Systems Thinking for Health Systems Research: Using System Dynamics for Policy Evaluation

Rachel Cassidy

26th April 2023
3pm CET
SYSTAC Europe Forum seminar series

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Overview

- Rachel Cassidy
- Conceptual overview
- Considerations for study design
- Application example
- Questions and wrap-up

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Rachel Cassidy

- Scientific Collaborator – Geneva Centre of Humanitarian Studies (2022-)
  - SENSELET Project:

  Sustainably improving healthcare supply chain management in Ethiopia by supporting and building local and humanitarian response capacity.
  Project Link: https://humanitarianstudies.ch/research-0/senselet-project/
  - PULSE Project:

  Real Time Evaluation of Community Engagement for Vaccine Delivery in Humanitarian Settings

- Research Fellow / Honorary Research Fellow – London School of Hygiene and Tropical Medicine (2018-)
  - COSMIC Project:

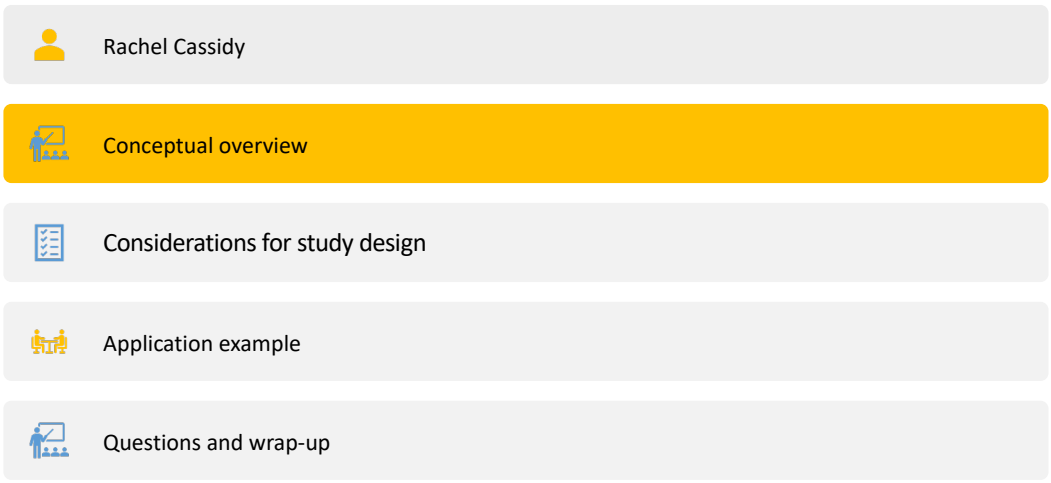
  Using systems thinking approaches (causal loop diagrams, system dynamics modelling) to further understanding on pathways to impact for results-based financing programmes and design recommendations for future implementation
  Project Link: https://www.lshtm.ac.uk/research/centres-projects-groups/cosmic
  - Staff PhD (completed in March 2023):

  Using systems thinking to optimise health system interventions for improved maternal and child health in low-resource settings

- Co-ordination team member SYSTAC EURO Hub:

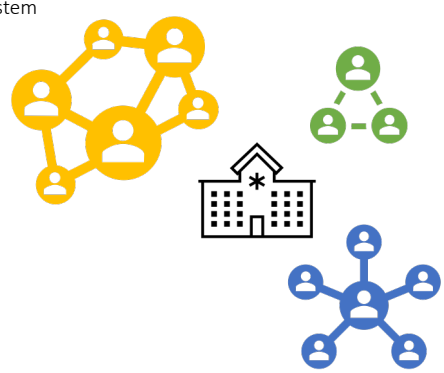
  WHO Alliance for Health Policy and Systems Research – part of GLOBAL SYSTAC network
  Links: https://systac-europe.org and https://hive.ahpsr.org

