Defining, illustrating and reflecting on logic analysis with an example from a professional development program

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ABSTRACT

Program designers and evaluators should make a point of testing the validity of a program's intervention theory before investing either in implementation or in any type of evaluation. In this context, logic analysis can be a particularly useful option, since it can be used to test the plausibility of a program's intervention theory using scientific knowledge. Professional development in public health is one field among several that would truly benefit from logic analysis, as it appears to be generally lacking in theorization and evaluation. This article presents the application of this analysis method to an innovative public health professional development program, the Health Promotion Laboratory. More specifically, this paper aims to (1) define the logic analysis approach and differentiate it from similar evaluative methods; (2) illustrate the application of this method by a concrete example (logic analysis of a professional development program); and (3) reflect on the requirements of each phase of logic analysis, as well as on the advantages and disadvantages of such an evaluation method. Using logic analysis to evaluate the Health Promotion Laboratory showed that, generally speaking, the program's intervention theory appeared to have been well designed. By testing and critically discussing logic analysis, this article also contributes to further improving and clarifying the method.

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1. Introduction

Ideally, a program's intervention theory should reflect the mechanisms by which the intervention produces the desired outcomes. Too often the intervention theory, which stipulates the links between a program's resources, activities and effects, does not represent the way in which the program actually produces its effects, but rather the program designers' perceptions and beliefs about the causal mechanisms (Brousselle & Champagne, 2011; Weiss, 1998). Using theory-based evaluation, these perceptions and beliefs can be tested. Testing the validity of a program's intervention theory before investing either in implementation or in any type of evaluation would improve the potential of the program (Brousselle & Champagne, 2011). In this context, logic analysis can be a particularly useful option, since it can be used to test the plausibility of a program's intervention theory on the basis of a multidisciplinary integrative theoretical framework using scientific knowledge (Brousselle & Champagne, 2011; Brousselle, Contandriopoulos, & Lemire, 2009; Rey, Brousselle, & Dedobbeleer, 2012).

Logic analysis is a relatively new approach in the stream of theory-based evaluation. In recent years, there have been a few concrete experiences and applications of logic analysis (Brousselle & Champagne, 2011; Brousselle et al., 2009; Rey et al., 2012), and we believe it still needs to be tested and refined through its application in different settings. Our aim in this paper is to contribute to the knowledge in this field by (1) defining the logic analysis approach and differentiating it from other theory-based evaluations; (2) illustrating the application of this method by a concrete example (logic analysis of a professional development

program); and (3) reflecting on the requirements and pitfalls of each phase of logic analysis, as well as on the advantages and disadvantages of using such an evaluation. In so doing, our intention is to further improve and clarify the method.

Professional development in public health is one field among several that would truly benefit from logic analysis, as it appears to be generally lacking in theorization and evaluation (Gotway Crawford et al., 2009; Koo & Miner, 2010; Tilson & Gebbie, 2004). The example chosen in this article presents the application of this analysis method to an innovative public health professional development program, the Health Promotion Laboratory.

2. Logic analysis: what it is and how it differs from similar trends

Logic analysis is a type of evaluation that fits within the broader stream of program theory evaluation, or theory-based evaluation (Brousselle & Champagne, 2011). The purpose of theory-based evaluation is to question the validity of a program's intervention theory by collecting "data to see how well each step of the sequence is in fact borne out" (Weiss, 1997) (p. 501). To do so, theory-based evaluation deconstructs the program's causal mechanisms and identifies which elements and factors are responsible for its success or failure (Weiss, 1997). "They seek to show how the intervention is expected to work or make a difference" (Mayne, 2012) (p. 271).

