This section includes shorter (e.g., 10–15 double-spaced manuscript pages or less) papers describing methods and techniques that can improve evaluation practice. Method notes may include reports of new evaluation tools, products, and/or services that are useful for practicing evaluators. Alternatively, they may describe new uses of existing tools. Also appropriate for this section are user-friendly guidelines for the proper use of conventional tools and methods, particularly for those that are commonly misused in practice.

A Three-Step Approach to Teaching Logic Models

RALPH RENGER AND ALLISON TITCOMB

ABSTRACT

Developing a logic model is an essential first step in program evaluation. Our experience has been that there is little guidance to teach students how to develop a logic model that is true to its intended purpose of providing a clear visual representation of the underlying rationale that is not shrouded by including the elements of evaluation. We have developed a three-step approach that begins with developing the visual representation of the underlying rationale, central to which is the identification of **A**ntecedent conditions. Step 2 ensures that program activities **T**arget antecedent conditions, while Step 3 focuses on **M**easurement issues, depicting indicators and objectives for outcomes being included in the evaluation plan. We have coined this method of teaching the **ATM** approach. We hope that teachers of evaluation will find the ATM approach useful in the form presented here or at least stimulate thought as to how to adapt the approach to meet individual teaching needs.

A logic model is a visual representation of a plausible and sensible method of how a program will work under certain conditions to solve identified problems and is fundamental to program evaluation (Bickman, 1987; Dwyer, 1997; Julian, Jones, & Deyo, 1995). The *primary* purpose of the logic model is to enable "... program managers and evaluators to see more clearly the underlying rationale or logic of a program" (Chen, Cato, & Rainford, 1998–1999, p. 450). For the purpose of this article, underlying rationale refers to the visual representation of causal factors related to the problem. When teaching we also use the terms

Ralph Renger • College of Public Health at University of Arizona, 1435 N. Fremont Ave., Tucson, AZ 85712, USA; Tel: (1) 520-882-5852; E-mail: renger@u.arizona.edu.

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antecedent conditions, root causes, risk factors, or predisposing factors as synonymous with causal factors.

Developing the visual representation of the underlying rationale is challenging. Often program managers implicitly understand the underlying rationale of a program, but have not made them explicit. The logic model should make these implicit understandings explicit (McLaughlin & Jordan, 1999). Soliciting expert opinion and analyzing the research literature are two methods of making the underlying rationale explicit. Because this can be a time consuming and arduous task, program managers and evaluators may forego making the initial investment in developing a logic model. However, despite being a resource intensive task, investing time into developing the logic model is critical because ". . . everything which follows depends on how well the project is initially conceptualized" (Trochim, 1989, p. 1). Simply put, you get out what you put in.

In addition to clearly conveying the underlying rationale, logic models should depict, in a common sense manner, the relationship between underlying rationale and the *elements* of evaluation, which include resources, activities, objectives, indicators, impacts (i.e., short-term actions) and long-term outcomes of a program (Chen et al., 1998–1999; Dwyer, 1997; Julian et al., 1995; McLaughlin & Jordan, 1999). As will be demonstrated later in this article, showing the relationship between the elements of evaluation is much easier when the underlying rationale has been clearly expressed first. With the underlying rationale established, the complexity of the problem and the resources needed to address this complexity (e.g., partners with other expertise, time needed to change causal factors) are clearer. Knowing what causal factors are being targeted first is essential to assessing whether an activity is appropriately targeted, identifying appropriate indicators of change, and writing sound objectives.

Developing a logic model is fundamental to program evaluation and a core skill required by evaluators. The challenge for teachers is that while much has been written about the importance of logic models and the essential elements there is a dearth of literature that actually provides step-by-step instruction as to how to develop a logic model. The purpose of this article is to describe an approach we have developed in response to this need.

TEACHING LOGIC MODELS

It is important to note that we begin each semester by teaching students that planning is integral to evaluation. We explain that the logic model is essential in both planning *and* evaluation. We begin teaching logic models by first explaining their purpose emphasizing that the term "underlying rationale" refers to a visual representation of the root causes of the problem being targeted. We then introduce students to the essential elements of evaluation that are included in a logic model, namely resources, activities, objectives, indicators, impacts, and outcomes of a program. We stress that the elements of evaluation must be linked to the underlying rationale and are not intended to stand-alone.

