



Evaluating Services and Systems Interventions

LEARNING
AND GROWING
THROUGH
EVALUATION

MODULE 5

2021 Updates

MODULE 5

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Copies of *Learning and Growing through Evaluation: Asthma Program Evaluation Guide* can be viewed or downloaded from http://www.cdc.gov/asthma/program_eval/guide.htm

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Chapter 1 Evaluating Services and Systems Interventions

After reading this module, users should be able to:

- ② Understand how to apply the CDC Framework for Program Evaluation in Public Health to the evaluation of services and systems interventions.
- ② Develop an individual evaluation plan for an asthma service or system intervention.
- ② Implement a service or system evaluation in a manner that conforms to professional evaluation standards.
- ② Translate findings into an action plan to improve asthma interventions.

Program evaluation can help us see how our intervention efforts are contributing to intended change. **PROGRAM EVALUATION** can also provide insight into program modifications to improve efficiency. Because of the complex environments in which public health programs operate, our evaluation probably can't definitively tell us whether an **INTERVENTION** is directly responsible for an outcome, but it can help us make difficult decisions about where to target funding and other resources.

Module 5 of the *Learning and Growing through Evaluation* series focuses on evaluation of service and systems interventions. We are using the term intervention to refer to any group of **ACTIVITIES** that are coordinated by the asthma program to achieve **OUTCOMES**. Service interventions are those that are targeted to individuals with asthma, their families, and other caregivers. Systems interventions address issues more broadly, often at the population level. We emphasize interventions that are evidence-based. These interventions are capable of yielding their intended impact across a variety of settings, as evidenced through systematic peer reviews and rigorous evaluations (Spencer, 2014).

We define an intervention as any group of activities coordinated by the asthma program to achieve outcomes.

The module begins with a brief overview of how interventions fit within a comprehensive public health approach to asthma control, and looks at how you can use **EVIDENCE-BASED INTERVENTIONS** to achieve program goals. The remainder of the module describes how the CDC *Framework for Program Evaluation in Public Health* (1999) is applied to an evaluation of intervention(s). To facilitate use, we have revisited some topics found in other modules, while focusing on application to interventions. **Appendix A** includes additional information (highlighted in **Blue** and indicated with a leaf in the margin), and **Appendix B** is a glossary of terms (highlighted in **GREEN**). Additional appendices include practical information and tools for evaluating asthma interventions: **Appendix C** for evaluating the interrelation between infrastructure and interventions, **Appendix D** on using social science theory in evaluation, and **Appendix E** on selecting indicators.

Asthma Interventions for a Comprehensive Public Health Approach to Asthma Control

Evidence-based interventions are known to achieve and sustain substantial improvements in the health and wellbeing of people with asthma and their families (Spencer, 2014). Results from published meta-analyses, systematic literature reviews, and evaluation studies using experimental and quasi-experimental designs suggest there are six interventions that work to reduce the burden of asthma. These evidence-based interventions are described in CDC's

 **Technical Package** for asthma programs, which is organized according to the acronym EXHALE. To appropriately serve people with asthma, asthma programs should combine some or all of these interventions into multi-component interventions.

The EXHALE Evidence-based Interventions

Education on asthma self-management

X-tinguishing smoking and exposure to secondhand smoke

Home visits for trigger reduction and asthma self-management education

Achievement of guidelines-based medical management

Linkages and coordination of care across settings

Environmental policies or best practices to reduce asthma triggers from indoor, outdoor, or occupational sources

Asthma Interventions and the Comprehensive Public Health Approach to Asthma Control Logic Model

The *Comprehensive Public Health Approach to Asthma Control through Evidence-based Interventions* **LOGIC MODEL (Figure 1.1)** shows how successful implementation of strategies to enhance an asthma program's infrastructure (i.e., leadership/program management, strategic partnerships, surveillance, communications, and evaluation) combined with leveraging partnerships to expand EXHALE strategies work together to ultimately improve health for individuals who have asthma, lower costs associated with asthma, and provide better asthma-related care.

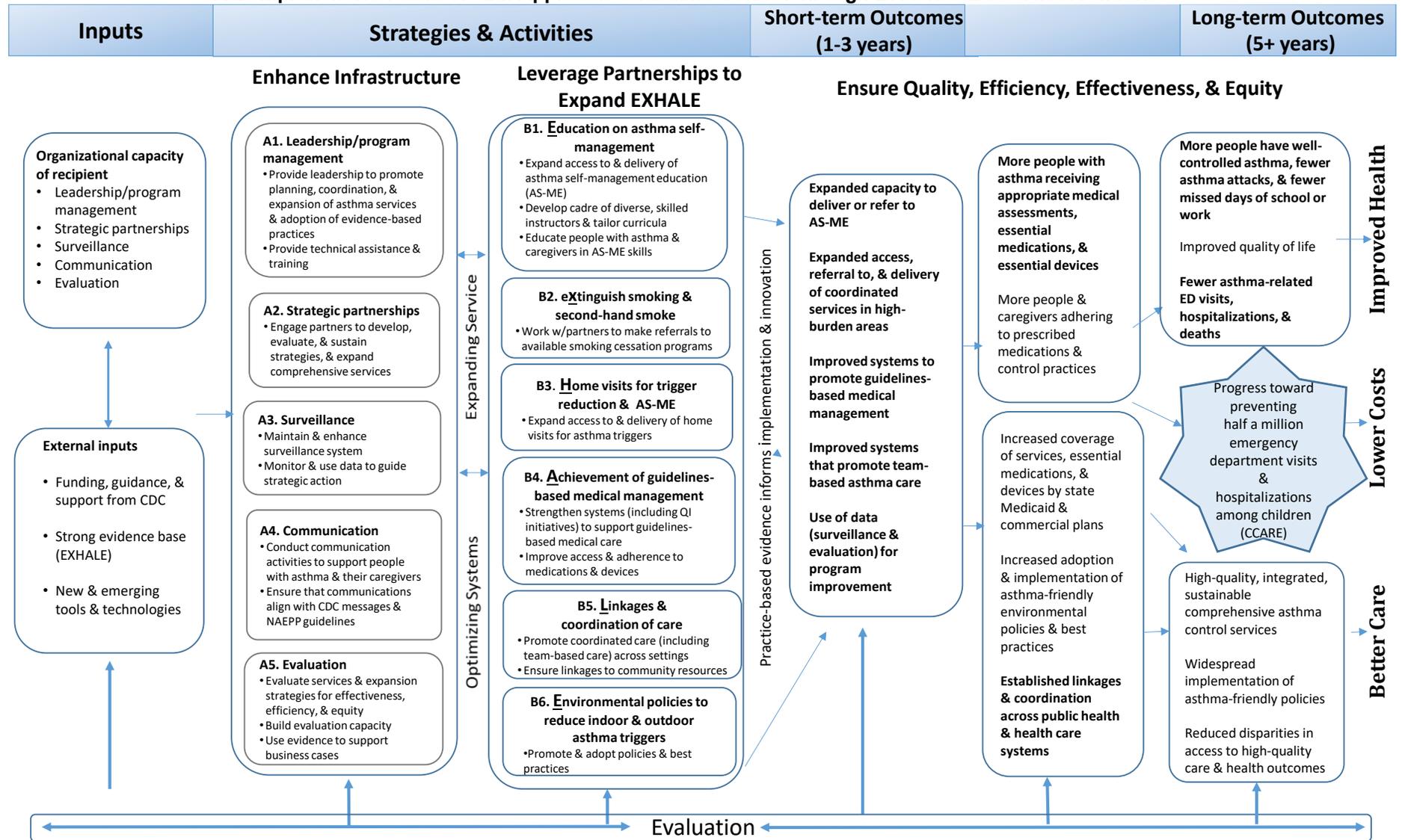
Asthma programs can work with their partners to expand EXHALE strategies by **EXPANDING SERVICE STRATEGIES** which entails providing direct support to people with asthma by ensuring they receive asthma self-management education (AS-ME) (B.1), offering referrals to smoking cessation programs (B.2), and improving access to home visits to reduce asthma triggers and deliver AS-ME (B.3). Additionally, asthma programs can work with their partners to use **OPTIMIZING SYSTEMS STRATEGIES** to facilitate population-level change. These systems strategies include actions such as strengthening healthcare systems to support guidelines-based medical care for asthma (B.4), promoting coordinated care (B.5), and promoting the adoption of policies related to decreasing exposure to indoor and outdoor asthma triggers (B.6). Finally, the comprehensive approach means that the approaches used to expand service strategies and those optimize systems strategies work together. First they link

people with asthma to guidelines-based care. Second, they link those whose asthma remains poorly controlled to more individualized services (intensive self-management education, home-based trigger-reduction services, and other environmental management strategies).

- 🌱 The **evaluation planning team** should discuss whether the intervention being evaluated is part of an Expanding Service Strategy or an Optimizing Systems Strategy. Although there are conceptual overlaps, identifying where change is intended will help guide the evaluation. The intervention level will determine the **AUDIENCE** for the intervention. Audiences for Expanding Service Strategies may be individuals with asthma, their families, and individual healthcare providers. Audiences for Optimizing Systems Strategies may be health care organizations, their administrators, and policymakers. Often, systems strategies are designed to support and promote service-based strategies. You must also consider the **SETTING** in which the intervention will occur (e.g., homes or schools), when thinking about the audience.

