



COPRH Con
Colorado Pragmatic
Research in Health
Conference

Using systems diagrams to conceptualize context and interventions in pragmatic research

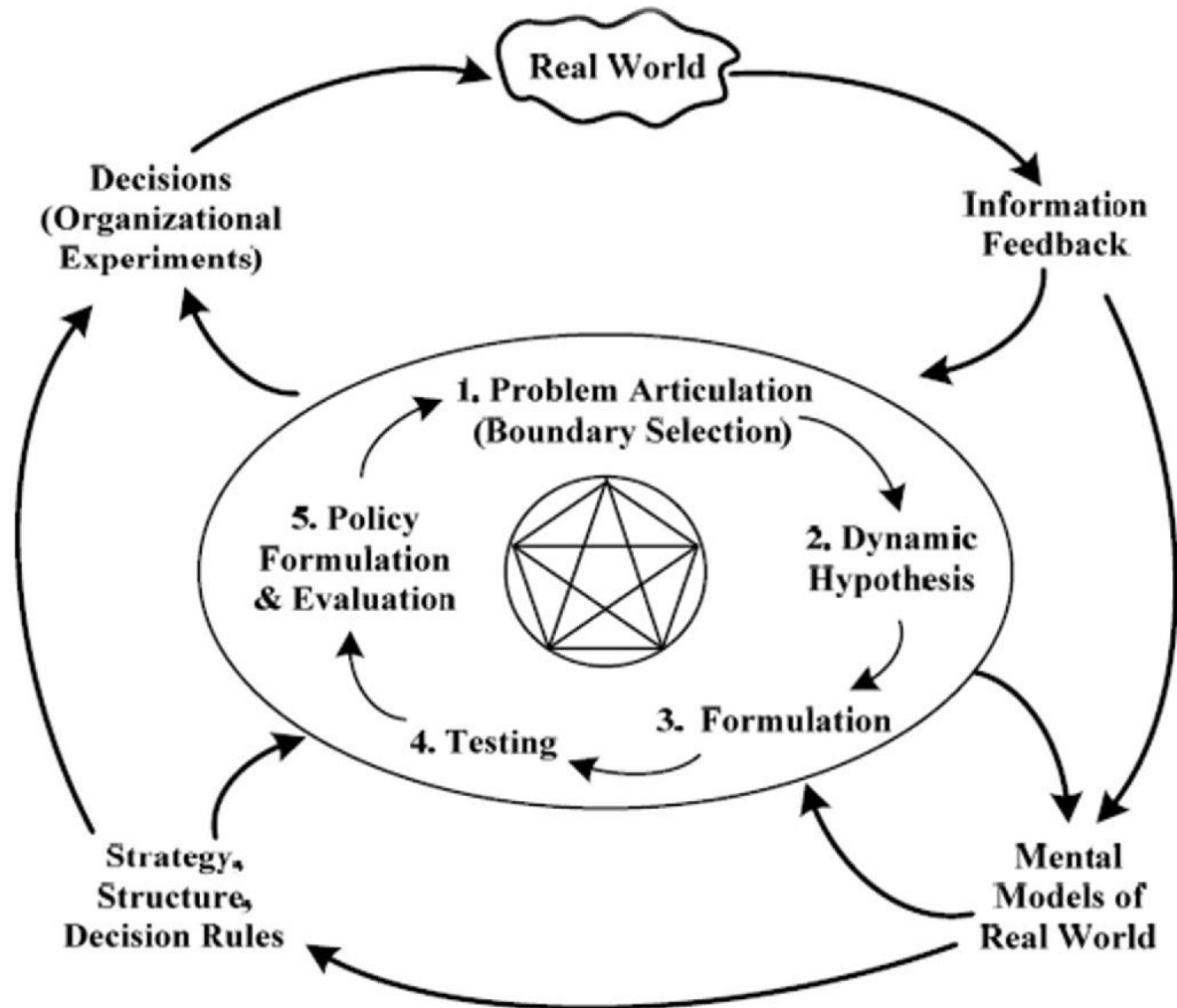
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Dynamic complexity

- Arises from interactions between variables over time
- Goes beyond detail complexity (lots of factors)
- Emphasizes:
 - Interdependence of factors across multiple scales
 - Contingency, unpredictability, uniqueness
 - Change over time
- Recognizes not just barriers, but drivers, feedback, goals, etc. (causal structure)

Modeling process



Example: CRC screening interventions

- **Question:** How can mailed fecal immunochemical testing (FIT) and patient navigation be adapted to rural settings?
- **Study:** SMARTER CRC, part of NCI-funded ACCSIS consortium
- **Problem definition:** Colorectal (CRC) screening rates are below the goal set by the National Colorectal Cancer Roundtable, and are even lower for rural and Medicaid populations.