With this foundation, our approach is to then provide students with different examples of logic models. We ask them whether the underlying rationale of the program is clear and whether the relationship between the underlying rationale and the elements of evaluation makes common sense. By engaging in this exercise we attempt to teach students two lessons: the consequences of trying to convey everything in a logic model and the consequences of failing to explicitly depict the underlying rationale.

Consequences of Trying to Convey Everything in a Logic Model

To illustrate the problem of trying to convey everything in a logic model, we provide students with examples of logic models such as those developed by Dwyer (1997) and McLaughlin and Jordan (1999). The logic model developed by Dwyer (1997) for a bicycle safety program contained 22 boxes grouped by 10 evaluation elements (e.g., goal, process objectives, etc.). Similarly, the logic model developed by McLaughlin and Jordan (1999) consists of 26 boxes grouped by seven evaluation elements. We point out to students that when we developed similar logic models on other projects, even though we involved stakeholders in the process to maximize buy-in, the final product was not always well received. Stakeholders complained that the elements of evaluation were detracting from the underlying rationale that they worked so hard to make explicit. We end the lesson by pointing out that many problems are complex and as such will require many boxes to clearly explain the underlying rationale. However, by overlaying all the elements of evaluation we may be defeating the purpose of the logic model because the underlying rationale of the program becomes shrouded.

Consequences of Failing to Explicitly Depict the Underlying Rationale

In teaching this lesson we introduce students to logic models such as those developed by Julian et al. (1995) which consist of three elements: the problem statement, the activities designed to resolve the problem, and the outcomes. These three elements are presented in a table format with one column dedicated to each element. Students quickly notice that it is difficult to glean the underlying rationale from the columns in the table. For example, in the logic model developed by Julian et al. (1995), the problem condition is clearly stated, namely that “the offspring of precariously housed, substance abusing women are likely to suffer a relatively high rate of birth anomalies and other developmental handicaps” (p. 339). Some of the activities listed include “individual and group substance abuse counseling,” “educational programs related to daily living skills and infant care, parenting and child health,” and “intensive case management during residential treatment and for 18 months after discharge.” The problem is that the underlying rationale being targeted by the stated activities is ambiguous. What behaviors, beliefs, attitudes, knowledge, or environmental causal factors is the counseling, educational programs, and case management trying to change? Without explicitly denoting the causal factors, it becomes very difficult to meaningfully show the relationship between the underlying rationale and the elements of evaluation, particularly the indicators, impact and outcome objectives. These same issues have been noted elsewhere (e.g., Weiss, 1995).

In summary, logic models are a fundamental first step in program evaluation. The two main features of the logic model are the visual representation of the underlying rationale and the relationship of elements of evaluation to this underlying rationale. The examples we provide to students demonstrate how attempting to convey the underlying rationale and all the elements of evaluation can create a logic model that is overwhelming. The examples also show that some logic models fail to visually depict the underlying rationale of the program making it virtually impossible to understand the relationship between the elements of evaluation and the underlying rationale. What is needed is a way to teach students how to develop a logic model that visually and clearly depicts the underlying rationale while at the same time not overwhelming potential users with the elements of evaluation.

OUR APPROACH TO TEACHING LOGIC MODELS

The three-step approach we use to teach students logic models results in a logic model that describes the underlying rationale and shows the relationship of the essential elements of evaluation to this underlying rationale. From this standpoint, the approach results in a product that is similar to other logic models. However, we believe our approach is a better process of teaching the essentials of developing and demonstrating the utility of logic models to students.

Step 1: Identify Antecedent Conditions of the Problem

The first step in developing a logic model is visually depicting the underlying rationale. The key word we use to help students establish the causal factors related to a problem of interest, or antecedent conditions as we refer to them, is *why*? This approach to getting at the root cause of a problem is not uncommon and has been used in other fields. For example, Ohno (1988) advocates asking "why" five times as a simple method for establishing the root causes for problems encountered in the automotive industry.