All asthma program interventions are undertaken with the support of the asthma program's infrastructure (e.g., surveillance, leadership, strategic partnerships). Given this, it is just as important to evaluate the infrastructure strategies used by the asthma program as it is to evaluate the interventions. You can learn more about how to evaluate two important infrastructure strategies by reviewing Modules 3 and 4 of the *Learning and Growing through Evaluation* series. Module 3 provides insights about how to evaluate asthma program partnerships. Module 4 includes details for evaluating asthma surveillance.

Figure 1.1 Asthma Program Logic Model
A Comprehensive Public Health Approach to Asthma Control through Evidence-Based Interventions



Although the main text of Module 5 focuses on evaluating service and systems strategies, **Appendix C** of this module addresses how the connections between the asthma program infrastructure and these intervention strategies can be evaluated. Since the interconnections among infrastructure, services, and systems are essential to realizing the intended program outcomes, you may need to draw on multiple aspects to appropriately evaluate your interventions.

The Role of Performance Measures in Evaluating Interventions

CDC asthma awardees are required to collect performance measures. **PERFORMANCE MEASURES** are important tools for managing a program; they clarify “what” is occurring related to the program. Unlike evaluation, performance measures do not answer “why” or “how” questions. However, they can provide insights that are helpful in identifying and prioritizing program areas that may benefit from evaluation.

It will be helpful for the **EVALUATION PLANNING TEAM** to review the **PERFORMANCE MEASUREMENT** data related to the intervention you will be evaluating. For example, if you are considering evaluating a self-management education intervention, you may find it helpful to examine data that you are collecting already (see the textbox to the right). Perhaps an analysis of your performance measurement data indicates that the number of program participants attending the recent self-management sessions do not reflect what you expected. This points to a potential focal point for your evaluation—finding out what barriers exist in identifying and recruiting program participants and what strategies can work to overcome the barriers.

Examples of Performance Measures:

Below are a few of the performance measures from the Notice of Funding Opportunity published in 2019.

- Number and description of existing, new, and discontinued services supported by the recipient and their partners, by geographic area and intervention type; and alignment of services with high burden geographic areas.
- Number and demographics of people with asthma who initiated and attended at least 60 percent of sessions of guidelines-based asthma self-management education.

Applying the CDC Framework to Services and Systems Evaluation

In the following sections, we walk through the six steps of the CDC Framework. In Module 1, Chapter 2 of *Learning and Growing through Evaluation*, your Strategic Evaluation Planning Team developed a **STRATEGIC EVALUATION PLAN** where you identified one or more interventions to evaluate. You can use the information included in Module 5 to identify members for an **Evaluation Planning Team**. These members can then work together to develop an **INDIVIDUAL EVALUATION PLAN** for each intervention.

 Prior to making the decision to evaluate a particular intervention, you may wish to conduct an **evaluability assessment** to determine how feasible it is to conduct an evaluation at a given time (Leviton & Gutman, 2010).

Step 1 – Engage Stakeholders

STAKEHOLDERS are important to evaluation at all stages, from planning to implementation to using evaluation findings to improve your intervention strategy. The stakeholders for a given intervention strategy will vary. Knowing the audience, setting, and type of change expected will help you identify the people you need to engage in the evaluation. In deciding whom to engage, you might ask the following questions:

- Who is the intervention ultimately intended to affect (e.g., persons with asthma)?
- Who is supposed to participate in the intervention (e.g., medical practitioners)?
- Who are the people implementing the intervention?

Consider including people from each of these groups as stakeholders in your evaluation.

For services interventions, your stakeholders may include people with asthma, their family members, diverse community members (including teachers, coaches, and employers), health care providers, service delivery staff members, direct supervisors and managers of services, local program personnel, and asthma program staff members. For systems interventions, stakeholders may include state or regional directors for health care systems or chains, insurers and plan representatives, managers and staff members from related programs, school superintendents, housing authority administrators, state legislature personnel and members, and asthma program staff members. The setting for the intervention will also influence decisions about whom to include as stakeholders in the evaluation.

Remember to discuss with your stakeholders what information they will need from the intervention evaluation and when they will need it. For example, if the Evaluation Planning Team is designing an evaluation for an intervention taking place within a school setting, they will need to account for the school calendar and major activities taking place within it. The needs for information and timing of these needs will drive many of the decisions you make in the following steps.

-  To enhance the **cultural responsiveness** of your evaluation, it is critical to engage stakeholders who reflect the diversity of the community. Try to employ strategies to ensure that all perspectives are respected in the design, conduct, and use of evaluation.

We recommend that you bring stakeholders into the planning process early by including them in your Evaluation Planning Team. For this team, you will want to include stakeholders who are particularly knowledgeable about the intervention you are evaluating. Include those who are involved in implementing the intervention, organizational leaders who can help to provide access to data or to the intervention setting, beneficiaries of the intervention or their representatives, people who are interested in the evaluation findings, funders, and people who have access to data or will be involved with data analysis. Not all of these people may need or want to be part of the day-to-day evaluation planning, but most will be interested in the opportunity to provide input into the **EVALUATION DESIGN** or in receiving information about the evaluation's progress and findings.

 Your **Evaluation Implementation Team** may include the same members as your Evaluation Planning Team, or you may decide to bring in different members to help. Depending on the evaluation design, you may need the cooperation of your intervention partners. These partners may work at several different levels within their organizations. For example, if your design called for a small delay in the start of an intervention, to allow for baseline data collection, your team would need to reach out to the site’s leaders. It is important for the organizational leaders at the intervention site to understand the rationale for the delay. If your design called for support from clinic personnel to collect information from or provide information to patients, to pull medical records, or to abstract medical records, it would be important for some of these personnel to ensure that the design is feasible and that all required ethics paperwork and reviews are accounted for in the evaluation timeline.

Step 2 – Describe the Intervention

The evaluation of your intervention starts with a clear description of the overall service or system strategy, the interventions that comprise it, and how they interrelate to achieve outcomes. This step in the evaluation cycle is typically where you will begin to discuss the general scope of what is on the table to evaluate—meaning you will begin making a determination as to whether you will develop evaluation questions (in Step 3) that pertain to the entire intervention strategy (all related interventions), some part of the strategy (selected interventions), a specific intervention, or a subset of activities within an intervention. For example, within the school-based services strategies, an intervention evaluation may examine the effects of an entire intervention, or it may ask questions about segments of an intervention (e.g., a caregiver education strategy in one school or a training intervention for coaches in a particular school district).

Most intervention strategies are either implicitly or explicitly based on some type of social science theory. **THEORY-DRIVEN EVALUATION** involves using theory to describe how your intervention is expected to work and then designing the evaluation to test that theory. For those who wish to review more information on how social science theory can be used to inform your asthma intervention evaluation, see **Appendix D**.

Using a logic model may help you better understand the theory of change behind the interventions. The model can also describe the overall intended operations of the program. As explained in Module 1, *Learning and Growing through Evaluation*, logic models are a good way to graphically depict your program. Typical components of a logic model include **INPUTS**, activities, **OUTPUTS**, and outcomes. You may also want to consider including elements of **CONTEXT** that affect the implementation of your interventions or the outcomes it can achieve. Even if your evaluation purpose is narrow, it is generally important to map out all of the aspects of the intervention.

While the overarching logic model (**Figure 1.1**) will help frame how your overall program is operating, you will need to customize your logic model so that it matches the intervention you will evaluate. The new logic model needs to clearly show the type of change(s) your intervention intends to achieve, as well as a clear and logical set of activities that will achieve that change. You may want to include information, such as

- The intended population or setting affected (e.g., what population(s) should experience the change).
- The specific change(s) sought (e.g., what type(s) of behavior change).

- The time period (e.g., when change is expected to occur).
- The costs or resources needed to implement the intervention in a real-world setting.

In addition to a pictorial description of the intervention, a written description of the intervention can serve as a communication tool to ensure that all stakeholders are informed as the evaluation moves forward. Developing this intervention description with your stakeholders will help ensure that members of your Evaluation Planning Team share a common understanding of the intervention being evaluated and what it is expected to accomplish.

For your intervention description, you can build on what you developed earlier in your Strategic Evaluation Plan. To expand this initial description, questions in the Individual Evaluation Plan Template in Module 1, **Appendix E** of *Learning and Growing through Evaluation*, can help you develop or refine your intervention description.

Step 3 – Focus the Evaluation Design

Developing good **EVALUATION QUESTIONS** is at the heart of any evaluation, and is an important part of focusing the evaluation design. Your questions will determine all evaluation activities that follow, from your design to your data collection strategy. There are many aspects of an intervention that you could potentially evaluate. High-level evaluation questions you may want to address include

- What did we do?
- How did we do it?
- Who was affected?
- What change(s) did we accomplish?
- How can we improve upon what we have done?
- How did the context affect our implementation (process) or our results (outcomes)?

However, given time and resource constraints, you will need to focus your evaluation to ensure that it is both useful and feasible. It is important to focus the evaluation questions on stakeholder needs—what can they most directly use the evaluation information for and when? Then pick three to five key evaluation questions to structure the evaluation around. You may find it helpful to ask yourself, the Evaluation Planning Team, and other stakeholders the following questions to help with the prioritization process:

- What do we most need to know about this intervention?
- What issues or challenges do we face with this intervention and need to know more about?
- Which boxes in the logic model seem most important at this point in time?
- Which links between boxes in the logic model seem most important at this point in time?
- What level and type of change can be accurately measured at this stage?

