

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

Macq, Jean ; Deconinck, Hedwig ; Van Durme, Thérèse ; Lambert, Anne-Sophie ; Karam, Marlène ; Cès, Sophie

ABSTRACT

1) Introduction Moving from existing segmented care to integrated care is complex and disruptive. It is complex in the sense that the type of changes and the timeframe of these changes are not completely predictable. It is disruptive in the sense that the process of change modifies but also is influenced by the nature of interactions at the individual and organisational level. As a consequence, building competences to govern the necessary changes towards integrated care should include capacity to adapt to unexpected situations. Therefore, the tacit knowledge of the stakeholders ("knowledge-in-practice developed from direct experience; subconsciously understood and applied"¹) should be at the centre. However, the usual research and training practices using such a knowledge (i.e. action research or case studies), are highly time-consuming. New approaches are therefore needed to elicit tacit knowledge. One of them is agent based modelling (ABM)² through computer simulation. The aim of this paper is to make a "showcase" of an agent-based model that uses the emergence of tacit knowledge and enhances loco-regional adaptive governance for improving integrated chronic care. 2) Theory/Methods We used a complex adaptive system's lens to study the health systems integration process. We applied key components of ABM to assess how health systems adapts through the dynamics of heterogeneous and interconnected agents (agents are characterised by their level of autonomy, heterogeneity, and interactions with other agents). The agent-based model was developed through a process wh...

CITE THIS VERSION

Macq, Jean ; Deconinck, Hedwig ; Van Durme, Thérèse ; Lambert, Anne-Sophie ; Karam, Marlène ; et. al. *Enhancing loco-regional adaptive governance for integrated chronic care through agent based modelling (ABM)* .17th International Conference on Integrated Care (Dublin, Ireland, du 08/05/2017 au 10/05/2017). <http://hdl.handle.net/2078.1/184684>

Le dépôt institutionnel DIAL est destiné au dépôt et à la diffusion de documents scientifiques émanant des membres de l'UCLouvain. Toute utilisation de ce document à des fins lucratives ou commerciales est strictement interdite. L'utilisateur s'engage à respecter les droits d'auteur liés à ce document, principalement le droit à l'intégrité de l'œuvre et le droit à la paternité. La politique complète de copyright est disponible sur la page [Copyright policy](#)

DIAL is an institutional repository for the deposit and dissemination of scientific documents from UCLouvain members. Usage of this document for profit or commercial purposes is strictly prohibited. User agrees to respect copyright about this document, mainly text integrity and source mention. Full content of copyright policy is available at [Copyright policy](#)

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

Authors

J. Macq, H. Deconinck, Th. Van Durme, M. Karam, A-S. Lambert, S. Ces
Contact: Jean.macq@uclouvain.be UCL-IRSS

Theoretical lenses

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

Justification

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

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.

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", transition phases, causal loops, scale-free networks

Generally, CAS seek equilibrium.

Simulating the behavior of a loco-regional system with Netlogo© and sharing it with MPH students to progressively 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 Woodclap ©), 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.

