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The connection between logic models and systems thinking concepts

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Abstract

This article examines the relationship between systems thinking concepts and the logic model. Two notable shortcomings of the logic model are illustrated: depicting the program theory linearly and failing to place the program in context. Both issues lead to an artificial depiction of reality making evaluation findings difficult to interpret. Systems thinking concepts are defined and how they address these shortcomings is discussed. This article then demonstrates how many systems thinking concepts are evident in the logic model; although in a limited way. This article concludes by noting the importance of using system concepts when answering evaluation questions related to system dynamics and interrelationships.

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Logic models are a fundamental tool of theory-driven program evaluators (Chen, Cato, & Rainford, 1998/1999; Donaldson, 2005; Frechtling, 2007). The logic model's purpose is to summarize key program elements including the program assumptions, activities, inputs, outputs and outcomes (Gale, Loux, & Coburn, 2006; Knowlton & Phillips, 2012; McLaughlin & Jordan, 1999; Millar, Simeone, & Carnevale, 2001). For the purpose of illustrating forthcoming arguments, a sample logic model for an obesity prevention school-based educational curriculum targeting knowledge about healthy food choices is shown in Table 1.

Over the last several years, the logic model like that shown in Table 1 has come under some criticism (Cabrera, Colosi, & Lobdell, 2008; Midgley, 2006). One criticism is the logic model oversimplifies the context in which a program operates (Frye & Hemmer, 2012). To illustrate this point, consider the obesity context map in Figure 1. Figure 1 is an actual context map created by collecting multiple stakeholders' perspectives for a statewide obesity initiative completed by the first author (R.R.). It is evident there are a myriad of obesity antecedent conditions and root causes. The boundary circle in Figure 1 highlights the antecedent conditions being targeted by the school-based curriculum shown in Table 1. The logic model boundary is defined by engaging program leadership in a prioritization process to target those antecedent conditions within the control of the program (e.g., within the program mission; have necessary resources can show change in a defined time period; Renger & Titcomb, 2002).

Figure 1 helps make clear there are many other contributing factors beyond the program boundaries influencing obesity. By only depicting those factors germane to a program, the logic model can create unrealistic expectations about what a program can change (Huntington & Renger, 2003; Renger, Foltysova, Becker, & Souvannasacd, 2015). This is because there are many factors beyond the direct and immediate control of the program, not depicted in the logic model, that can influence evaluation results (Huntington & Renger, 2003; Renger, 2006).

Another criticism of the logic model is its linear depiction of program elements (Hummelbrunner, 2010). It is the author's experience that evaluators levying this criticism are referring to the linear depiction between all logic model elements (i.e., activities-inputs-outputs-outcomes) as is the case with many mainstream logic models (e.g., Kellogg Foundation, 2004). This is misleading. The linearity criticism pertains to how the program theory in the logic model is conveyed. For example, in Table 1, the program theory is contained in the program assumption column and is stated as three if-then logic statements. The linear, if-then representation of the program theory is a direct result of the root cause analysis methodology used to identify obesity precursors (Renger et al., 2015; Renger & Titcomb, 2002).

Table 1. Obesity reduction logic model for a single agency.

Program assumptions	Activities	Outcomes			
		Short-term outcomes	Intermediate outcomes	Long-term outcomes	
If we improve knowledge about nutrition, then more youth will make healthy food choices. If youth are making healthier food choices, then they are consuming fewer high calorie/fat foods. If youth are consuming fewer high calorie/fat foods, then they will be less likely to be obese.	School-based curriculum: Two 1-hr sessions teaching students the importance of good nutrition	Improved knowledge of the importance of good nutrition	More students make healthy food choices	Fewer students consume high-calorie/high-fat diet	Decrease in obesity rate in Arizona