Remember to consider how long an intervention has been operating when selecting your evaluation questions. The Good **Evaluation Questions Checklist** can help with this process (www.cdc.gov/asthma/program_eval/assessingevaluationquestionchecklist.pdf).

Process Evaluation Questions

Table 1.1 lists some process evaluation questions that are appropriate for interventions targeting any type of change. Evaluation questions about inputs and activities (e.g., dose delivered, dose received, fidelity to original intervention plan, and reach of intervention) are characteristic of a process evaluation (Steckler & Linnan, 2002). However, you can also use process targets to explain how outcomes were reached in an outcome evaluation.

Depending on your intervention's stage of development, you may decide to conduct a process evaluation only. If the outcomes you expect have not yet had a chance to materialize, then an outcome evaluation does not make sense (though starting to set the stage for one by collecting baseline data may make sense). For an intervention that has only been operating for several weeks or months, process evaluation can assess fidelity to the intended model and may show ways to improve and enhance the intervention, thereby promoting the likelihood of positive outcomes.

Table 1.1 Intervention Evaluation Question Types – Process Questions

Process Evaluation Questions
Inputs
What are the starting conditions and contexts?
To what extent are the resources available for intervention implementation adequate?
To what extent are the true needs of the community being addressed by the intervention?
In what ways, if any, does the intervention fit with the overall strategy for asthma control?
Activities and Outputs
What key activities were implemented?
Was the intervention implemented as planned?
To what extent is the intervention reaching the appropriate priority population?
How well was the intervention administered? What are some opportunities for improvement?
With what level of fidelity is the intervention being implemented? Where does it stray from fidelity and what contributes to this deviation?
Is the intervention acceptable to the intended participants? Is it culturally appropriate? Is it feasible?
Is the intervention being used by the intended participants? How is it being disseminated?
What are the major barriers or facilitators to implementing the intervention successfully?
Context
What support has been mobilized for action?
What progress has been made in capacity-building to support increased implementation?
How sustainable is the intervention over time?
How well coordinated is the intervention with other interventions in the community or system?

Outcome Evaluation Questions

Table 1.2 presents generic outcome questions. Questions that focus on short-, medium-, or long-term changes are characteristic of outcome evaluations. The outcome evaluation questions for short- and medium-term outcomes need to match your intervention description and the specific type(s) of change intended. However, long-term health outcomes are often achieved through a convergence of short-term and intermediate changes in intended outcomes.

Table 1.2 Intervention Evaluation Question Types – Outcome Questions

Outcome Evaluation Questions
Short-Term Outcomes
To what extent, if at all, has knowledge or awareness of asthma changed?
To what extent, if at all, have skills and behaviors related to asthma changed?
What initial steps, if any, have key decision makers taken to facilitate environmental changes?
Have leaders made changes in policies or procedures to facilitate asthma control? What types of changes are most common and how do they align with the intent of our intervention?
Have relationships or linkages been formed to promote systems change? What types? Which are most common?
Medium-Term Outcomes
To what extent, if any, has the intervention contributed to changes in asthma management and care?
To what extent, if any, has the intervention affected the level or amount of asthma triggers?
What types of [knowledge or awareness, behavior, environmental, or systems changes], if any, have resulted from enacting the policy?
To what extent, if any, has the systems change resulted in [knowledge or awareness, behavior, environmental, or policy changes]?
Long-Term Outcomes
What has been the effect of the intervention, if any, on the health and quality of life of individuals or families affected by asthma? What is the direction and magnitude of these changes?
To what extent, if at all, has the intervention contributed to addressing asthma disparities? What types of disparities were most likely to be impacted through this intervention?
Were there any unintended (positive or negative) outcomes as a result of this intervention? How did they come about?
What was the cost-benefit or cost-effectiveness of the intervention?
What opportunities exist for enhancing the impacts of the intervention?

When you conduct an outcome evaluation it is important to also collect data about the process to help you interpret the outcomes. For example, if you know that your intervention was well implemented, you will feel more confident that your intervention was responsible for the changes you observe. Similarly, if you learn that expected outcomes are not occurring as planned, data about the process implementation can provide insights about whether the model was implemented as intended.

To a great extent, your evaluation questions will drive your evaluation design (see Module 2, *Implementing Evaluations*, **Appendix E** for more information on evaluation designs). If you want to answer a causal question (e.g., did the intervention result in the outcomes observed?), you will want to consider an evaluation design that helps to rule out **THREATS TO INTERNAL VALIDITY**. In this case you may need an evaluation design that includes a **COMPARISON GROUP** or **CONTROL GROUP**. If you want to examine change over time, you will need to include **REPEATED MEASURES**. Depending upon the priority evaluation questions identified, you may also want to consider including some elements of cost evaluation in your design (see Module 6, *Economic Evaluation*).

If you are interested in looking at the system as a whole, parsing out which components of the intervention contributed most to the outcomes may be difficult in some cases. Applying a **SYSTEMS THINKING** lens and complexity theory can help you develop evaluations for systems interventions that are not linear or straightforward. Complexity theory recognizes that reality is complex, and outcomes result from multiple causes that are interrelated and interact with each other (Byrne, 2002). The outcomes may be greater or less than the sum of all the components in a complex system, because components may enhance or cancel each other out. Health care systems can be characterized as complex systems when there are many components that are highly interconnected (Kannampallil, Schauer, Cohen, & Patel, 2011). Such a system is dynamic and has feedback loops that provide information on what is happening within the system. To evaluate complex systems, there are several methods that can be useful depending on your evaluation questions.

- Social Network Analysis (SNA) is a method used to understand systemic change, complexity, and connections between individuals or groups within a network (Durland & Fredericks, 2005). SNA can be useful for examining relationships, identifying important members in a network, understanding the capacity of a network to achieve a goal, tracking changes in a network over time, and understanding the connection between a network and outcomes (Honeycutt, 2009). For more information on how to use SNA in program evaluation, see *Making Connections: Using Social Network Analysis for Program Evaluation* (<https://www.mathematica.org/our-publications-and-findings/publications/making-connections-using-social-network-analysis-for-program-evaluation>).
- Outcome Harvesting is an evaluation approach used for dynamic complex systems when the relationship between causes and effects of the intervention are not entirely identifiable or understood (Wilson-Grau, 2015). It can be used when there is an observable change in behavior of an individual or organization. Outcomes are “harvested,” using six iterative steps through a participatory process involving a variety of stakeholders (Wilson-Grau & Britt, 2013). For more information, see *Outcome Harvesting Brief revised Nov 2013.pdf* (https://www.outcomemapping.ca/download/wilsongrau_en_Outcome_Harvesting_Brief_revised_Nov_2013.pdf).
- Outcome Mapping is an approach that can be used for intervention planning, performance monitoring, and evaluation (Earl, Carden, & Smutylo, 2001). Like Outcome Harvesting, this method focuses on behavioral outcomes and assumes the contribution to the outcomes, rather than attribution. The approach uses twelve steps through a participatory process with stakeholders. For more information on Outcome Mapping, see
 - https://www.outcomemapping.ca/download/OM_English_final.pdf
 - https://www.outcomemapping.ca/download/csette_en_ILAC_Brief07_mapping.pdf