We suggest students begin uncovering the underlying rationale by soliciting opinions of experts through qualitative methods such as individual interviews. During the interview with an expert, students should be taught to continue asking "why" until the expert is satisfied that the underlying rationale of the problem is made explicit. This first step of defining the underlying rationale is identical to that used by other evaluators (McLaughlin & Jordan, 1999), but we also teach our students to rely on their knowledge of existing theories to guide their line of inquiry with experts. In the field of health education and promotion, our students are introduced to many theories, such as the PRECEDE-PROCEED (Green & Kreuter, 1999), Health Belief Model (Rosenstock, 1974), Stages of Change (Prochaska, Redding, & Evers, 1997), Theory of Reasoned Action (Fishbein & Ajzen, 1975) and so forth. As will be shown below, having knowledge of these theories can ensure that the visual depiction of the underlying rationale is as comprehensive as possible.

We will now illustrate how we teach students to develop the underlying rationale by drawing on an example we use in our class. The problem we present to students is that of bone fractures in the elderly: a growing concern, especially as our population ages. We ask students to assume that the group contacting them for help in planning and evaluating has expertise in physical activity. In trying to establish the underlying rationale the program evaluator begins by interviewing a physical activity expert in the organization. As a teacher we take the role of the expert. The student then begins by asking the expert why. The expert notes that bone fractures are caused by thinning bones (the first why). The student then asks what contributes to thinning bones. The expert answers that it is possible to prevent thinning bones by engaging in weight bearing exercise (the second why). When asked why some people do not engage in weight bearing activity to prevent thinning bones the expert suggests that lack of knowledge may be the root cause (the third why). The results of this line of inquiry are shown in Figure 1.

In our experience, students will immediately recognize that the depiction of the problem in Figure 1 is oversimplified. We then ask students how they would develop a more comprehensive understanding of the underlying rationale. One answer is that the question why may have to be asked again. Students are taught to continue asking experts why until the line of reasoning is exhausted. Another answer is that the student should ask the expert about causal factors identified in other theories with which they (the student) are familiar. In this public

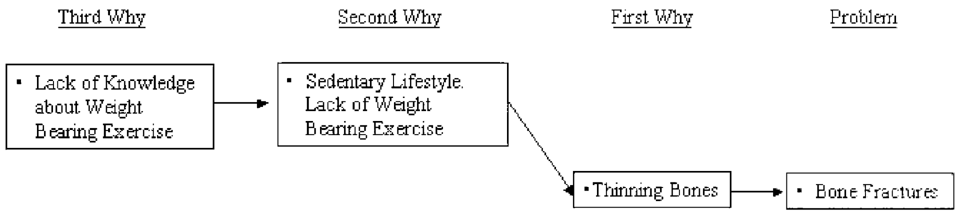

Figure 1. Beginning to establish the underlying rationale: identifying the antecedent (A) conditions.

health example, the student might rely on their knowledge of (a) the Stages of Change theory (Prochaska et al., 1997) and ask the expert whether self-efficacy is a causal factor in the decision of individuals to engage in physical activity, (b) the Theory of Reasoned Action (Fishbein & Ajzen, 1975) to ask whether social norms might be an important causal factor, (c) the Health Belief Model (Rosenstock, 1974) to ask whether the perception of susceptibility might be an important causal factor, or (d) PRECEDE-PROCEED to determine whether any predisposing, behavioral, or environmental factors might have been overlooked. We teach students that they must walk a fine line between assisting the expert in developing a comprehensive understanding of the underlying rationale by using their knowledge of existing theories and biasing them. This is why we suggest that students employ their knowledge of other theories *after* the expert is comfortable that they have nothing more to add. The evolving logic model in Figure 2 shows how other causal factors have been included as a result of prompting.