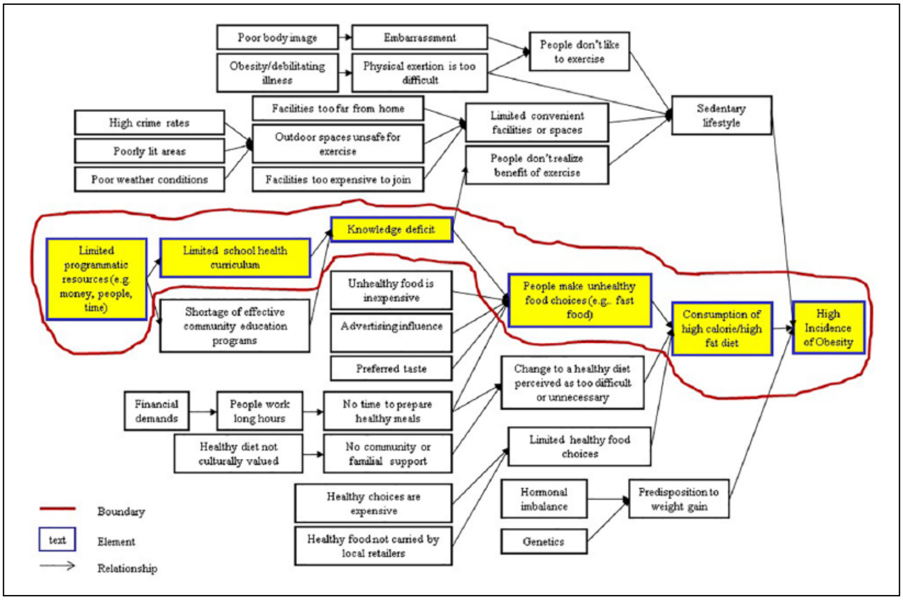

Figure 1. The logic model shown in context.

The consequence of the aforementioned limitations is the logic model creates an artificial representation of reality. This in turn often leaves evaluators using inadequate logic models and struggling to interpret evaluation findings (McLaughlin & Jordan, 1999; Renger, 2011; Renger, Bartel, & Foltysova, 2013).

Systems thinking concepts as a response to logic model shortcomings

A growing number of evaluators are suggesting methods grounded in systems and systems thinking concepts in response to the logic model criticisms noted above (Jackson, 2003; Williams & Hummelbrunner, 2010). We first define these concepts and then discuss their relationship in addressing the logic model shortcomings.

The American Evaluation Association (AEA) (2018) Systems in Evaluation Topical Interest Group (TIG) draft titled Principles for Effective Use of Systems Thinking in Evaluation defined a system as a 'set of interrelated elements that interact to achieve an inherent or ascribed purpose' (p. 6). Furthermore, systems thinking is defined as a 'way of thinking based on core system concepts' (p. 6).

The AEA document outlines five system thinking principles. The *systems-in-evaluation* principle suggests evaluators examine problems through a systems thinking lens. The authors agree with this tenet's premise with the caveat that evaluators should always seek the most appropriate methods for the problem at hand (Williams, 2010). We need to be careful not to swing the pendulum so far into system thinking that all problems are seen as a nail because our only tool is a hammer.

The *interrelationships* principle focuses on the heart of a system, namely which system elements must work together and how they best working together to achieve the ascribed purpose. When systems breakdown, it is often because of failures in elements to interrelate efficiently and effectively.

The *boundaries* principle is also important because it defines the evaluation scope. Our world is a large system consisting of countless subsystems. In the authors' opinion, there are no naturally occurring boundaries for many of the difficult problems we are tasked with evaluating. Evaluators must be clear what slice of the universe they are evaluating and why.

Systems are always in flux and complex. They are being influenced by external factors and need to adjust accordingly. The needed system response is often nonlinear, for example, using feedback loops. The *dynamics* principle reminds evaluators of the need to integrate flexibility into evaluation plans that anticipates and captures system fluidity.

Finally, multiple *perspectives* are needed from system actors to establish the system boundaries and accurately capture system interrelationships and dynamics. Not everyone sees the world the same way. Systems actors responsible for overseeing the system will have different perspectives than those responsible for system operation. These perspectives will differ again from those whom the system is intended to serve. It is these combined perspectives that provide the best system understanding.

System thinking concepts applied to logic modeling

Many evaluators see systems thinking concepts as distinct from logic models (Lanzendörfer, Rubens, Vahlhaus, & Zintl, 2011; Renger, Wood, Williamson, & Krapp, 2011). However, this is a fallacy. In actuality, if one were to apply the *systems in thinking* principle to Table 1 logic model, several systems thinking concepts are evident. First, by comparing Table 1 and Figure 1, it should be clear the logic model for an individual program depicts a subset of the system issues. There is a *boundary*, it is just narrow. Second, an inspection of the program assumptions in Table 1 (narrative form) and Figure 1 (visual form) shows the logic model does depict relationships between elements. It is just that the relationships are all linear. Finally, deriving a logic model often involves evaluators including many stakeholders' *perspectives* (Bryson, Patton, & Bowman, 2011). For example, perspectives of leadership, staff and clients were sought in generating the Figure 1 context map. It was the process of prioritizing based on resources, expertise and time that led to the focused set of program assumptions shown in Table 1 logic model. Thus, it would be erroneous to conclude, based on the simplicity of the logic model, that multiple perspectives were not included.

There are, however, several important systems thinking concepts not reflected in both Table 1 and Figure 1. Most notable are system *dynamics* and complex *interrelationships*.