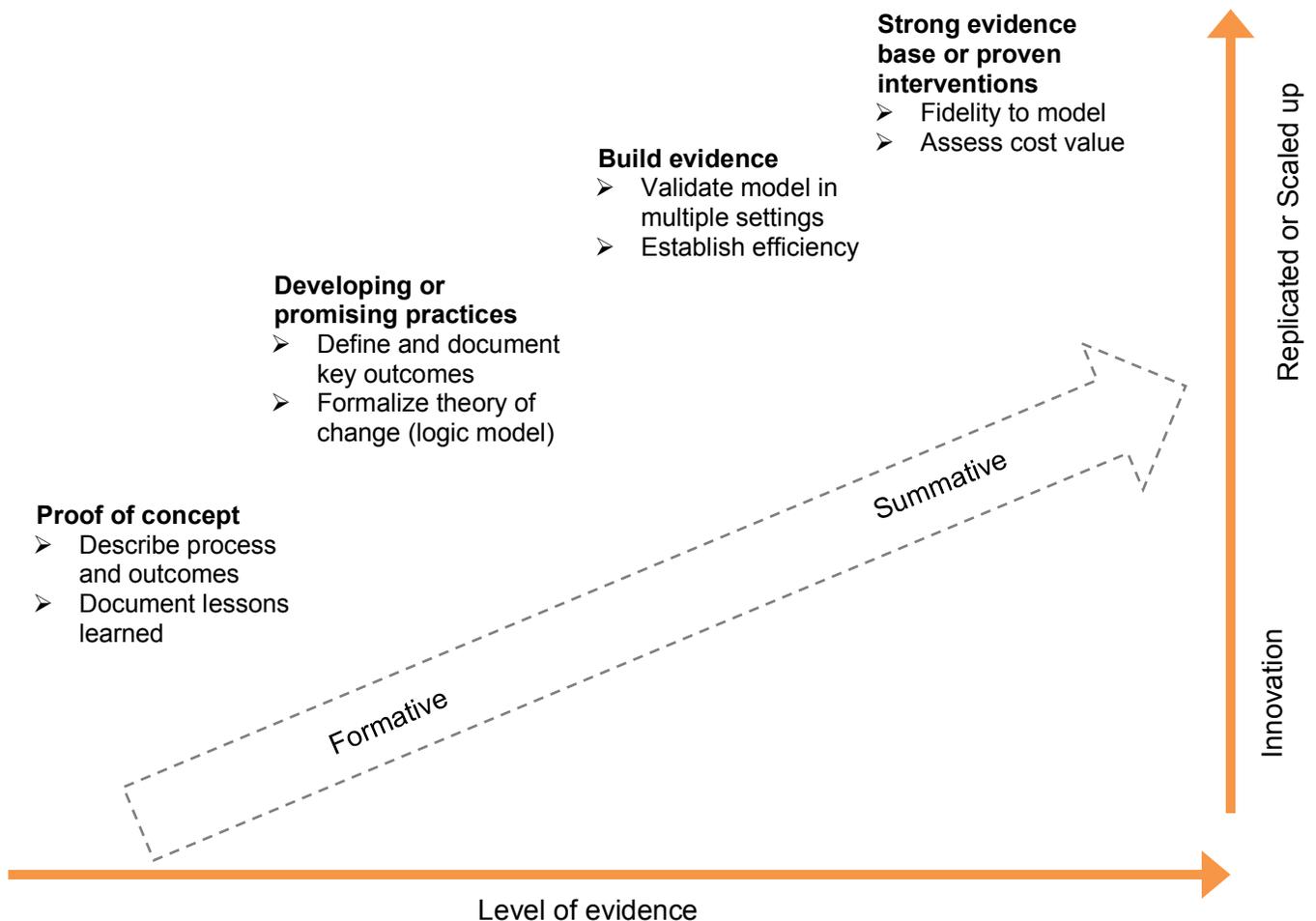
Talk with your evaluation technical advisor (ETA) about the implications of using different types of evaluation designs. Ensure that the type of design you select is adequate to answer your evaluation questions.

While developing your design, it is important to consider the analyses stakeholders will want later. For example, how will they want to subcategorize information? Will they want to look at separate geographic areas or different demographic variables? You may want to pose different scenarios to the stakeholders to ensure that the design will provide sufficient information. This is also an opportunity to build evaluation capacity as well.

Accounting for the Existing Evidence Base

The type of design you select needs to be informed by the evidence base related to your intervention. **Figure 1.2** summarizes how evaluation can support recommended tiered-evidence programming (DHHS, 2014).

Figure 1.2 Evidence Continuum and Types of Evaluation



Proof of concept. Evaluation of a **PROOF OF CONCEPT** is helpful when evidence is needed to explain the viability of an intervention or determine what supports are needed for a successful implementation. These types of projects are usually smaller in scale since the objective is to establish feasibility and not effectiveness or impact. Useful data include information on lessons learned from implementation and a description of the process and outcomes. Evaluation of proof of concept can be challenging and using innovative evaluation approaches, such as

 **Developmental Evaluation** may be helpful.

Developing or promising practices. With promising practices, the scale of the intervention increases after proof of concept has been demonstrated. At this stage, **EFFECT SIZES** and the significance level of changes in outcomes can begin to be estimated. Evaluation data are helpful in formalizing the theory of change (logic model). Assessing program fidelity is important because it establishes that the potential for success can be achieved even in different settings.

Building evidence. In the building evidence stage, the viability of the intervention is examined in multiple settings. Effect sizes are still estimated. In addition to measuring effect size, the efficiency of the intervention’s implementation is explored (i.e., how well the intervention was implemented). Each additional setting introduces new contextual factors that may complicate achievement of intervention effects. Evidence is built by examining how intervention effects are maximized while maintaining the same level of effort.

Evidence-based or proven interventions. An intervention deemed evidence-based or proven indicates that the intervention would work in diverse settings and would yield substantial intervention effects and changes for participants. When an intervention is demonstrated to be effective, cost evaluation can offer additional evidence on the value of the intervention by comparing costs with level of effectiveness, benefits, or utility. Cost data can also provide information on how to improve efficiency or whether an intervention should be scaled up or down.

It is important to recognize that interventions with a strong evidence base may not have been demonstrated as effective in a specific context. In these cases, evaluation needs to be performed in accordance with the level associated with lesser evidence.

Step 4 – Gather Credible Evidence

What information will you gather to help you answer the key evaluation questions? What information is credible to your stakeholders? At this stage, keep in mind that various stakeholder groups may consider different types of evidence to have more or less credibility. As a result, you may want to consider including data sources that will be meaningful to different types of stakeholders.

Selecting Criteria of Merit, Indicators, Data Sources, and Methods

One of the first tasks in this step is to choose criteria of merit that align with the evaluation questions of interest. These are “...the aspects of what is being evaluated that define whether it is good or bad and whether it is valuable or not valuable” (Davidson, 2005, p. 239). Next, you must identify indicators that demonstrate the level of performance on each criteria of merit. When selecting indicators, you need to work with stakeholders to ensure the level of measurement is appropriate for the level of the intervention. For example, if you are interested in how well a state policy regarding asthma-friendly schools is being adopted, you may be able to review district-wide policies and procedures. However, if you are interested in whether or not students with asthma are benefiting from asthma-friendly school policies, you will need to work with individual schools to determine how the policy is implemented and document specific changes that have occurred. **Appendix E** describes many options for developing indicators.

Once you have selected indicators, you will need to identify data sources. Options include existing data, modifying existing data, or collecting new data from participants in the intervention. Each is discussed below.

Analyzing existing data. Before you allocate resources to designing new data collection instruments and procedures, consider whether any existing data sources could be used in your evaluation. Using existing sources may save you time and money but does require some up-front planning. You may know of existing sources of data or your partners may be able to identify sources that you can use. Review these data sources carefully to determine their suitability for use in the evaluation. What data are being collected? Who collects the data? How often are data collected? Who has access to these data? What permissions are needed to access these data? How long does it typically take to obtain these permissions?

You may find that existing data sources do not have all of the information you need to fully answer an evaluation question. Or, you may find that the data elements you need are incomplete or inaccurate. For example, if you want to know whether your intervention is affecting asthma health disparities, any existing source you use would need to include demographic data to help you understand whether you are making progress among subgroups of interest.

Modifying an existing data collection. Sometimes you may have the opportunity to modify the existing data source to better meet your needs. Can you add questions to an existing form? Can you combine two data sources with complementary information? Can you influence the frequency or timing of existing data collection efforts to better track intervention outcomes or processes? Can you influence data collection instructions or training to improve data quality? In some cases, you may not have control over an existing data source and will simply need to use the data you have. In this case you may need to supplement existing sources with new data collection. Be sure to pilot and ensure the cultural relevance and appropriateness of any questions you add or modify for the data collection process.

Collecting new data. If you make the decision to collect new data, you will need to design appropriate instruments and data collection procedures. Remember, pilot testing ensures that your instruments and procedures are providing the data you need.

If the Evaluation Planning Team chooses to collect new data, you may not need to design instruments and procedures from scratch. You may be able to use or adapt survey instruments, focus group guides, checklists, and interview instruments that are already available. Using instruments that were developed to support other evaluations or studies can help you

- Save effort in designing your evaluation.
- Compare your results to the results of interventions implemented by others.
- Provide greater assurance of the validity of your data collection efforts.

For example, the Tool for Assessing Asthma Referral Systems (TAARS) is a free instrument intended for use by asthma control programs. TAARS assesses how effectively their referral systems are operating (CDC, 2017). TAARS was adapted from the Referral Systems Assessment and Monitoring Toolkit, originally developed by MEASURE Evaluation for the *President's Emergency Plan for AIDS Relief* (PEPFAR) for HIV/AIDS service providers. This tool can be

used as is or it can be adapted to the specific design and purpose of your specific asthma referral system. You can find the TAARS at https://www.cdc.gov/asthma/program_eval/taars.html.

In the following section, we provide some guidance on using existing tools and instruments. If the Evaluation Planning Team decides to develop data collection instrument(s), it can still be useful to look at existing instruments for ideas about how others have collected similar information.

How to Choose from Previously Developed Data Collection Instruments

Given the sheer number of existing resources for data collection, how can you choose among them and what factors do you need to keep in mind?

- **Instrument purpose.** The key consideration in using an existing instrument is whether it will suit your evaluation purposes. Does this instrument include the questions you are interested in? Does it cover all the topics you need to answer your evaluation questions? You may need to add some questions to cover your own topics of interest. Remember to pilot test the instrument in your specific context.
- **Making changes.** When using an existing instrument, especially one that has been validated (tested for validity and reliability among large groups of people), avoid making major changes to question wording, sequence, or answer categories, as you will then lose the benefit of the prior testing. Many survey instruments contain scales (multiple questions related to the same topic) and, if you need to adapt or remove elements, it is better to remove or keep an entire section, rather than cherry-pick certain questions.
- **Respondent population.** Has the instrument been used in a population similar to your respondent population? Is the instrument appropriate for your population in terms of literacy level, idioms used, language, or cultural relevance? If possible, you may want to look for an instrument that has been used with a similar audience rather than adapting an instrument that was designed for a different group.
- **Instrument length.** In deciding whether or not to use an existing instrument, keep in mind how long your respondent population will have to participate in data collection for your evaluation versus how long it takes to complete the existing instrument. Pilot testing the instrument with a small group of people prior to wider use can help you determine whether using the instrument is feasible in your situation.
- **Getting permission.** It is good to get permission from the instrument developer to use an instrument. This is usually as simple as an email or telephone call. In addition to making sure you are covered to use the instrument, you may also get valuable information not included in public sources, such as information about a new version of the instrument or details about how to analyze results.
- **IRB and participant protection.** Before administering the instrument, ethical considerations may need to be assessed by an institutional review board (IRB). Initiate data collection after the IRB has determined that minimum risk is involved and specified what protections are appropriate for your priority population.

