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Conceptual tools

Conceptual diagrams in public health research

Yin Paradies, Matthew Stevens

Constructing a conceptual diagram is as much art as science

Conceptual diagrams, models, and frameworks are often used in public health literature to help illustrate relations between health exposures and outcomes. However, it is not always clear what these conceptual tools are describing, what they mean or how best to use, design or present them. In fact, the gaze of even the most critical reader tends to glaze over when suddenly faced with a conceptual diagram that is barely, if at all introduced, let alone explained in the accompanying text.

The online Oxford English Dictionary defines a diagram as a “set of lines, marks, or tracings which represent symbolically the course or results of any action or process” or a “delineation used to symbolize related abstract propositions or mental processes”. Adapted from what Earp and Ennett¹ call a “conceptual model”, we define a conceptual diagram as a “diagram of proposed relationships among a set of concepts, factors, or variables about a particular hypothesis, question, context, problem or topic”. Conceptual diagrams are used to organise and synthesise knowledge, define concepts, provide explanations for causal and associative linkages, generate hypotheses and specific research questions, plan and target interventions, designate variables to be operationalised, and anticipate analytical approaches.¹ Conceptual diagrams delineate the scope of an inquiry and break up phenomenon into manageable pieces that map out the conceptual terrain in an area of interest.² These diagrams also assist in: interpreting statistical models, identifying knowledge gaps, directing future research,³

and transferring research into policy and practice.

A cursory search through recent issues of the *JECH* uncovered a number of conceptual diagrams that we use below to illustrate key points in the use and misuse of these diagrams in public health research. Excluding mathematical/statistical diagrams and protocol/organisational flowcharts, conceptual diagrams can be categorised into two main types: causal/associative and descriptive/structural, with some diagrams including aspects of both types. Causal diagrams usually consist

of polygons containing objects linked by (weighted) arrows and are designed primarily to show the aetiology of a topic that has been delineated into its constituent components. Figure 1, as reproduced from an article by Starfield, is an example of this type of conceptual diagram.⁴

Descriptive/structural diagrams are designed to clearly delineate layers of phenomena or types of objects to aid in organising and synthesising knowledge, designating variables, and so on. Figure 2, as reproduced from Barrett *et al*, is an example of this second type of conceptual diagram.⁵ Causal/associative models generally provide predictions that can be tested and falsified whereas descriptive/structural diagrams provide paradigmatic ways of thinking through phenomenon.

The most common failing in the use of conceptual diagrams is their inclusion in an article devoid of sufficient description in the text. This is akin to presenting tabular or graphical data without any interpretation and, not surprisingly, severely limits the utility of these diagrams for potential users. As an exam-