Overview



Systems thinking for health system research

- Health system behaviour is difficult to predict or manage, consisting of emergent behaviour, feedback, interactions….health and policy research need a set of tools that derive from **systems thinking**
- Viewing problems and the impact of interventions as part of a wider, dynamic system
  - Pattern of behaviour over time
  - Causality and how a behaviour is generated
  - On going process with feedback
- A variety of methods depending on research need…



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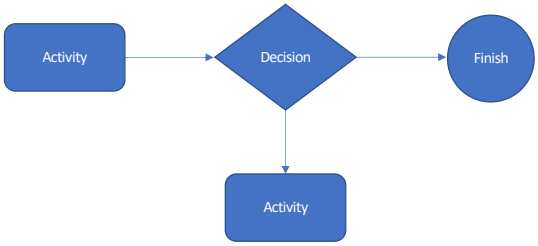

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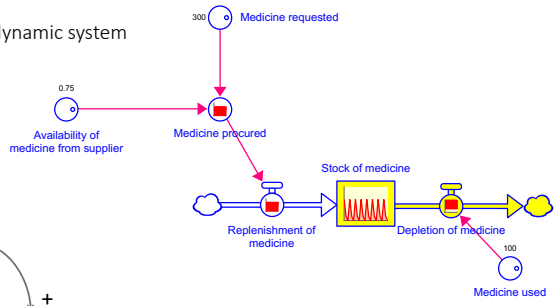

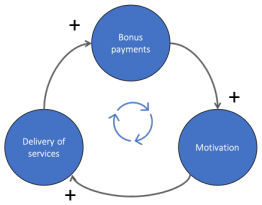

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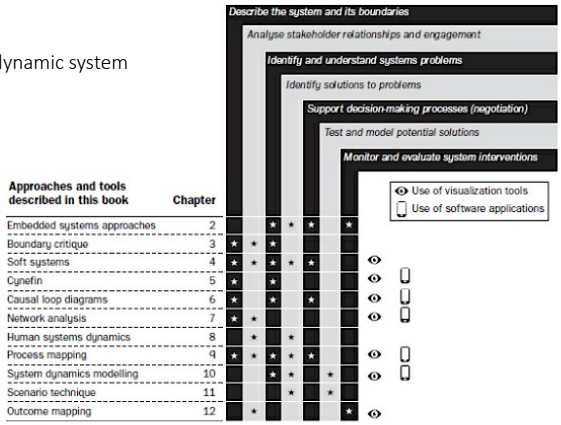

Linking research need to research tool/approach.
Source: de Savigny D, Blanchet K, Adam T. 2017. Conclusion: mapping methods to research challenges. In: de Savigny D, Blanchet K, Adam T. Applied Systems Thinking for Health Systems Research : A Methodological Handbook. McGraw-Hill Education, 226–7.

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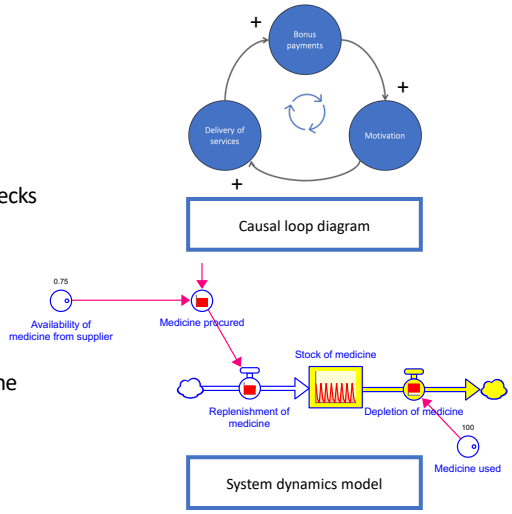
Why use CLDs and SDMs in Health Systems Research?

