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Series: Clinical Epidemiology in South Africa. Paper 3: Logic models help make sense of complexity in systematic reviews and health technology assessments

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Abstract

Objective: To describe the development and application of logic model templates for systematic reviews and health technology assessments (HTAs) of complex interventions.

Study Design and Setting: This study demonstrates the development of a method to conceptualize complexity and make underlying assumptions transparent. Examples from systematic reviews with specific relevance to Sub-Saharan Africa (SSA) and other low- and middle-income countries (LMICs) illustrate its usefulness.

Results: Two distinct templates are presented: the system-based logic model, describing the system in which the interaction between participants, intervention, and context takes place; and the process-orientated logic model, which displays the processes and causal pathways that lead from the intervention to multiple outcomes.

Conclusion: Logic models can help authors of systematic reviews and HTAs to explicitly address and make sense of complexity, adding value by achieving a better understanding of the interactions between the intervention, its implementation, and its multiple outcomes among a given population and context. They thus have the potential to help build systematic review capacity—in SSA and other LMICs—at an individual level, by equipping authors with a tool that facilitates the review process; and at a system-level, by improving communication between producers and potential users of research evidence.

Keywords: Africa; Complexity; Evidence synthesis; Analytical framework; Conceptual framework; Systems-based thinking

1. Introduction

1.1. Role of evidence synthesis in Sub-Saharan Africa

Sub-Saharan Africa (SSA) is affected by an overwhelming burden of diseases and injuries [1] and faces considerable challenges in health service provision. Addressing this burden requires a well-functioning health system and a variety of curative and preventive interventions relevant to the African context, many of which can be considered complex. Policy makers and health care practitioners need to consider the evidence about the benefits and harms of these interventions, if they are to make optimal use of limited resources [2]. Systematic reviews provide the most complete and reliable evidence on intervention effectiveness, while taking stock of existing research and critical gaps [3]. This is crucial to reduce wasting resources on unnecessary research, especially in SSA and other low- and middle-income countries (LMICs) [4,5]. In these settings, a number of challenges hinder research evidence use, including a paucity of existing systematic reviews relevant to LMICs [2,3,6] and limited capacity for research synthesis. In a recent

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What is new?

LMIC challenges and opportunities

- In the light of the significant burden of disease, Sub-Saharan Africa (SSA) faces huge challenges related to health systems and delivery of health care. Interventions required to address these challenges are often complex, and management should be informed by the current best evidence.
- Evidence synthesis of complex interventions is an intricate process. Logic models can help build capacity by equipping authors of systematic reviews and health technology assessments (HTAs) of complex interventions with a tool to develop their own intervention-, question-, and context-specific logic model; they can also help improve communication of research evidence between evidence producers and users.
- The system-based and process-orientated logic model templates described are a valuable tool to guide the entire process of a systematic review or HTA of a complex intervention. In this way, evidence synthesis can be made more relevant and applicable to SSA and other low- and middle-income countries (LMICs).

situation analysis, Oliver et al. (2015) identified a lack of overall systematic review capacity in LMICs, including individual, team, institutional, and system capacity. The authors highlight a need to develop methods and build capacity to address complex health system and health policy questions; a need linked to strengthening the relationship between producers and users of evidence [7].

1.2. Evidence synthesis of complex interventions

The UK Medical Research Council's guidance on complex interventions [8] resulted in wide use of the term. However, the complexity of the intervention itself is only one of many sources of complexity [9]. In evidence synthesis, complexity can relate to the characteristics of any part of the PICO (population, intervention, comparison, or outcomes) question, and to methodological issues inherent in the included primary studies [10]. Additional complexity can be found in the unique circumstances under which the intervention is delivered and in nonlinear pathways and feedback loops between intervention and outcomes, interactions between direct and indirect effects of the intervention, as well as between different intervention components [11]. Petticrew (2011) explains that complexity does not have to be an inherent characteristic of an intervention, but rather that interventions can have simple and complex explanations, depending on the perspective adopted and the research question asked [11].

A series of six articles published in the *Journal of Clinical Epidemiology* in 2013, provides the first concerted attempt to address complexity in systematic reviews at each stage of the process from formulating the question [10], to synthesizing evidence [12] and assessing heterogeneity [13] to reviewing the applicability of findings [14]. The series concludes with a research agenda, emphasizing methodological areas needing further development and testing [15].

1.3. Logic models

Logic models have been defined in various ways [16] and can be described, inter alia, as conceptual frameworks, concept maps, or influence diagrams. Anderson et al. (2011) argue that logic models "describe theory of change," "promote systems thinking," and contribute both in a conceptual and analytical way [17]. This resonates with our understanding of the use of logic models in systematic reviews and health technology assessments (HTAs). For the purpose of this article, we refer to a logic model as "… a graphic description of a system … designed to identify important elements and relationships within that system" [17,18]. Logic models can help conceptualize complexity [19] by (1) depicting intervention components and the relationships between them, (2) making underlying theories of change and assumptions about causal pathways between the intervention and multiple outcomes explicit [17], and (3) displaying interactions between the intervention and the system within which it is implemented. Such a graphic representation is particularly helpful as a mechanism for making transparent assumptions among researchers and other stakeholders, and making results more accessible to a potentially broad range of decision makers, including clinicians, public health practitioners, and policy makers. In essence, logic models provide a framework to support the entire systematic review or HTA process and help to interpret the results, as well as to identify areas where further evidence is needed.

Two main approaches to logic modeling can be distinguished: a priori and iterative logic modeling. With an a priori approach, the logic model is developed at the protocol stage to refine the research question, identify sources of heterogeneity and subgroups, design the data extraction form, and plan data synthesis. This type of logic model is finalized before data collection and remains unchanged throughout the systematic review or HTA process [17,20]. In an iterative approach, the logic model is conceived as a mechanism to incorporate the results of the systematic review or HTA and is subject to repeated changes during the process of data collection [21]. Although both approaches have their advantages and drawbacks (Booth et al., article in preparation), this article focuses mainly on a priori logic modeling.