We also teach students that their knowledge of existing theories is useful in identifying other experts that can help further develop the underlying rationale. For example, a student might use his/her knowledge of PRECEDE-PROCEED to realize that that the evolving underlying rational in Figure 2 is devoid of environmental factors. The teacher can then assume the role of an environmental health expert. Through inquiry, the expert notes that many fractures are due to falls in the home. The expert goes on to note that falls occur because precautions such as slip proof surfaces in the shower and handrails for staircases have not been installed in the home. The evolving logic model depicting the newly identified antecedent conditions is shown in Figure 3.

Once experts have been interviewed, we teach students to examine the research literature for empirical support of causal factors identified by experts and to identify other causal

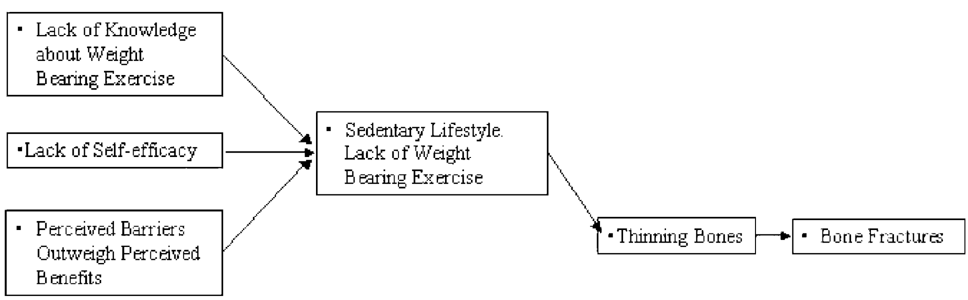

Figure 2. The evolving underlying rationale.

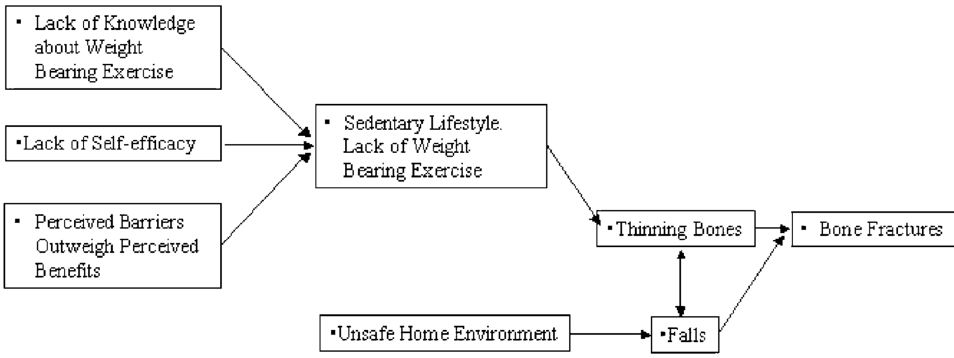

Figure 3. Using knowledge of theory to prompt expert in developing a more comprehensive understanding of the underlying rationale.

factors that may have been missed during the interviews. We usually assign this as a take home assignment. In our example there is a substantial body of literature relating to the importance of calcium intake that contributes to thinning bones, and this should be included in the visual representation of the underlying rationale. This is shown in Figure 4. Notice that as the underlying rationale evolves it is often necessary to make alterations to the visual representation. For this reason we recommend that students use a white board to complete the exercise.

Once a visual representation is developed, students are reminded of the importance of verification. Providing a one page visual representation of the underlying rationale and a brief written summary for experts to verify the logic model. This is similar to the checking stage used by McLaughlin and Jordan (1999).

Our experience has shown this first step to very time consuming, accounting for upwards of 75% of the resources needed to develop an evaluation plan. The relative resources needed for planning versus evaluation is similar to that experienced and reported by other evaluators

