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**SERIES: AHRQ SERIES ON COMPLEX INTERVENTION SYSTEMATIC REVIEWS**

**AHRQ series on complex intervention systematic reviews—paper 1: an introduction to a series of articles that provide guidance and tools for reviews of complex interventions**

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## 1. Introduction

Issues of complexity are taking primacy as research increasingly reflects the complexity of the world around us. Although advances in science have resulted in dramatic improvements in health and longevity worldwide, there is increasing recognition that the effectiveness even of apparently simple interventions is often influenced by complex interplays of individual characteristics, social determinants, the health care delivery system, and the interventions themselves. Systematic reviews of topics, such as slum upgrading [1,2], behavioral interventions for autism [3,4], smoking cessation in pregnancy [5], and the integration of mental health in primary care [6,7], illustrate that the boundaries of traditional reviews and review methods are being expanded and that reviewers are in need of guidance and tools to address this new approach.

When the methods for conducting systematic reviews were originally developed, the process of reviewing the

literature was treated as relatively straightforward. Complexity existed, but reviewers often tried to simplify this complexity to group studies and in attempts to make comparative claims. In general, the systematic reviews and primary research included in systematic reviews approached research from a classic reductive philosophic and methodologic stances. Increasingly, people interested in adopting published interventions from reviews have found that this reductive stance eliminates details that are critical for them to understand whether the intervention is feasible and likely to work in their context, with their populations, and at what cost. As the fundamentals of evidence-based practice are now established, complexity has moved to the forefront.

In order for systematic reviews to address this complexity, all stages of the review, including question formulation, framework development, selection of review and analytic methods, and synthesis, need to account for

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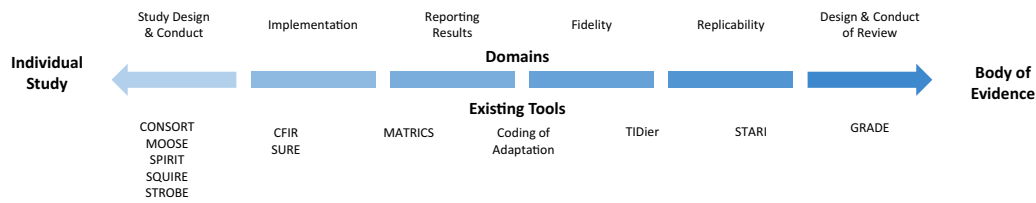
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**Fig. 1.** Existing tools for complex interventions. CONSORT, Consolidated Standards of Reporting Trials [8]; MOOSE, Meta-analysis Of Observational Studies in Epidemiology [9]; SPIRIT, Standard Protocol Items: Recommendations for Interventional Trials [10]; SQUIRE, Standards for QUality Improvement Reporting Excellence [11]; STROBE, Strengthening the Reporting of Observational Studies in Epidemiology [12]; CFIR, Consolidated Framework for Implementation Research [13]; SURE, Supporting the Use of Research Evidence [14]; MATRICS, Method for Aggregating the Reporting of Interventions in Complex Studies [15]; Coding of Adaptations [16]; TIDier, template for intervention description and replication [17]; STARI, Standards for Reporting Implementation studies of complex interventions [18]; GRADE, Grading of Recommendations, Assessment, Development and Evaluations [19].

these sources of complexity. Although several tools offer guidance for research on complex interventions, implementation of complex interventions, or specific aspects of conducting reviews (Fig. 1), until now, there has been no source of overarching guidance specific to systematic reviews of complex interventions [8–19].

### 1.1. Series approach

Against this backdrop, in 2013, the Agency for Healthcare Research and Quality (AHRQ) Evidence-based Practice Center Program launched a methods development program around systematic reviews of complex interventions. Initial efforts focused on outlining high-level approaches and challenges in conducting reviews of complex interventions [20,21]. Around the same time, the Montebello series was published, which included several articles describing the theoretical foundations of complexity in systematic reviews of interventions [22–24]. Building on these efforts, we undertook a three-staged process to develop practical guidance and tools for reviews of complex interventions: in-person meeting establishing the complex interventions working group; international Delphi process of reporting elements of reviews of complex interventions; and ongoing expert workgroup consensus.

A six-person steering committee invited representatives from international evidence review groups, methodologists, funders, and systematic review publishers to attend an in-person conference. The committee identified five areas in need of guidance: (1) formulating review questions and scope; (2) Population, Intervention, Comparator, Timing, Setting as well as frameworks; (3) selecting analytic approaches; (4) best practices in analytic approaches for complex interventions; and culminating in (5) Preferred Reporting Items for Systematic Reviews and Meta-analyses for Complex Interventions (PRISMA-CI) checklist; and (6) PRISMA-CI explanation and elaboration. On June 18–19, 2015, 57 experts in quantitative and qualitative approaches to systematic reviews of complex interventions attended a conference at AHRQ's Eisenberg Building in Rockville, Maryland. The conference format included

presentations, moderated discussions, brainstorming, and writing roundtables. After the meeting conference attendees participated in designated workgroups via twice-monthly teleconference calls to draft documents providing guidance for systematic reviewers of complex interventions in the five outlined areas: (1) scope and questions; (2) frameworks, (3) selecting analytic methods; (4) advanced analytic methods and matching methods to review questions; and (5) reporting standards for reviews of complex interventions.

### 1.2. Defining complexity

To date, there is no single agreed on definition of complex interventions. For this series, we build on prior definitions and posit this consolidated definition for complex interventions [20,21,23–29].

