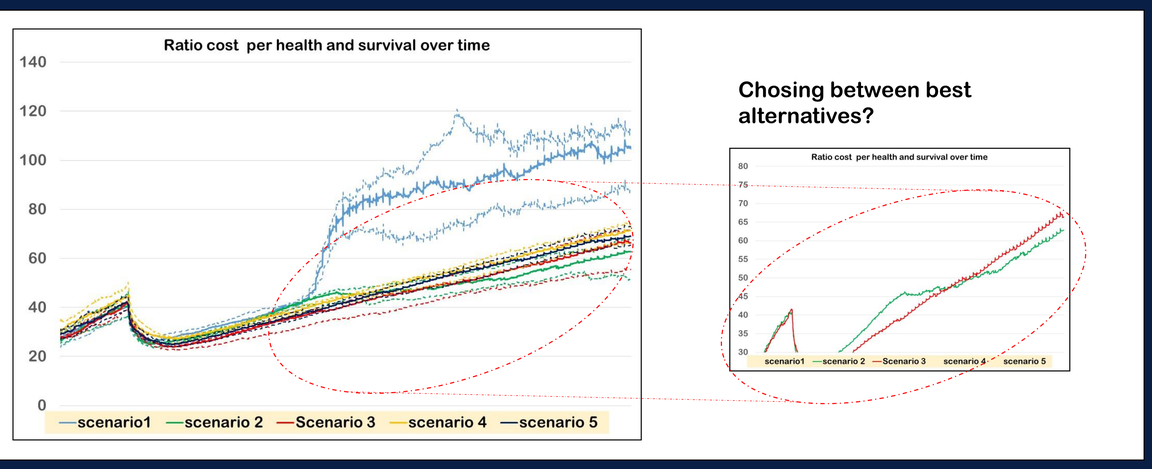
- ✓ **Market: All PCPs and hospitals can settle where they want**
  - ❑ Number of PCP need to decided (simulated for 100 PCPs)
  - ❑ Number of hospitals : 9
  - ❑ People are free to choose their provider if it is close enough to them
- ✓ **Territorial organization:**
  - ❑ 4 territories
  - ❑ 1 hospital per territory
  - ❑ Equal repartition of PCP between the 4 PCP (can install where they wand within a territory)
  - ❑ People are free to choose their provider if it is close enough to them
- ✓ **"system with a gatekeeper role":**
  - ❑ Patient must enter in the system through a PCP, except there is no access to it
- ✓ **Case Management:**
  - ❑ The CM ensure that people with low autonomy have better access to healthcare services (PCPs and hospitals)

Scenarios chosen by students

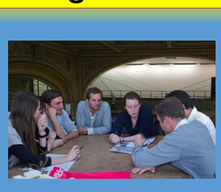
	Initial setup	After 500 steps	After 1000 steps
Scenario 1	market	Gatekeeper + CM hospit	Market + CM PCP
Scenario 2	market	Gatekeeper + CM hospit	Gatekeeper + CM hospit
Scenario 3	Territorialisation	Gatekeeper	Gatekeeper
Scenario 4	territorialisation	Gatekeeper	Getakeeper + CM hospit
Scenario 5	Territorialisation	Getakeeper + CM hospit	Getakeeper + CM hospit

System evolution

Behavior of the system over time (centered on ratio « cost » over « health » simulated)



Sharing tacit knowledge and elicit cognitive heuristics



Discussion

Moving away from intervention evaluation towards system monitoring: promoting the development of methodology combining ABM with participative approaches to make better use of tacit knowledge

Conclusion

This is the initial step of an exercise to use ABM as a mean to take advantage and enhance tacit knowledge to strengthen governance for integrated care. It is expected that it will be used to foster dialogue between loco-regional projects to integrate health and social care for chronic diseases in Belgium (a new program initiated by federal authorities).

Future research should continue the development of methodology combining ABM with participative approaches to make better use of tacit knowledge in strengthening loco-regional governance for the development of integrated care.