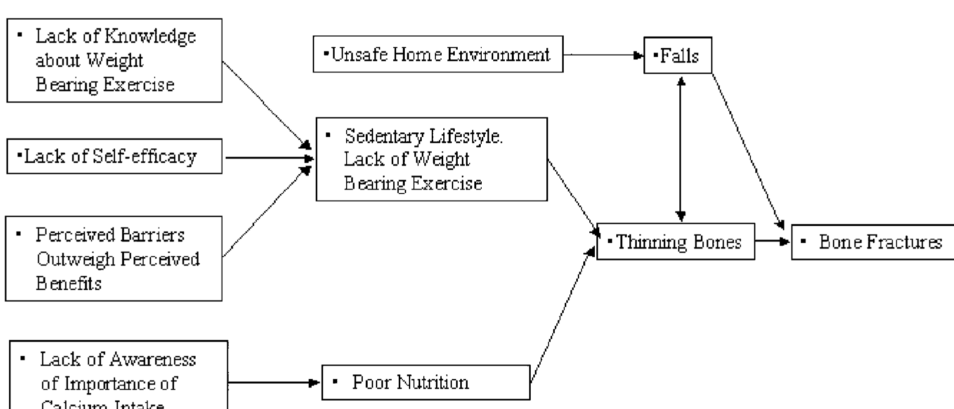

Figure 4. Including research literature to develop a more comprehensive understanding of the underlying rationale.

(Goodman, Steckler, Hoover, & Schwartz, 1992). When this fact is shared with students it reinforces for them the importance of planning in the evaluation process.

Step 2: Identifying the Antecedent Conditions Targeted by the Proposed Program

Students are taught that, once the underlying rationale is established, it is possible to begin discussions about the type of program that will be implemented. That is, it is only "logical" that the proposed program target the causal factors identified in the visual representation of the underlying rationale. Students are taught to insist on a detailed description and protocol of the proposed program. Then using the visual representation students are taught to shade the causal factors in the underlying rationale that the proposed program will target. This exercise is important for two reasons. First, it will assure that proposed program components are appropriately targeted. Assume in our example that the proposed program will be a 4-week educational curriculum. It is proposed that the first half will target knowledge and the second half will target self-efficacy. It is hoped that if knowledge and self-efficacy are improved, then people will become more active. If people are more active, then this should result in stronger bones and less susceptibility to bone fractures. By shading the boxes in the visual representation it is evident that the importance of addressing perceived barriers and benefits has been overlooked in the curriculum (see Fig. 5). Thus, program decision makers can be made aware of this oversight and adjust their proposed program accordingly.

This has proven to be a very valuable step in the planning process. It reinforces for students the importance that a proposed program must target causal factors. It serves to remind students that the program components must specifically change these factors. Doing so will help avoid what a colleague refers to as activity traps (Lynn, 1999). Activity traps are activities that seem like a good idea and perhaps carry political value, but do not target antecedent conditions related to the problem.

Elements of evaluation that can be addressed after Step 2. At the completion of Step 2 (identifying the activities targeting antecedent conditions), we begin to teach students

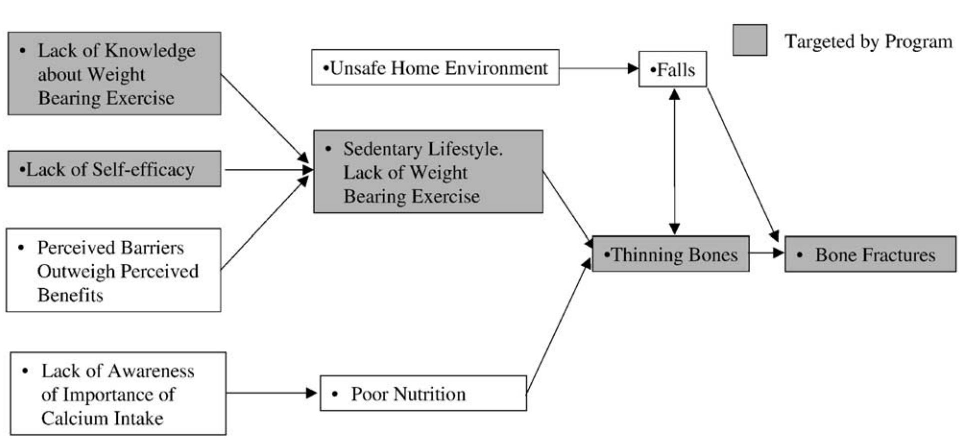

Figure 5. Ensuring proposed activities target (T) the underlying rationale.