Other Important Considerations

There are several other considerations that are important to discuss with your Evaluation Planning Team when making decisions about gathering credible evidence. Specifically, your team should talk about how much data to collect and what specific methods will be used.

How much data to collect. You will need to decide how much data is needed. The amount of data needed depends on many factors, including but not limited to, the type of intervention being evaluated, the specific evaluation questions at hand, and the information needs of the stakeholders. Please see Module 2, *Implementing Evaluations*, **Appendix H**, for more information on sampling.

Detailing the data collection methods. It is important to ensure that the Individual Evaluation Plan includes a detailed description of how you will collect data. The Individual Evaluation Plan should include instruments, data collection guides for evaluation staff members, other data collection materials (e.g., consent forms and advance letters for a survey), and a detailed timeline for data collection activities.

Once the Evaluation Planning Team has decided upon the data sources that will be most credible for answering the evaluation questions, matched the data sources (whether existing or new) to each key evaluation question, and documented the proposed methodologies in the Individual Evaluation Plan, the **EVALUATION IMPLEMENTATION TEAM** will follow the plan to collect or compile the data needed. Module 2, *Implementing Evaluations*, provides valuable guidance on implementing the evaluation. It includes information on dealing with common evaluation challenges, training data collectors, conducting and monitoring data collection, and budgeting for evaluation.

Step 5 – Justify Conclusions

This step involves the analysis, synthesis, and interpretation of results to answer the evaluation questions. Developing an analytic strategy for the intervention evaluation is part of your Individual Evaluation Plan. However, analysis is not the final step. The Evaluation Implementation Team and other stakeholders also need to interpret the results in order to justify the conclusions made about the intervention.

The Evaluation Planning Team began thinking about how data would be analyzed back in Step 3, when focusing the evaluation design. In step 5, the Evaluation Implementation Team executes that plan. Since many evaluations will be multi-leveled and multi-faceted, it is important that you remember the level from which the data were collected during the analysis. When triangulating information, you need to maintain the connections among data sources and the evaluation questions.

To ensure their questions are answered in a manner meaningful to them, keep your stakeholders engaged in the analysis. Since stakeholders may not have expertise in all analytic techniques, it is your responsibility to make sure they understand what is being done and how the evaluation information is generated. You may find that you need to teach stakeholders, or even revise your analytic plan, to ensure understanding. This iterative analysis will reveal the findings and help stakeholders integrate knowledge gained from the evaluation.

It is very important that you begin analysis as early as possible. Analyzing data early will enable you to identify gaps or misunderstandings in the data being collected and revise the evaluation protocol accordingly.

Furthermore, beginning analysis early is an excellent way to share with stakeholders the way information is being built so that surprises are less likely at the end of the evaluation. Occasionally, you may find that enough information is gathered to answer an evaluation question earlier than anticipated. If this occurs, you may be able to stop the data collection process or refocus it to answer additional questions.

Once the Evaluation Implementation Team has sufficiently analyzed the data, they will need to compare the results against the standards of performance that were established earlier. You may be familiar with performance **BENCHMARKS**, which are one type of standard. Imagine, for instance, that one of your indicators for an asthma self-management education intervention is the proportion of attendees who complete training. Based on existing literature or results of similar evaluations conducted in other settings, the Evaluation Planning Team may have established that good performance occurs when more than 60% of attendees complete the training.

Standards often include comparisons over time or with an alternative approach (e.g., no action or a different intervention). There are several resources the Evaluation Planning Team may consult when deciding on performance standards. For instance, existing evaluations of evidence-based interventions or promising practices similar to the current intervention may provide insights about appropriate levels of success. If the intervention integrates information from one or more social science theories, the Evaluation Planning Team might look to the literature about these social science theories to better understand what results might be anticipated and the general levels of performance that might be viewed as acceptable. See **Appendix D** for more on social-science theories that have been applied to asthma programs. Finally, the evaluation stakeholders and Evaluation Planning Team members may have specific insights about acceptable levels of performance from their own experience.

It is important to note that the standards established by the Evaluation Planning Team do not have to be quantitative in nature. Regardless of whether the indicators are qualitative or quantitative, it is important to discuss what will be viewed as a positive finding. When possible, document the standards you select in the Individual Evaluation Plan. In the event that such standards cannot be clearly identified in advance (i.e., sometimes there is not enough existing knowledge to set a standard), make sure to include in the Individual Evaluation Plan what process the Evaluation Implementation Team should undertake and with whom, to understand what constitutes success and how they will collectively assign value to the evaluation findings.

Developing Recommendations

Not all evaluations produce specific recommendations. If your evaluation is intended to generate specific recommendations, consider the following activities

- Ensure that the recommendations are supported by, and directly aligned with, the evaluation findings. While it may be tempting to jump to a solution, evidence uncovered by the evaluation needs to be used to clearly show how the recommendation will address the issue.

- Tailor recommendations for those who can implement them. Often, evaluations have recommendations that require actions be taken on different levels (e.g., program staff members may be asked to change a practice, while administrators address policy issues). You may find it helpful to have different sets of recommendations that focus on what actions specific stakeholders can take.
- Test the feasibility of recommendations with stakeholders. One common, and reasonable, criticism of evaluation recommendations is that they are not feasible to implement. One technique for addressing this criticism is to refrain from offering recommendations in the final report or other dissemination documents. Instead, discuss the implications of the evaluation findings with stakeholders and work together to generate an action plan. See Module 2, *Implementing Evaluations*, **Appendix K** for more details on action planning. Another approach is to test out drafts of recommendations with stakeholders. Stakeholders are knowledgeable about what is feasible and appropriate within the program's context, and can be helpful in producing actionable recommendations. Better Evaluation presents several additional ideas for developing recommendations at https://www.betterevaluation.org/en/rainbow_framework/report_support_use/develop_recommendations.

Step 6 – Ensure Use of Evaluation Findings and Share Lessons Learned

Evaluation findings are meant to be used. The findings may help the evaluation stakeholders decide whether to continue or stop an intervention or, more likely, identify ways to improve an intervention that is working well but might need some tweaking.

Communicating Findings

Thinking early and often about communicating evaluation results to different audiences is an important way to ensure the use of the findings. The timing of communications can be as important as the content of the communications. During the evaluation planning process, it is critical for the Evaluation Planning Team to consider when key audiences will need results from the evaluation. Delivering evaluative insights after they are needed can be frustrating for stakeholders and evaluators alike.

You will want to refer back to your communication and reporting plan developed as part of the Individual Evaluation Plan (Module 1, *Planning Evaluations*, **Appendix E**). Are there any additional audiences you want to communicate results to? Are there additional ways to communicate your findings (see Module 1, *Planning Evaluations*, **Appendix F**, for several helpful resources on communicating evaluation findings)? Have you tailored dissemination of findings to your stakeholders' needs? Do you need to make any other revisions to your

COMMUNICATIONS PLAN?

Action Planning

Developing an action plan based on the findings of your evaluation is a critical step for ensuring use of the findings (see Module 2, *Implementing Evaluations*, **Appendix K**). Including your evaluation stakeholders in developing the action plans also promotes the use of findings. As you develop the action plan, consider the following questions:

- Why did partners get involved in the intervention? Why should they get involved in future interventions?
- What were the positive results of the intervention? How can they be sustained and strengthened?
- Were there unintended positive results from the intervention? How can we ensure they continue to occur?
- Were there negative unintended consequences of the intervention? How can they be mitigated or avoided?
- How did the intervention change over time? Why were changes made? Should these changes be maintained?
- What were the main barriers faced in the implementation of the intervention? How were they (or how could they be) overcome?
- What factors facilitated implementation of the intervention? How can these factors be supported? What improvements would you like to make to the intervention in the future?
- How can you promote sustainability or institutionalization of the intervention?

We encourage you to think broadly about the lessons learned from evaluating the intervention. You may want to hold a debriefing session with your Evaluation Planning Team and intervention partners after each evaluation to discuss the lessons learned and how to share them. You have probably learned more than you realize. Documenting these lessons and their corresponding actions creates a record that you and your stakeholders can refer to and use to improve the intervention in the future. It will also foster collaboration and create a learning environment among your partners and stakeholders.

You have just invested considerable effort and time in conducting and implementing the evaluation. Make sure that as you ensure use and share lessons learned that you also take the time to celebrate accomplishments, build on relationships, and acknowledge the many contributions by partners and stakeholders in designing and implementing a successful evaluation.