#### Definition of complex interventions

All complex interventions have two common characteristics; they have multiple components (*intervention complexity*) and complicated/multiple causal pathways, feedback loops, synergies, and/or mediators and moderators of effect (*pathway complexity*). In addition, they may also have one or more of the following three additional characteristics; target multiple participants, groups, or organizational levels (*population complexity*); require multifaceted adoption, uptake, or integration strategies (*implementation complexity*); or work in a dynamic multidimensional environment (*contextual complexity*).

### 1.3. How do I know if an intervention is complex?

To judge whether an intervention is simple or complex, systematic reviewers should specify clearly what the intervention is. Depending on how the intervention is framed, the same core component could potentially be reviewed as a simple or complex intervention. A complex intervention involves, at minimum, multiple components and a complex pathway. For example, if the focus of the review is the efficacy of taking aspirin after a myocardial infarction compared with another pill, placebo, or no treatment, this would not be a complex intervention. Although aspirin may act through complex biologic pathways, biologic or

**Table 1.** Description of article in the *Journal of Clinical Epidemiology* series on complex interventions

Key concept	Article title	Topic
Introduction	AHRQ series on complex intervention systematic reviews—paper 1: an introduction to a series of articles that provide guidance and tools for reviews of complex interventions	Provides an introduction and overview of the AHRQ series on complex intervention systematic reviews. This article discusses the process used to develop the series, provides a consolidated definition of complex interventions, and provides questions systematic reviewers can ask to determine whether the subject of their review is a complex intervention
Developing protocols for systematic reviews and meta-analyses of complex interventions Scoping questions	AHRQ series on complex intervention systematic reviews—paper 2: defining complexity, formulating scope, and questions [30]	Offers guidance on the earliest stages of a review, particularly on stakeholder engagement and scope and key question formulation. Complex intervention problem formation is an iterative and emergent <i>process</i> that requires careful articulation before the literature review
Developing frameworks	AHRQ series on complex intervention systematic reviews—paper 3: adapting frameworks to develop protocols [31]	Examines how to use frameworks to elaborate the research questions and define the study eligibility criteria (i.e., whether and why/how it works) and an analytic framework (or other visual model) to clearly depict how the analysis will address the key research questions, taking into account how the interventions may affect outcomes of interest
Developing analytic plans for systematic reviews of complex interventions Best practice analytic methods	AHRQ series on complex intervention systematic reviews—paper 4: selecting analytic approaches [32]	Describes important considerations for choosing analytic approaches for review questions about complex interventions
Selecting analytic approaches	AHRQ series on complex intervention systematic reviews—paper 5: advanced analytic methods [33]	Introduces analytic methods that can address four broad questions about complex interventions: (1) How effective is the intervention?; (2) How well does the intervention work for whom in what contexts?; (3) What happens when the intervention is implemented?; and (4) What decisions are possible given the results of the synthesis?
PRISMA-CI PRISMA-CI checklist	AHRQ series on complex intervention systematic reviews—paper 6: PRISMA-CI extension statement & checklist [34]	Provides a template for authors to use when reporting systematic reviews of complex interventions. It is intended to improve the transparency and scientific merit of systematic reviews of complex interventions
PRISMA-CI explanation and elaboration	AHRQ series on complex intervention systematic reviews—paper 7: PRISMA-CI elaboration & explanation [35]	Explains the meaning and rationale for each PRISMA-CI checklist item and provides examples for further clarity on their use

*Abbreviations:* AHRQ, Agency for Healthcare Research and Quality; PRISMA-CI, Preferred Reporting Items for Systematic Reviews and Meta-analyses of Complex Interventions.

physiologic complexity is not considered sufficient to categorize an intervention as complex for the purposes of a systematic review. However, a review question about how to increase adherence with daily aspirin after a myocardial infarction would be complex. Because behavioral interventions often use multiple approaches and target systems or multiple agents (e.g., providers, patients, family members, etc), they are commonly considered complex. A second example of a complex intervention would be personal protective equipment. A systematic review of the efficacy of one type of mask compared with another may reasonably

treat the intervention as simple. In contrast, systematic reviews focusing on effectiveness in public health settings and feasibility of uptake should consider the intervention to be complex: the effectiveness of the intervention depends on the context in which the personal protective equipment will be implemented, whether agents are available to perform fittings and testing, whether there are mechanisms available to disseminate the personal protective equipment items, whether training is required, and the ability of people to get to a place for training, and others. Each of these considerations can be deemed a component in this system

intervention. Commonly, public and population health, community and system-level interventions, and those aimed at behavior change are more likely to be complex than simple.

#### 1.4. Series overview

The seven articles in this series reflect and distill the discussions from the in-person meeting and follow-up workgroups on tools and approaches to systematic reviews of complex interventions (Table 1).

The first three articles address how systematic reviews for complex interventions are conceptualized and operationalized for the protocol [30,31]. The next two articles discuss how to choose appropriate analytic methods to implement analyses of complex interventions [32,33]. The final two articles [34,35] describe proposed reporting elements for systematic reviews of complex interventions.

Methods and approaches described in this series are intended to help researchers design and conduct systematic reviews of complex interventions to better answer important clinical, policy, and research questions; improve their usefulness; and improve health care and health outcomes. However, as the number of methods and approaches for reviewing complex interventions proliferate in a rapidly evolving field, unanswered questions remain about the relative value of these methods. Widespread adoption of new methods and transparency of reporting can help solidify our understanding of the best methods for complex interventions, advance the field, and help better answer pressing real-world questions. Recognizing that this is a rapidly evolving field, the complex interventions working group intends to monitor the application of these tools and modify them as needed.

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