how to begin to overlay some of the elements of evaluation. By having a visual representation and understanding of the underlying rationale, it becomes possible to identify the types of *resources* needed, such as potential partners. From Figure 5 it can be seen that partners in nutrition and environmental safety would be needed to fully address the problem of reducing bone fractures. To avoid the problem of overcomplicating the logic model, we teach students to only include elements of evaluation for which the evaluator is directly responsible. With respect to resources, it is our contention that it is the responsibility of those intending to fund and implement a program to determine whether adequate resources exist to implement the program. Certainly the visual representation of the problem can assist the decision makers in this analysis, but it does not need to be included in the visual representation. The evaluators' primary concern is in the final decision, namely whether those responsible for the program believe they have the resources to continue. Therefore, we recommend to students not to place the resource element in the visual representation.

The second element is activities. Our students are taught to encourage program managers to develop detailed descriptions of the program components. With this detail it is possible to determine the extent to which the intended activity is appropriately targeted. In our example we would want to ensure that the proposed curriculum contains details about the knowledge being provided and the exercises that will be used to improve self-efficacy. Again, we suggest that students not overlay the detail of the activities, but use the visual representation to link proposed program components to targeted causal factors (i.e., shaded boxes in Fig. 5).

We also point out to students that another advantage of shading the causal factors being targeted is that program decision makers can quickly conceptualize the complexity of the program and the degree to which their proposed program addresses this complexity. Conceptualizing where one's program fits in the big picture helps create more realistic expectations regarding expected changes in outcomes. From Figure 5, it can be observed that the proposed program only targets knowledge of the importance of weight bearing exercise and self-efficacy. From the visual representation it is evident that other partners or resources would need to be brought to bear to effect change in the nutritional and environmental conditions. If such partners are not forthcoming, then the likelihood of observing change in bone fractures is reduced.

The third element is outcomes. Because of the confusion that can exist between the terms impact and outcomes, we teach students to think of outcomes as being proximal or distal. This appears to be conceptually easier for students because proximal outcomes relate to causal factors identified in the visual representation and distal outcomes relate to the endpoints, or far right-hand-side of the diagram. In our example, the distal outcome is bone fractures and the proximal outcomes relate to the many causal factors depicted in the visual representation of the underlying rationale. The shaded boxes are again useful in helping the student understand and pinpoint which of the many potential outcomes will be of interest in the evaluation. We make the case to students that proximal and distal outcomes are the direct responsibility of evaluators, should be depicted in the logic model, and that the shaded boxes are in essence the outcomes of interest. We teach our students about the importance of process outcomes and that they must be tailored to the specifics of the program (i.e., another reason for detailed study protocols). However, it is very difficult to depict these details visually so again we suggest that they not be included in the visual representation.

Another advantage of shading the targeted causal factors (i.e., proximal and distal outcomes) is that it provides students with a better understanding of what might be expected to change given the funding duration of the program. Short funding cycles are a reality of today's world. Programs are often too short in duration to observe change in the distal outcomes. If the causal links identified in the underlying rationale are empirically strong, a convincing case can be made that if changes in the proximal outcomes can be observed then it is logical to assume that changes in the distal outcome will follow, even though the length of funding does not permit direct assessment of the distal outcomes.

Step 3: Representing Measurement in the Logic Model

From Step 2, activities targeting antecedent conditions, it is now clear to students what outcomes are expected to change as a result of the proposed program. It is now possible to overlay the elements of evaluation of indicators and objectives. The question we teach students to ask at this step is, for which outcomes identified in Step 2 are indicators necessary? Students are taught to systematically examine each shaded box and ask whether changes in the outcome can be expected during the course of the program (Green & Kreuter, 1999; Renger, Carver, Custer, & Grogan, 2002). The value of dedicating program and evaluation resources to identifying, implementing, and monitoring indicators for outcomes not expected to change is questionable.