- Capture macro-level system behaviour
- **Causal loop diagrams** (CLDs)
  - Visualise complexity and system structure related to a problem
  - Gain holistic perspective of system to investigate delays and bottlenecks in health facility processes
  - Can be developed using a variety of data sources
- **System dynamics models** (SDMs)
  - Exploring behaviour over time
  - Monitoring interconnected processes between sub-systems over time
  - To determine impact of interventions before real world application



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- **Considerations for study design**
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Considerations for study design for health systems research

Box 1. Four guiding steps that underpin the design and conduct of CLDs for health systems research

(1) What is the scope of this research?
To define the phenomena or behaviour that you are trying to unpack, there are three key elements to consider:
- Time frame of interest
- Boundary of issue
- Level of system aggregation

(2) What data do I need to collect or source?
To further understanding on what is driving phenomena/behaviour, we can source and analyse:
- Primary data (e.g. key informant interviews and group model building)
- Secondary data (e.g. programme evaluation data, published literature, health surveys or reports, policy documents and systematic or realist review).
- Primary and secondary data

(3) What is my chosen method for CLD development?
Method for analysing and extracting data for CLD development:
- Ex post development (e.g. thematic analysis and purposive text analysis)
- Real-time development (e.g. group model building)

(4) How will I validate the CLD?
Method for confirming the CLD is still grounded in the experience of those with expert knowledge of the phenomena/behaviour:
- Stakeholder dialogue, including group model building activities
- Comparison to primary/secondary data sources

Health Policy and Planning, **00**, 2022, 1–9
DOI: https://doi.org/10.1093/heapol/czac064
Advance access publication date: 3 August 2022
How to Do (Or Not to Do)

How to do (or not to do)…using causal loop diagrams for health system research in low and middle-income settings

Rachel Cassidy[1,*], Josephine Borghi[1], Agnes Rwashana Semwanga[2], Peter Binyaruka[3], Neha S Singh[1], and Karl Blanchet[4]

When can I use CLDs?

- Ex-ante, to inform the design of a health systems intervention or policy, or to develop a theory of change to guide its evaluation.
- Retrospectively to explore how policy implementation changes over time, or to explore why health policies have succeeded or failed.
- Used in conjunction with existing health system frameworks, for example by identifying interconnections and/or dynamic behaviour between the WHO health system building blocks.
- Support the synthesis of evidence regarding a health systems intervention, used to present the results of realist and systematic reviews
- Not just programme evaluation – how health systems respond to shocks, identifying factors that lead to a resilient system, drivers for sub-optimal health outcomes…

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(1) What is the scope of this research?

To consider

- Time frame of interest – of the policy? What length is appropriate to capture drivers for system behaviour and trends?
- Boundary - where do we draw the line for what should be included/excluded?
- Aggregation – level of detail needed to understand patterns of behaviour? Daily, weekly, monthly occurrence?

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(2) What data do I need to collect or source?

Examples

- Primary data
  Sharma et al. (2020), Noubani et al. (2020)
- Secondary data
  Cassidy et al. (2021), Nigenda et al. (2015), Namatovu and Semwanga (2020)

To consider

- Key informant interviews vs. group model building? *Valcourt et al. (2020)*
- Stakeholder engagement
- Use of secondary data for CLD development

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Examples

- Ex post
  Kwamie et al. (2014), Lembani et al. (2018)
- Real-time
  Noubani et a. (2020), Trani et al. (2016)

To consider

- Inductive vs. deductive coding
- Scripts available for group model building
- Combination of methods

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OXFORD

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(4) How will I validate the CLD?

To consider

- Why is it important?
- For stakeholder dialogue – piloting tools and adapting

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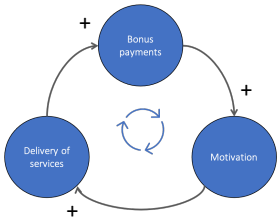
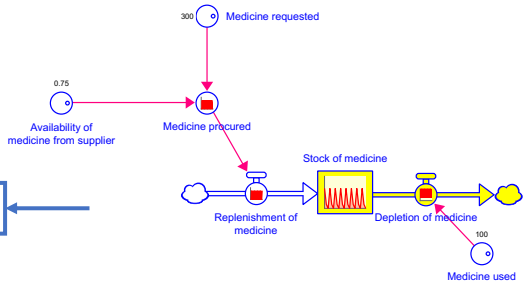
Application example: *COSMIC project*

How are CLDs and SDMs being used in this project?