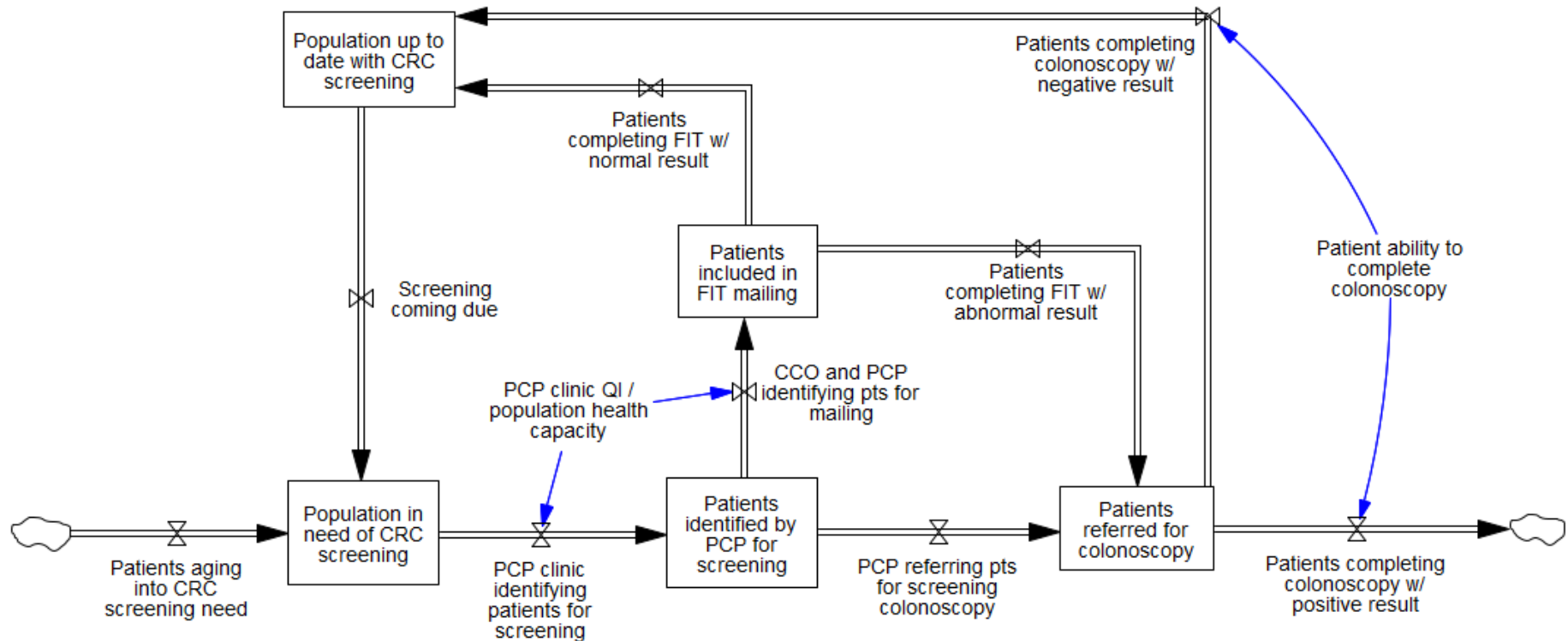
Example: CRC screening interventions

- CRC screening rates are low in rural Medicaid settings due to a complex set of factors at the patient, clinic, and community levels.
- Small, rural clinics have fewer resources than urban health systems and are less likely to have robust quality improvement or population health capacities.
- Medicaid health plans (Oregon coordinated care organizations) are positioned to support clinics in implementing CRC interventions.
- Practice facilitation is an effective strategy for supporting implementation of evidence-based interventions.
- Collaborative approach could help build clinic and CCO capacity.

Example: CRC screening interventions

- Using causal-loop diagramming to illustrate usual care and intervention scenarios for SMARTER CRC study
- Link to diagram: <https://kumu.io/ekenzie/smarter-crc-cld-v2>
- Link to walkthrough: <https://ekenzie.kumu.io/managing-complexity-in-smarter-crc-v2>

Example: stock-and-flow diagram



Characteristics of approach

- Describes how system structure produces behavior
- Centers the problem or system and its context
 - Interventions are seen as attempts to change system behavior
- Can be used as a conceptual model by teams
 - Can be a mirror for study team's mental model
 - Can help align and refine perspectives of team members
 - Can draw from various source material
- Can be used to aid planning and analysis
 - Should be revisited & revised
- Time intensive and requires training

Questions for research

- Which causal structures (feedback loops, links, variables, etc.) are common across different contexts?
 - Can 'template' models be developed for specific interventions or contexts?
- What are the best practices for developing and applying systems diagrams for pragmatic research?
- How can systems diagrams be used alongside more linear or categorical models and frameworks?

References

Coronado, G.D., Leo, M.C., Ramsey, K. et al. Mailed fecal testing and patient navigation versus usual care to improve rates of colorectal cancer screening and follow-up colonoscopy in rural Medicaid enrollees: a cluster-randomized controlled trial. *Implement Sci Commun* 3, 42 (2022).

David B. Nash, Raymond J. Fabius, and Alexis Skoufalos. *Population Health Management*. Apr 2021.286-295.

Davis MM, Renfro S, Pham R, Hassmiller Lich K, Shannon J, Coronado GD, et al. Geographic and population-level disparities in colorectal cancer testing: a multilevel analysis of Medicaid and commercial claims data. *Prev Med*. 2017;101:44–52.

Sterman, J. *Business Dynamics: Systems Thinking and Modeling for a Complex World*. Irwin/McGraw-Hill. (2000).