Applying the Program Evaluation Standards throughout the Evaluation

As you learned in the earlier modules of the *Learning and Growing through Evaluation*, the graphic that accompanies the CDC Framework has, at its center, the **evaluation standards**: **UTILITY**, **FEASIBILITY**, **PROPRIETY**, and **ACCURACY**. The modules have provided you with methods and strategies to apply these standards to any type of evaluation you are undertaking.

In addition to the four standards shown in the graphic, evaluators have one more standard to consider that has recently been added—**evaluation accountability**. This standard focuses on ensuring the evaluation is properly managed and implemented (Yarbrough, Shulha, Hopson, & Caruthers, 2011). While the other standards can serve as parameters for evaluation during your work with any stakeholders, this standard lets evaluators to know whether their work is meeting professional expectations.

The first task to meet the **EVALUATION ACCOUNTABILITY** standard is to ensure that the evaluation is documented appropriately. You can use the Individual Evaluation Plan as a starting point for this documentation: note what was done, what was modified, and why decisions were made. The standard also promotes internal and external reviews of the evaluation. Is it being planned and implemented in the best manner? Per the standard, all evaluations need to have at least one internal review, a strategy that promotes accountability. Within this co-operative agreement, your ETA can serve this function. For evaluations that involve major investments of resources, or can have major consequences (i.e., high stakes evaluations), external review is appropriate. This type of **META-EVALUATION** will likely involve additional time or resources, so consider this during the planning process.

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Appendix A. Chapter Notes

Technical Package

The National Asthma Control Program (NACP) prioritizes the three interventions with the strongest evidence of effectiveness: medical management based on the National Asthma Education and Prevention Program's (NAEPP) EPR-3 guidelines (National Heart, Lung, and Blood Institute, 2007), asthma self-management education, and home visits for multi-component, multi-trigger reduction.

Just as the EPR-3 and its recent updates (National Heart, Lung, and Blood Institute, 2020) use a stepwise approach to the medical management of asthma, the NACP recommends a stepwise, control-based approach to the management of asthma on a population level:

- People with intermittent or mild persistent asthma may achieve control of their symptoms with good medical management and office-based or written instructions alone (Cloutier, Hall, Wakefield, & Bailit, 2005).
- People whose asthma is not controlled with medical management, especially those with moderate and severe persistent asthma, may benefit from referral to formal, skills-based self-management training (Szeffler et al., 2008; Busse et al., 2011).
- People whose asthma is not controlled with these measures may require a home-based assessment with a focus on decreasing asthma triggers (Woods et al., 2012).

These three interventions should be linked with communication and feedback across providers.

Adding to these three priority interventions is evidence of an association between smoking during pregnancy and transient early wheeze (starting during the first year of life and resolving around three years of age) (Caudri et al., 2013). This transient early wheeze is a risk factor for adult asthma (Caudri et al., 2013). Reducing exposure to maternal smoking and environmental tobacco smoke among pregnant women and infants is a priority action under strategy four of the *Coordinated Federal Action Plan to Reduce Racial and Ethnic Asthma Disparities* (EPA, 2012). Finally, as part of good public health practice, surveillance information can be used to identify populations in need of services and geographic areas to locate interventions to serve those needs.

These evidence-based strategies are the core of a **TECHNICAL PACKAGE**, referred to as EXHALE (Hsu, Sircar, Herman, & Garbe, 2018):

- Education on asthma self-management.
- X-tinguishing smoking and secondhand smoke, particularly among pregnant women and young children.
- Home visits for asthma education and trigger reduction for those whose asthma is uncontrolled with medical management and self-management education.
- Achievement of guidelines-based medical management.
- Linkages and coordination of care across settings.
- Environmental policies and practices to reduce triggers from indoor and outdoor sources.

Evaluability Assessments

EVALUABILITY ASSESSMENTS (EAs) are pre-evaluation assessments of a program or activity; they are designed to determine the utility and feasibility of conducting a full evaluation. They are typically undertaken when there is uncertainty regarding a program's capacity to conduct an evaluation or to assist in determining whether an intervention is at a stage of development that would warrant rigorous outcome evaluation.

Since conducting an evaluation requires significant resources, EAs can ensure that investments will be made wisely. Because EAs collect only enough information to decide whether or not a program is ready for evaluation, they require fewer resources.

If the program is ready for evaluation, the EA-generated information will inform evaluation design and promote clarity of evaluation use. If the program is not ready for evaluation, the EA will assess areas of capacity insufficiency and provide guidance towards building evaluation capacity. Such guidance may include suggesting the need to increase access to information, improve consistency of program records, or address perceptions and attitudes that are counterproductive to evaluation. These suggestions may facilitate evaluation capacity building.

To learn more about EAs, see

Wholey, J. S., Hatry, H. P., & Newcomer, K. E. (2010). *Handbook of practical program evaluation* (3rd ed.). San Francisco: Jossey-Bass.

Cultural Responsiveness

To respond to persistent disparities in health outcomes, it is vital to ensure the public health workforce has the sensitivity and flexibility to work effectively in diverse contexts. Similarly, evaluation of programs requires a culturally responsive approach, as declared in the American Evaluation Association *Statement on Cultural Competence in Evaluation* (2011).

Culturally responsive evaluation includes being sensitive to individuals from different races, ethnicities, able-bodiedness, religions, and other characteristics in each of the steps of the CDC *Framework for Program Evaluation*, from engaging stakeholders to data collection to sharing lessons learned. To assist with developing and implementing practical strategies for culturally responsive evaluation, a guide and tip sheet are available from the CDC. These resources are listed below.

Additionally, the Cultural Competence Assessment Tool for State Asthma Programs and Partners (CCAT) is a practical resource designed to promote and enhance cultural responsiveness among our many asthma partner organizations (CDC, 2014). Based on the Culturally and Linguistically Appropriate Service (CLAS) Standards, the CCAT is a self-assessment tool designed to guide programs in assessing the cultural responsiveness of their own programs. Using a flexible, team-based approach, programs use the CCAT internally to identify program strengths and areas for improvement in cultural responsiveness. This resource is listed below.

To learn more about culturally responsive evaluation in different contexts, see

American Evaluation Association. (2011). *Statement on cultural competence in evaluation*.

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Evaluation Planning Team or Evaluation Implementation Team

Broad stakeholder engagement is an essential element of CDC and NACP’s approach to evaluation. People who have been included in evaluation planning and implementation are more likely to help ensure that the findings, which represent an investment of their time, are put to use. The evaluator is only one member of a larger team. Each team member is needed to ensure the evaluation is useful. A packet is available to help you think about how to build your evaluation team. It includes a sample job description for an evaluator, a list of evaluator competencies, and sample letters for recruiting members of your Strategic Evaluation Planning Team and the teams that are responsible for developing the individual evaluation plans. You can find it at http://www.cdc.gov/asthma/pdfs/finding_the_right_people_for_your_program_evaluation_team.pdf.

Evaluation Questions Checklist

The need for good evaluation questions is critical for a good evaluation, yet the evaluation literature has provided only broad guidance on developing them. To help you choose good evaluation questions—questions that are likely to lead to actionable evaluation findings—we created a checklist for assessing potential evaluation questions. The list is grounded in the evaluation literature and has benefitted from the practice wisdom of many evaluators inside and outside of CDC. Contact Maureen Wilce for a list of references: mwilce@cdc.gov. You can download the Evaluation Questions Checklist at http://www.cdc.gov/asthma/program_eval/assessingevaluationquestionchecklist.pdf.

Developmental Evaluation

Developmental evaluation (DE) is a type of Utilization-Focused Evaluation (an evaluation approach that employs activities specifically designed to increase the likelihood that evaluation findings will be used) that is designed to be used for innovative, quickly evolving programs. Pioneered by Michael Quinn Patton (2010), DE involves adapting evaluation methods and rapidly implementing them, so that real-time feedback is available and used for continuous improvements. DE may be appropriate early in the stage of development of complex programs. In DE, the evaluator works alongside the program’s developers to help guide program development. Program developers need to welcome evaluation and be willing to learn and respond to it. If a culture of collaboration and evaluative thinking is built, DE can help advance program development efficiently and appropriately.

DE is not typically appropriate for mature programs. For programs that are more established and operate in a routine or stable manner, other types of evaluation methods will provide more useful and accurate information. Even for new and innovative programs, if circumstances prohibit constant and rapid changes being made (e.g., administrative requirements that prohibit adding or changing job responsibilities), DE is not appropriate.

For more information about DE, see Patton, M. Q. (2010). *Developmental evaluation: Applying complexity concepts to enhance innovation and use*. New York: Guilford Press.

Evaluation Accountability and the Evaluation Standards

The third edition of the **EVALUATION STANDARDS**, published in 2011, provides evaluators with benchmarks to use in assessing the quality of their evaluation work. This edition expands the standards to include a new fifth standard, Evaluation Accountability. Meeting this standard requires that the process and decisions behind an evaluation be documented in a transparent manner. One strategy to achieve this documentation is to annotate the evaluation plans. We suggest adding something like the following to the evaluation plan templates, found in **Appendices D and E** of Module 1, *Planning Evaluations*, to quickly note and explain changes if they occur.