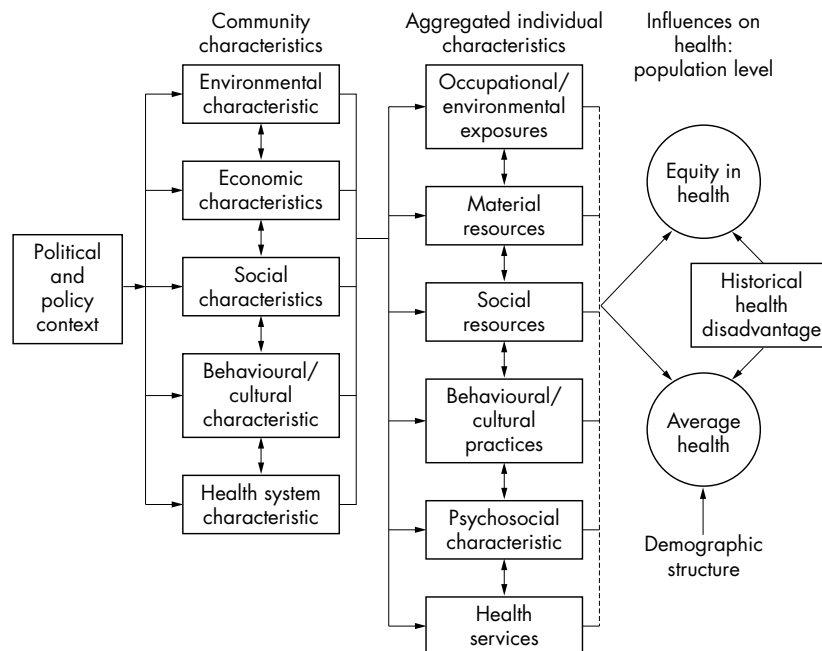


Figure 1 Example of a causal/associative conceptual diagram.⁴

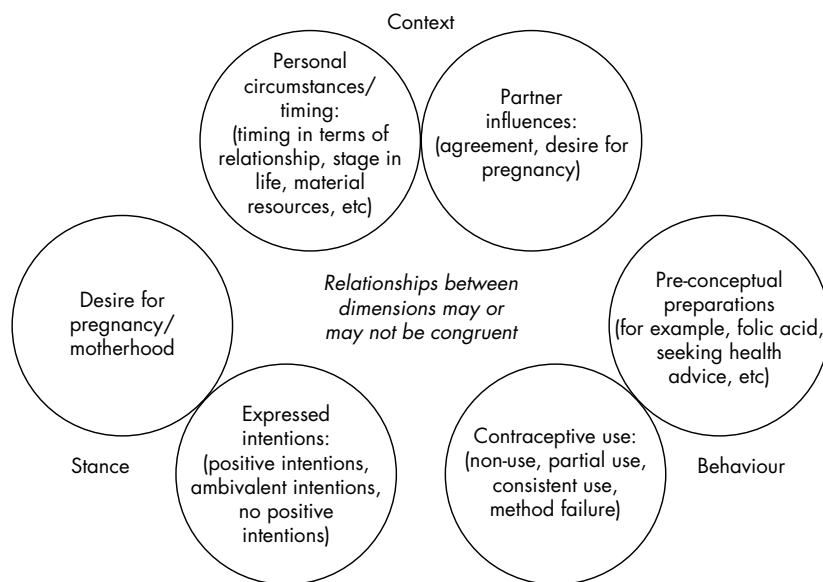


Figure 2 Example of a descriptive/structural conceptual diagram.⁵

ple, figure 4 in Moreau *et al*, which is a three dimensional conceptual diagram depicting the relation between job conditions and sick leave as mediated by a mix of positive and negative health related outcomes, is presented with no explanation whatsoever.⁶ In contrast, Starfield devotes over a quarter of her editorial to describing her conceptual diagram.⁴

Before creating a conceptual diagram it is important to decide on its scope: what is the topic of interest, how many levels/types of phenomenon will be included to convey the necessary relations and what portion of the causal web or typology will be described. The best conceptual diagrams are explicit about their scope, are informed and described by theories and/or empirical evidence and “parsimoniously convey complex information, allowing the viewer to quickly visualize and grasp complicated relationships”.¹ Diagrams that attempt to cover too great a scope as well as those that could just as easily

be described in a single sentence should be avoided.

For instance, the figure included in Droomers *et al*⁷ which consists of three boxed concepts joined by two arrows (between boxes one and two and between boxes two and three) in a single causal line, is described sufficiently in the text as: “the association between parental socioeconomic status and adolescents’ alcohol consumption might be explained by...predictors of high alcohol consumption”.⁷ Nothing is gained by the inclusion of a conceptual diagram in this case.

Given the recognised complexity of developing meaningful conceptual diagrams, public health researchers have been slow to adopt multiple spatial and temporal scales, nested hierarchies of socioeconomic and biophysical environments and feedback loops between phenomenon,⁸ as used in disciplines such as ecology. However, as conceptual diagrams incorporate ecological approaches to situating individuals in social, cultural, and physical worlds,⁹ it is vital to retain a “clearly designated category for the individual”¹⁰ so as not to fall into the trap of over-emphasising structure at the expense of individual agency.¹¹

It is important to recognise that “constructing a conceptual [diagram] is as much art as science”.¹ Although there are no hard and fast rules or easy checklists for their construction it is,

none the less, clear that readers appreciate elegant, informative, visually edifying, and adequately described diagrams, making it all the more important that the construction and use of conceptual diagrams is taken seriously in public health research.

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What this paper adds

This article seeks to focus attention on the role of conceptual diagrams in public health research by illustrating key points in relation to the use and misuse of diagrams