To ensure that the visual representation of underlying rationale remains at the core of the logic model, students are instructed to place it at the top of the page and set it apart from the indicators by placing a line across the page. Drop-down arrows are then used to identify those outcomes for which indicators are needed (i.e., those expected to change during the course of the program). On some occasions, reliable and valid indicators/measures are lacking to assess change in the outcome of interest. We share with students our experience that stakeholders may become disheartened when they learn that outcomes being targeted may not be measurable. We learned that the source of these stakeholders' discouragement was that they equated the inability to measure change in the outcome with the need to abandon the program. This certainly is not true.

Figure 6 shows two drop-down arrows for the outcomes related to knowledge and self-efficacy. We provide a caveat to the students that the proposed program is only 4 weeks in duration with no additional funding. Students should be able to reason that because there are insufficient resources to track changes in sedentary lifestyle changes, thinning bones, and bone fractures, drop-down arrows should not be drawn from these outcomes signifying that these outcomes will not be assessed in the evaluation plan.

Objectives should only be written for outcomes that are targeted (i.e., shaded in Step 2) and for which indicators have been deemed necessary and identified (i.e., drop-down arrows in Step 3). In our example, we provide students with indicators to assess change in knowledge (NIH, 2001) and self-efficacy (Marcus, Selby, Niaura, & Rossie, 1992). Knowing the problem (i.e., bone fractures in the elderly), the details of the program (i.e., 4 weeks), the outcomes being targeted (i.e., knowledge and self-efficacy), and the indicator by which change will be assessed (i.e., the knowledge and self-efficacy instruments) provides the essential components necessary for writing an objective, the who, when, what and how much, respectively (Green & Kreuter, 1999).

This approach to writing objectives is in contrast to many evaluation guides that suggest writing goals and objectives first. While the writing of a goal statement early in the process is appropriate, the same is not true for writing objectives. How often have we seen students struggle in learning how to write objectives or heard stakeholders complain about having to

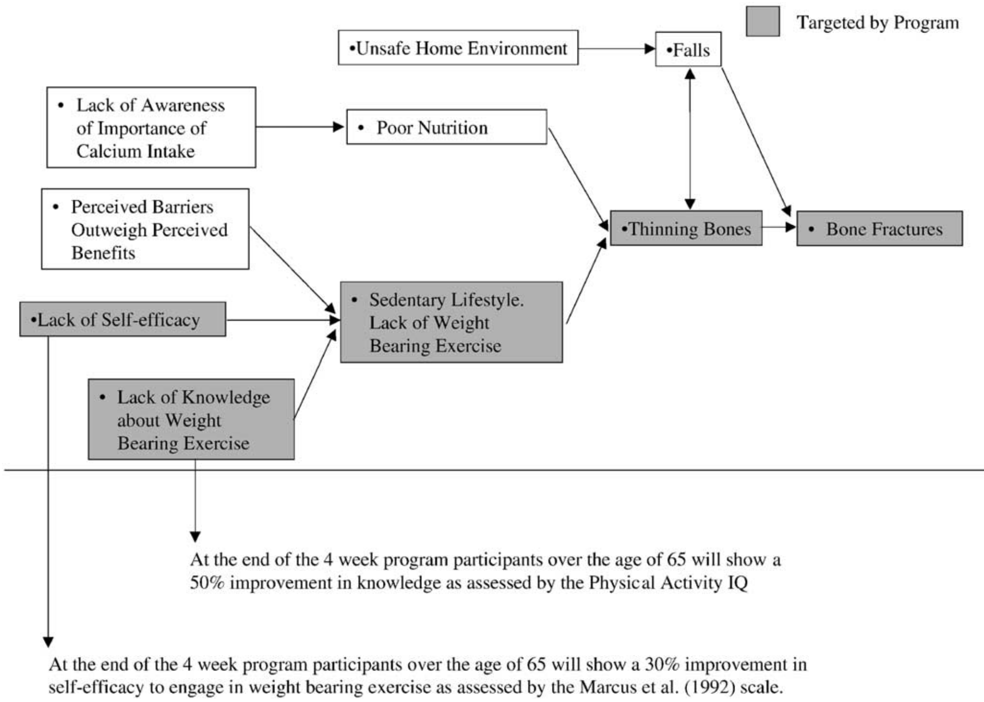

Figure 6. Depicting objectives in the logic model.

continually rewrite objectives? Our process makes the writing of objectives for students and stakeholders easier to learn and to accomplish.