- ___ Evaluation was implemented as planned
- ___ Changes made to the plan (describe changes as well as the rationale for changes)

The standard also requires that evaluators critically review the evaluation itself. This can be done internally by the evaluators on the project and can be done formally with evaluators external to the project on major evaluation efforts. Your CDC ETA can assist in meeting this standard. See Yarbrough, D. B., Shulha, L. M., Hopson, R. K., & Caruthers, F. A. (2011). *The program evaluation standards: A guide for evaluators and evaluation users*. Thousand Oaks: Sage.

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Appendix B. Glossary

Definitions included in the glossary can be found in the sources referenced at the end of the appendix. Note that glossary terms are often close paraphrases or excerpts from sources. Words highlighted in **GREEN, BOLD, SMALL CAPS** indicate cross-references to other terms included in the Glossary.

Accuracy	One of the program EVALUATION STANDARDS developed by the Joint Committee on Standards for Educational Evaluation. The extent to which an evaluation is truthful or valid in what it says about a program, project, or material (Yarbrough, Shulha, Hopson, & Caruthers, 2011). See also FEASIBILITY, PROPRIETY, UTILITY, and EVALUATION ACCOUNTABILITY.
Activities	The actual events or actions that take place as a part of the program (DHHS, 2005).
Audience	The individuals (such as your STAKEHOLDERS and other evaluation users) with whom you want to communicate the results of an evaluation (Salabarría-Peña, Apt, & Walsh, 2007).
Benchmarks	Measures of progress toward a goal, taken at intervals prior to the program's completion or the anticipated attainment of the final goal (EPA, 2007).
Communications Plan	A document that describes the communication needs and expectations for the project; how and in what format information will be communicated; when and where each communication will be made; and who is responsible for providing each type of communication (CDC, n.d.).
Comparison Group	A group not exposed to a program or treatment. Sometimes referred to as a CONTROL GROUP , comparison group is a term used more frequently in QUASI-EXPERIMENTAL DESIGN (than in EXPERIMENTAL DESIGNS) (DHHS, 2005; EPA, 2007).
Context	The socioecological conditions that directly and indirectly influence how an INTERVENTION is delivered, received, and evaluated (EPA, 2007).
Control Group	A group whose characteristics are similar to those of a program's participants but who do not receive the program services, products, or activities being evaluated. Participants are randomly assigned to either the experimental group (those receiving program services) or the control group. A control group is used to assess the effect of program activities on participants who are receiving the services, products, or activities being evaluated. The same information is collected for people in the control group and those in the experimental group (EPA, 2007). See also RANDOM ASSIGNMENT.

Evaluability Assessment	An evaluability assessment (EA) is a systematic pre-evaluation assessment of a program or activity designed to determine the utility and feasibility of conducting a full evaluation. Evaluability assists with determining whether an intervention is at an appropriate stage of development to warrant rigorous outcome evaluation; it also ascertains a program’s capacity to carry out such an evaluation (Leviton & Gutman, 2010).
Evaluation Accountability	One of the program EVALUATION STANDARDS developed by the Joint Committee on Standards for Educational Evaluation. This standard encourages increased transparency in planning and implementation of evaluation as well as how conclusions are drawn through documentation and meta-evaluation (Yarbrough et al., 2011). See also FEASIBILITY, ACCURACY, PROPRIETY, and UTILITY.
Evaluation Design	The overarching plan for collecting data, including when and from whom. This includes the use of comparison or CONTROL GROUPS , sampling methods, and measures that are used (or proposed) to address the specified EVALUATION QUESTIONS . Evaluation designs address information sources, data collection methods, the timing and frequency of data collection, and data analysis plans. Evaluation designs fall into one of three broad categories: EXPERIMENTAL DESIGN, QUASI-EXPERIMENTAL DESIGN, and NON-EXPERIMENTAL DESIGN (DHHS, 2003; GAO, 2012; Issel, 2009).
Evaluation Implementation Team	As used in this guide, this term refers to a small group of evaluation STAKEHOLDERS convened by an asthma program to implement or supervise implementation of an INDIVIDUAL EVALUATION PLAN . This group may include external evaluation contractors.
Evaluation Planning Team	As used in this guide, this term refers to a small group of evaluation STAKEHOLDERS convened by an asthma program to develop and implement a STRATEGIC EVALUATION PLAN or INDIVIDUAL EVALUATION PLAN .
Evaluation Question(s)	A question generated by your STAKEHOLDERS to ascertain information about a program’s implementation, OUTPUTS , or OUTCOMES , depending on where on the continuum of the logic model the evaluation is focused. The goal of an evaluation effort is to answer one or more evaluation question(s) (Russ-Eft & Preskill, 2009).
Evidence-based Interventions	Interventions with documented evidence from systematic peer reviews and rigorous evaluations that indicate that these health strategies are capable of yielding their intended impact across settings. These interventions are synonymous with interventions described as “proven” or “practice based” (Spencer, 2014).

Effect Size	The magnitude of a relationship between two variables or a measure of the size of an outcome of an intervention (Crano, Brewer, & Lac, 2015; Howell, 2013).
Evaluation Standards	Developed by the Joint Committee on Standards for Educational Evaluation, evaluation standards are the criteria upon which the quality of PROGRAM EVALUATIONS can be judged (Yarbrough et al., 2011). See also ACCURACY, EVALUATION ACCOUNTABILITY, FEASIBILITY, PROPRIETY, and UTILITY.
Expanding Service Strategy	Service strategies involve strengthening and expanding asthma control efforts in homes and schools, while linking with services offered by health care organizations. Strategies need to operate at the highest administrative level possible (e.g., partnering with school districts or systems, rather than individual schools, or with housing complexes or authorities, rather than individual homes) and focus on areas with a disproportionate asthma burden (DHHS, 2019).
Experimental Design	Designs that try to ensure the initial equivalence of one or more CONTROL GROUPS to a treatment group by administratively creating the groups through RANDOM ASSIGNMENT , thereby ensuring their mathematical equivalence. Examples of experimental or randomized designs are randomized block designs, Latin square designs, fractional designs, and the Solomon four-group (DHHS, 2005).
Feasibility	One of the program EVALUATION STANDARDS developed by the Joint Committee on Standards for Educational Evaluation. The feasibility standards are intended to ensure that an evaluation will be realistic, prudent, diplomatic, and frugal (Yarbrough et al., 2011). See also ACCURACY, PROPRIETY, UTILITY, and EVALUATION ACCOUNTABILITY.
Individual Evaluation Plan	As used in this guide, a written document describing the overall approach or design that will be used to guide an evaluation. It includes what will be done, how it will be done, who will do it, when it will be done, why the evaluation is being conducted, and how the findings will likely be used. May also be called an evaluation protocol (EPA, 2007).
Inputs	Resources that go into a program in order to mount the ACTIVITIES successfully (DHHS, 2005).
Intervention	Any group of activities that are coordinated by the asthma program to achieve outcomes. Service interventions are those that are targeted to individual people with asthma and their families and other caregivers. Health systems interventions address issues more broadly, often at the population level.
Logic Model	A systematic and visual way to present the perceived relationships among the resources you have to operate the

	program, the ACTIVITIES you plan to do, and the changes or results you hope to achieve (DHHS, 2005).
Meta-evaluation	External and internal review of evaluation processes and outcomes to determine whether or not procedures were appropriate and conclusions are valid (Stake, 2014).
Non-experimental Design	An EVALUATION DESIGN in which participant information is gathered during or after an intervention. There is no COMPARISON GROUP, CONTROL GROUP , or repeated measurements of the treatment group (DHHS, 2005; Salabarría-Peña et al., 2007).
Optimizing System Strategy	These strategies are directed at improving collaboration between health care and public health or community-based agencies so as to reach people with asthma on a population level (DHHS, 2019).
Outcomes	The results of program operations or ACTIVITIES ; the effects triggered by the program, for example, increased knowledge or skills, changed attitudes, reduced asthma morbidity and mortality (DHHS, 2005).
Outputs	The direct products and services delivered by a program, for example, number of messages aired, number of trainings offered, or number of meetings held. (DHHS, 2005).
Performance Measurement	The ongoing monitoring of a program's progress toward pre-established goals. It is typically conducted by program or agency management. Performance measures may address the type or level of program ACTIVITIES conducted (process), the direct products and services delivered by a program (OUTPUTS), or the results of those products and services (OUTCOMES) (GAO, 2005).
Program Evaluation	The systematic collection of information about the ACTIVITIES , characteristics, and OUTCOMES of programs to make judgments about the program, improve program effectiveness, or inform decisions about future program development (Patton, 2008).
Proof of Concept	A term synonymous with innovation testing and emerging practice, these evaluations are instrumental in determining if an intervention works as intended. Typically viewed as the beginning of the evidence-building continuum, the findings from these small-scale projects help to identify the pathways of change, the potential for impact and whether or not the concept has to be modified before expanding use (National Institute for Health and Clinical Excellence, 2011; Spencer, 2014).
Propriety	One of the program EVALUATION STANDARDS developed by the Joint Committee on Standards for Educational Evaluation. The extent to which the evaluation has been conducted in a manner that evidences uncompromising adherence to the highest principles and ideals, including professional ethics, civil law,