- We wanted to gain a holistic perspective of the health system to identify how factors have hindered or facilitated the implementation of payment for performance programmes (P4P) over time.
- Examine how variations in the implementation of P4P could result in different outcomes.
- Policy relevant recommendations to optimise design of P4P for improved maternal and child outcomes.
- Testing generalisability of developed models to another setting (Zambia).
- Guidance on how to use these systems thinking approaches in LMIC health system research.





Project Link: https://www.lshtm.ac.uk/research/centres-projects-groups/cosmic

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Application example: *COSMIC project*

Data

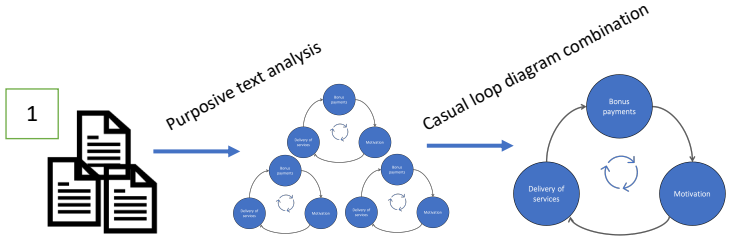
- Primary data
- Secondary data

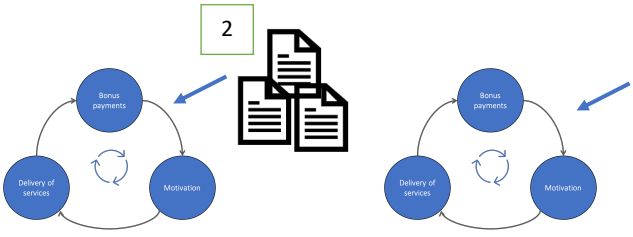
Method for development

- Purposive text analysis
- CLD combination

Method for validation

- Comparison to data source
- Discussion with stakeholders





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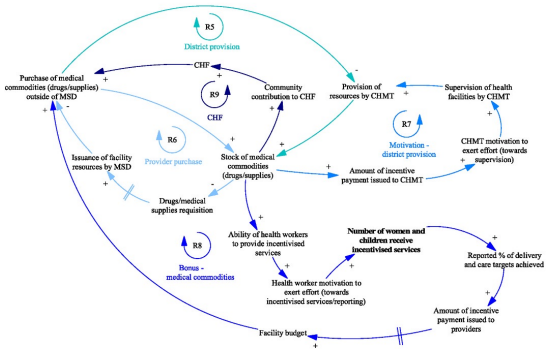
Application example: *COSMIC project*

Strengths

- Bottlenecks and policy targets/considerations
- Visual - engagement with stakeholders
- Utilising secondary data

Limitations

- Can't test programme design changes
- Difficult to show changes in variables over time
- Need to find a way to present the diagram so stakeholder/reader is not overwhelmed



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Final reflections….

1. Iterative process – not a linear path to development
2. Variety of data sources, methods for development and validation
3. Stakeholder engagement – pilot tools and adapt
4. Not modelling the 'system' but focus on a particular problem behaviour or issue
5. Possible to use two + systems thinking methods in one project
6. Validation is imperative

COSMIC Project - Acknowledgements

Peter Binyaruka
Karl Blanchet
Josephine Borghi
Zaid Chalabi
Chitalu Chama-Chiliba
Anna Foss
Julia Lohmann
John Maiba
Nicholaus Mziray
Miguel Pugliese Garcia
Agnes Rwashana Semwanga
Nkenda Sachingongu
Neha Singh
Andrada Tomoaia-Cotisel
Participants in stakeholder interviews

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