Logic analysis can be conceived as a specific type of theory-based evaluation. With formative or summative aims, logic analysis allows to test the plausibility of an intervention theory based on available scientific knowledge—either scientific evidence or expert knowledge (Brousselle & Champagne, 2011; Champagne, Brousselle, Contandriopoulos, & Hartz, 2009). Logic analysis, which can take two different forms (direct or reverse), may be used (1) to identify the crucial characteristics and critical contextual conditions needed for the program to produce its intended effects (direct logic analysis); or (2) to identify alternative means of action and better ways to produce those effects (reverse logic analysis). In fact, direct logic analysis of the intervention's theory will determine whether it is appropriate for obtaining the intended results (Brousselle & Champagne, 2011; Rey et al., 2012). It thereby makes it possible to identify the crucial characteristics of the intervention and the contextual conditions for achieving the effects (Rey et al., 2012). Taking the inverse path, reverse logic analysis starts from the desired results and identifies the best interventions to achieve them, by exploring alternatives and broadening the array of possible interventions that could be implemented (Brousselle & Champagne, 2011; Rey et al., 2012). This reverse analysis also helps to identify the crucial conditions needed to implement the alternatives and produce the effects (Rey et al., 2012). In this study, direct logic analysis is used to validate the design of the intervention and identify its crucial components as well as the critical conditions needed to achieve the results. An inverse logic analysis would have helped to identify other interventions to achieve the outcomes targeted by the project's promoters as well as to specify the critical conditions needed for those interventions.

Logic analysis usually proceeds in three phases (Brousselle & Champagne, 2011; Champagne et al., 2009; Rey et al., 2012). The first phase consists of representing the intervention theory through a logic model that specifies the links among resources, processes and results. In the second phase, based on the scientific literature, an integrative framework is developed within which the logic model of the intervention and its underlying premises will be examined. This phase thus involves studying the literature that analyzes and documents mechanisms similar to those attributed to the intervention. The aim is not to carry out a systematic literature review, but rather to provide a representative synthesis of the most recent knowledge in relevant and meaningful fields of research. The third and final phase consists of taking a new reading of the intervention in light of the integrative framework developed. This makes it possible to compare the intervention theory against the model that emerges from analysis of the literature, which helps bring to light the intervention's strengths and weaknesses.

It may be useful to consider how logic analysis differs from other theory-based evaluations, such as evaluability assessment, contribution analysis, or realistic evaluation (see Table 1). Logic analysis tests the intervention theory to determine whether a program is appropriately designed to achieve the desired results, based on scientific and expert knowledge. Evaluability assessment, in contrast to logic analysis, is a normative strategy which uses the intervention theory to assess the program implementation's compliance with the intended program (Smith, 2005; Wholey, 2004). Contribution analysis, on the other hand, could be considered a post-implementation impact analysis strategy which uses the intervention theory to assess the program's contribution to the observed result (Mayne, 2008; Mayne, 2012). Realistic evaluation is another theory-based evaluation method which uses a highly specific intervention theory (called the 'context–mechanism–outcome pattern configuration') that is tested empirically against the program's reality (Pawson & Tilley, 1997; Pawson & Tilley, 2008). While realistic evaluation is rather different from logic analysis, realist review, which emerged from realistic evaluation, shares many similarities with direct logic analysis because it can be used to understand and document how the intervention works with regard to existing theories and research (Pawson & Tilley, 2008). As such, realist review could be conceived as a potential literature review strategy when doing direct logic analysis (Brousselle & Champagne, 2011).

The emerging movement of theory-based evaluation and its related approaches over recent decades is evidence of the evaluation field's interest in giving more prominence to change models in evaluative processes (Coryn, Noakes, Westine, & Schoter, 2011). This movement will consolidate in the coming years, as understanding of the strengths, specificities and application possibilities of these approaches increases. This article is intended to contribute to this consolidation by presenting and discussing the application of logic analysis to a professional development program, which is the subject of the next section.

3. Logic analysis: a concrete example from a professional development program

The case presented in this article, the Health Promotion Laboratory, is an innovative program without precedent in the professional development field. As such, no comparable project was available in the scientific literature to support this program's conception. Its development was based mainly on the tacit and experiential knowledge of the public health professionals who were its architects. A direct logic analysis was used to evaluate whether the Health Promotion Laboratory program was designed

Table 1
Comparison of theory-based evaluation approaches and questions asked.

Evaluation approach	Question asked
Logic analysis	Is the program designed in a way that can logically produce the desired results?
Evaluability assessment	Is the program implemented as planned, so that it is ready for summative evaluation?
Contribution analysis	To what extent are the observed results due to the program's activities rather than to other factors?
Realistic evaluation	What works, for whom, in what circumstances and in what respects, and how?