SUMMARY

Developing a logic model is an essential first step in program evaluation. Our experience has been that there is little guidance to teach students how to develop a logic model that is true to its intended purpose of providing a clear visual representation of the underlying rationale that is not shrouded by including the elements of evaluation. We have developed a three-step approach that begins with developing the visual representation of the underlying rationale, central to which is the identification of **A**ntecedent conditions. Step 2 ensures that program activities **T**arget antecedent conditions, while Step 3 focuses on **M**easurement issues, depicting indicators and objectives for outcomes being included in the evaluation plan. We have coined this method of teaching how to develop a logic model the **ATM** approach. We hope that teachers of evaluation will find the ATM approach useful in the form presented here or at least stimulate thought as to how to adapt the approach to meet individual teaching needs.

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REFERENCES

Bickman, L. (1987). The functions of program theory. In L. Bickman (Ed.), *Using program theory in evaluation. New directions for program evaluation, no. 33*. San Francisco: Jossey-Bass.

Chen, W. W., Cato, B. M., & Rainford, N. (1998–99). Using a logic model to plan and evaluate a community intervention program: A case study. *International Quarterly of Community Health Education*, *18*(4), 449–458.

Dwyer, J. (1997). Using a program logic model that focuses on performance measurement to develop a program. *Canadian Journal of Public Health*, *88*(6), 421–425.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.

Goodman, R., Steckler, R., Hoover, S., & Schwartz, R. (1992). A critique of contemporary community health promotion approaches: Based on a qualitative review of six programs in Maine. *American Journal of Health Promotion*, *7*, 208–220.

Green, L. W., & Kreuter, M. W. (1999). *Health promotion planning: An educational and ecological approach* (3rd ed.). Mountain View: Mayfield.

Julian, D. A., Jones, A., & Deyo, D. (1995). Open systems evaluation and the logic model: Program planning and evaluation tools. *Evaluation and Program Planning*, *18*, 333–341.

Lynn, D. (personal communication, February 10, 1999).

Marcus, B. H., Selby, V. C., Niaura, R. S., & Rossi, J. S. (1992). Self-efficacy and the stages of exercise behavior change. *Research Quarterly of Exercise and Sport*, *63*, 60–66.

McLaughlin, J. A., & Jordan, G. B. (1999). Logic models: A tool for telling your program's performance story. *Evaluation and Program Planning*, *22*, 65–72.

NIH. (2001). Physical activity and heart disease I.Q. Available at http://www.nhlbi.nih.gov/health/public/heart/obesity/phy_act.htm. Accessed April 26.

Ohno, T. (1988). *Toyota production system*. Portland, OR: Productivity Press.

Prochaska, J. O., Redding, C. A., & Evers, K. E. (1997). The transtheoretical model and Stages Of Change. In K. Glanz, F. M. Lewis, & B. K. Rimer (Eds.), *Health behavior and health education: Theory, research, and practice* (pp. 60–84). San Francisco: Jossey-Bass.

Renger, R., Carver, J., Custer, A., & Grogan, K. (2002). *How to engage multiple stakeholders in developing a meaningful and manageable evaluation plan: A case study*. Manuscript submitted for publication.

Rosenstock, I. M. (1974). The Health Belief Model and preventive health behavior. *Health Education Monographs*, *2*, 354–386.

Trochim, W. M. K. (1989). An introduction to concept mapping for planning and evaluation. *Evaluation and Program Planning*, *12*, 1–16.

Weiss, C. H. (1995). Nothing so practical as good theory: Exploring theory-based evaluation for comprehensive community initiatives for children and families. In J. P. Connell, A. C. Kubisch, L. B. Schorr, & C. H. Weiss (Eds.), *New approaches to evaluating community initiatives*. Washington, DC: Aspen Institute. http://www.aspenrountable.org