Methods

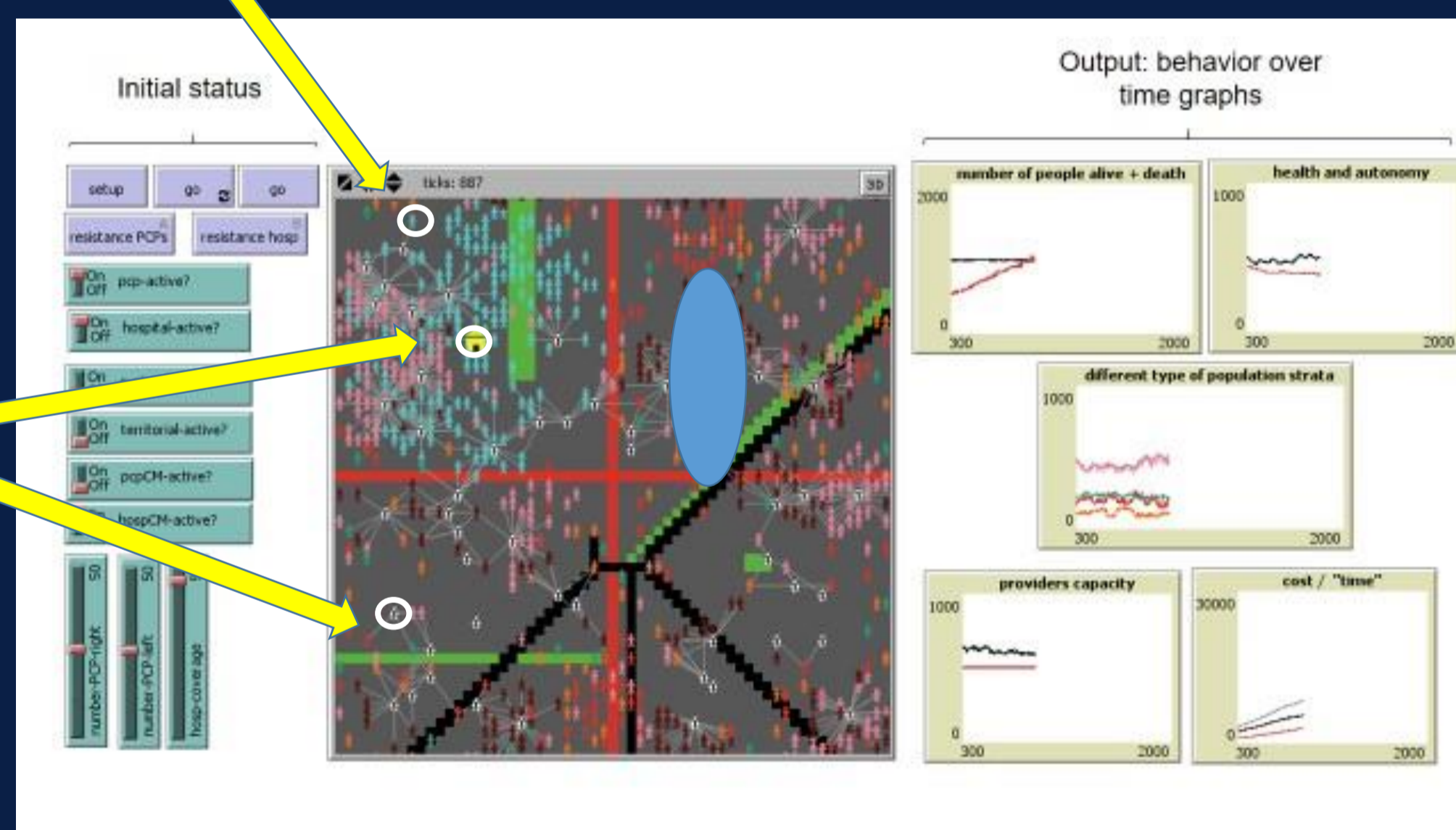
Results

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 accessibility
 - 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)

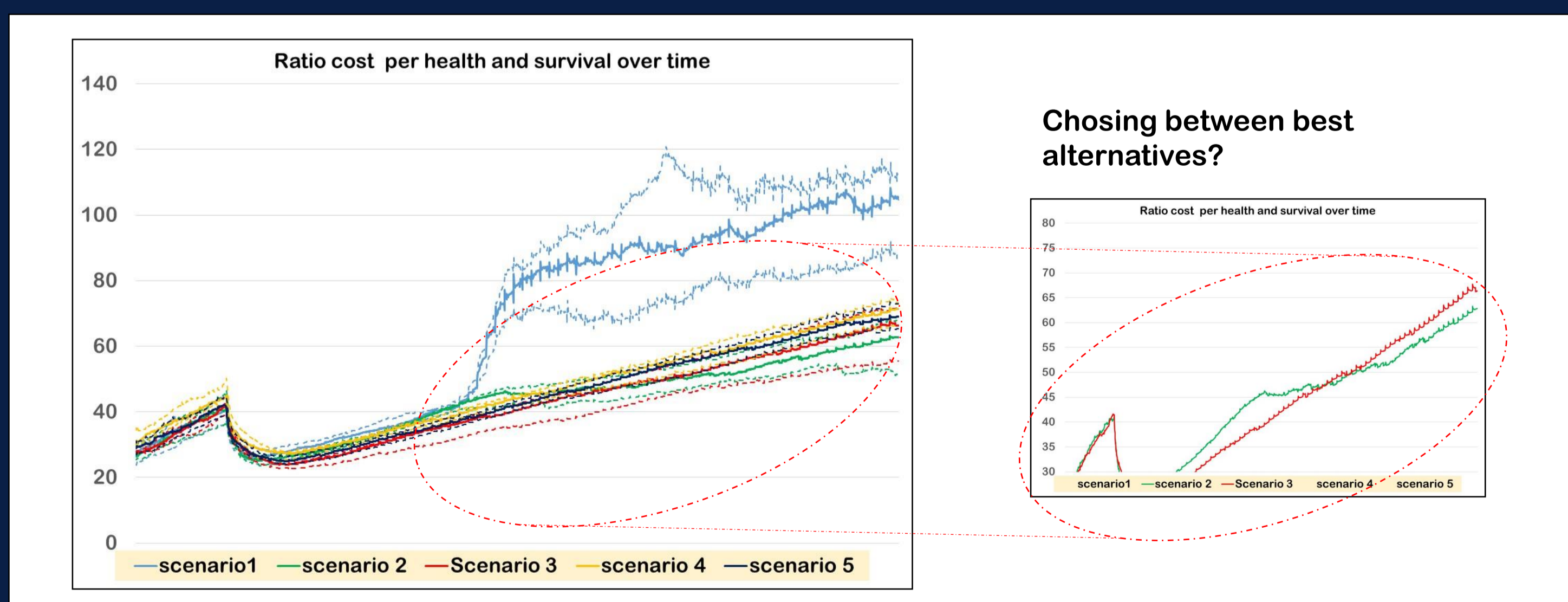
Scenarios chosen by students

	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 components

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.