While many system elements are depicted in Figure 1, it is unrealistic to believe these elements only interact with each other linearly. Methods grounded in systems thinking such as social network analysis, causal loop diagrams and outcome mapping are better suited for capturing the nonlinear and complex program interactions (Williams & Hummelbrunner, 2010).

Furthermore, significant advances are being made in using system thinking concepts as a foundation for evaluating systems (Renger, 2015, 2016; Renger, Foltysova, Renger, & Booze, 2017; Renger, Keogh, Hawkins, Foltysova & Souvannasacd, 2018). In a series of publications, Renger and his colleagues illustrate how the systems thinking concept of *perspectives* is used to define the system concepts of boundaries, elements and relationships. The publications also provide evaluators guidance as to how to draw a system *boundary* by leveraging an understanding of the ascribed system goal and how to document system element interrelationships using process flow mapping. Furthermore, these articles also describe how system concepts such as feedback loops, cascading failures and reflex arcs can be used to better identify where and how to evaluate system efficiency and effectiveness.

Adopting a systems-in-evaluation approach from the onset by using systems grounded methods and/or systems evaluation theory will help avoid the pitfalls of creating an artificial representation of the context in which programs operate. This will lead to more meaningful and useful evaluation results.

Using more logic models to capture system complexity is not the answer

Instead of using systems thinking concepts to capture the complexity of a problem like obesity, some evaluators suggest using more logic models as a solution (Rogers, 2008). In the obesity example, a statewide coalition was formed to address obesity. Several member agencies each targeted a different set of contextual factors that fell within their agency mission. The different colored boxes in Figure 2 represent each agency. In this example, there would be a total of five logic models; one to evaluate the targeted conditions by each agency. In the authors' opinion, such a solution does provide more context 'coverage' and is a step up in capturing reality, but is still inadequate because the coalition coordination aspects, the interrelationships between agencies, will not be captured. A better solution remains to view the problem from a systems perspective from the onset rather than to band-aid the problem with familiar, but underpowered methods.

Conclusion

In judging logic model utility, it is important to remember that its purpose is to *[logically] summarize a process* of aligning underlying conditions, strategies and measurement (Gale, Loux, & Coburn, 2006; Renger & Titcomb, 2002). As such, the logic model is only intended to highlight the program focus. It only depicts the narrow boundary of elements targeted by the program. Considering its purpose, it is unfair to

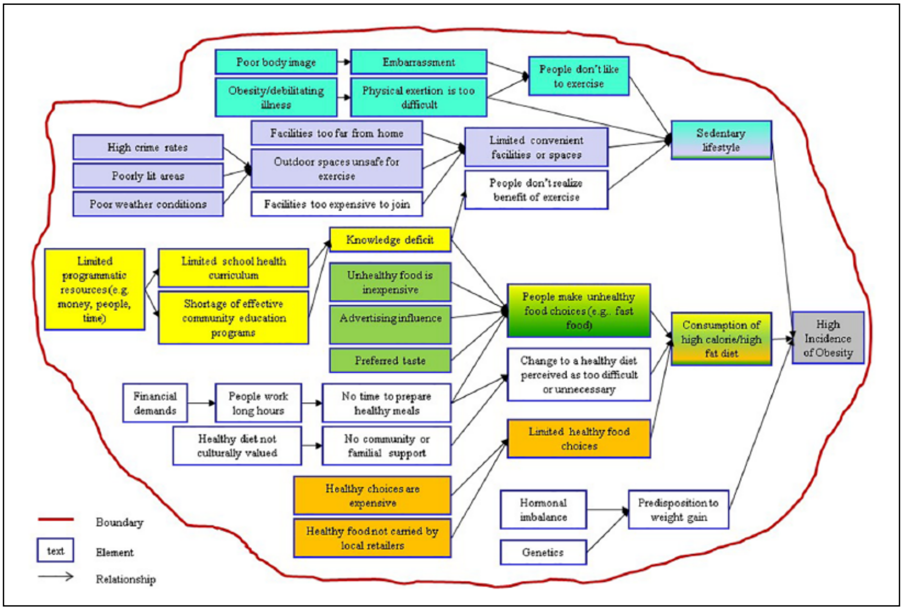

Figure 2. Using multiple logic models to capture coalition coordination.

criticize the logic model for something it was never intended to do, namely capturing the dynamics and interrelationships among all the contextual variables influencing program outcomes.

If the evaluation questions center on understanding how the dynamics and interrelationships between system elements are influencing outcomes, then applying systems thinking concepts from the onset has great potential for creating more meaningful and useful evaluations. When such evaluation questions are germane, systems thinking concepts are a better key for the lock (Williams, 2010) than trying to scaffold underpowered program evaluation methods like the logic model to answer the evaluation questions.

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