	<p>moral code, and contractual agreements (Yarbrough et al., 2011). See also ACCURACY, FEASIBILITY, UTILITY, and EVALUATION ACCOUNTABILITY.</p>
Quasi-experimental Design	<p>Study structures that make comparisons to draw causal inferences but do not use randomization to create the treatment and COMPARISON GROUPS. The treatment group is usually given the treatment or program, whereas the comparison group is not; comparison groups may be selected to match the treatment group as closely as possible, selected as non-equivalent comparison groups which must be corrected for statistically, selected based on a specified pre-program cutoff score, or the treatment group may serve as its own comparison group over time to observe changes in an outcome; in this way inferences on the incremental impacts of the program can be made (Campbell & Stanley, 1966; Trochim, 2020).</p>
Random Assignment	<p>The assignment of individuals in the pool of all potential participants to either the experimental (treatment) group or the CONTROL GROUP in such a manner that their assignment to a group is determined entirely by chance (GAO, 2012; GAO, 2005).</p>
Repeated Measures	<p>This QUASI-EXPERIMENTAL DESIGN involves the measurement of OUTCOME indicators over time. This design can include a simple pre and post evaluation design where the indicator in question is only measured once before the intervention and after the intervention is introduced. This design can also be used if you have different versions of the you are testing. In this case, you collect data prior to implementation of the intervention and then after each version of the intervention is introduced. This EVALUATION DESIGN is also useful when a comparison or CONTROL GROUP is not available to use (Crano et al., 2015).</p>
Setting	<p>The physical location where an intervention is delivered (e.g. school or home) (DHHS, 2004).</p>
Stakeholders	<p>People or organizations that are invested in the program (program stakeholders) or that are interested in the results of the evaluation or what will be done with results of the evaluation (evaluation stakeholders) (DHHS, 2005).</p>
Strategic Evaluation Plan	<p>As used in this guide, this term refers to a written document describing the rationale, general content, scope, and sequence of the evaluations to be conducted over time.</p>
Systems Thinking	<p>A set of analytic skills used for understanding and predicting system behavior and for developing alterations to introduce to the system to obtain desired results (Arnold & Wade, 2015).</p>
Technical Package	<p>A set of evidence- and practice-based interventions that are used to improve public health and reduce burden of disease (Frieden, 2013). See the technical package for addressing asthma at</p>

https://www.cdc.gov/asthma/pdfs/EXHALE_technical_package-508.pdf

**Theory-driven
Evaluation**

An evaluation approach that is organized by articulated assumptions for how an intervention will effect social change. These articulated assumptions are used to guide the design and execution of evaluation projects by prescribing what factors effect change and the types of change expected. Theory-driven differs from method-driven evaluation in that the latter is guided by the structural goals of a particular method, e.g., qualitative evaluation (Chen, 1990; Donaldson, 2007).

**Threats to Internal
Validity**

The factors that can threaten the validity of the causal relationship established between the intervention and outcomes; threats include history, maturation, testing, instrumentation, statistical regression, mortality, selection bias, diffusion of treatment information, compensatory treatment equalization, compensatory rivalry, and demoralization of comparison group (Campbell & Stanley, 1966; Trochim, 2020).

Utility

One of the program **EVALUATION STANDARDS** developed by the Joint Committee on Standards for Educational Evaluation. The extent to which an evaluation produces and disseminates findings that inform relevant **AUDIENCES** and have beneficial impact on their work (Yarbrough et al., 2011). See also **ACCURACY, FEASIBILITY, PROPRIETY, and EVALUATION ACCOUNTABILITY.**

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Appendix C. Evaluating the Infrastructure Strategy

As we think about a comprehensive public health approach to asthma control through evidence-based interventions, one of the earliest steps is to examine the functionality of infrastructure systems. Infrastructure consists of the interrelated capacities of leadership, partnership, surveillance, evaluation, and communication. The successful development and sustainability of these elements contribute to the success of services and systems strategies. These elements are also indirectly linked to, and thus contribute to, outcomes in asthma control.

Evaluation plays a unique role in the overall infrastructure strategies. Evaluation is necessary for determining what resources and supports are needed to strengthen infrastructure strategy activities. Evaluation also determines whether these activities were executed as intended and whether they yielded the anticipated outputs. Evaluation, therefore, is an encouraged strategy for ensuring that proper planning occurs, improvements are made, and successes are achieved in the areas of leadership, partnership, communication, and surveillance, as depicted in the following figure.

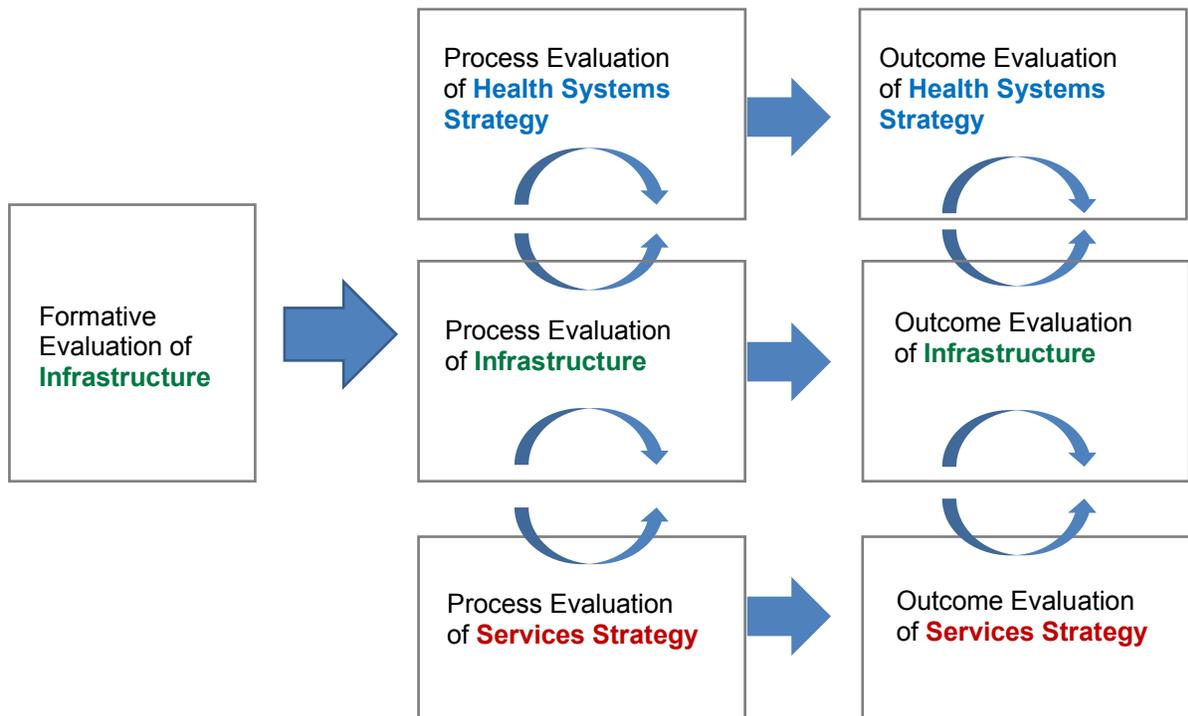
Figure C.1 Conceptual Model of Evaluation's Role in Infrastructure Strategy Area



Without evaluating the status or current needs of your asthma program’s infrastructure, program staff members may find it difficult to determine if existing resources are appropriate for planned interventions. In addition, given that resources and conditions change over time, periodic evaluation keeps you informed of the soundness and capacity of your program’s infrastructure. Furthermore, evaluating the relationships among the various components and strategies that comprise program infrastructure and their linkages to outcomes could offer valuable information on available capacity to scale up or replicate interventions beyond the original sites.

Based on the program theory reflected in the logic model within CDC-RFA-ED19-1902 (DHHS, 2019), the development and refinement of infrastructure precedes implementation of expanding services or optimizing systems strategies. The inherent logic is that the success of expanding services and optimizing systems strategies is dependent upon a strong infrastructure. How do we know that the quality of infrastructure can adequately support planned interventions and strategies? Rather than rely only on markers of performance, evaluation can provide important information on how to best enhance infrastructure to improve the likelihood that desired services and systems outcomes will result. For example, strategic partnerships often assist with the implementation of an intervention. Routinely assessing the quality of support from strategic partners is recommended since changes in membership so often occur in coalitions and other formal partnerships. The quality of support that existed at the beginning of the intervention may be missing at the end of the project. Thus, it is advantageous to include an evaluation of strategic partners and other infrastructure components throughout the lifecycle of a project. In fact, evaluation can be considered cyclical. In **Figure C.2**, we depict how essential the evaluation of infrastructure is at different stages in the life span of a project. We also show how infrastructure evaluations are related to evaluations of expanding service and optimizing systems strategy areas.

Figure C.2 Infrastructure Evaluation Lifecycle



Moreover, because asthma programs operate in a complex, dynamic environment, it is important to periodically evaluate infrastructure to ensure its efficiency and effectiveness. Measuring efficiency involves determining how the use of resources is minimized and how productivity (outputs and outcomes) is maximized. Assessing effectiveness is a way of ensuring that the objectives of the infrastructure strategies have been accomplished.

The Benefits of Infrastructure Evaluation in Uncharted Waters

Understanding how outcomes are achieved is as vital as measuring whether they were achieved. Even with a strong outcome evaluation design, collecting process data is still important to inform important decisions, such as whether or not surveillance communications are reaching the appropriate audiences. Further, assessing how each of the infrastructure strategies individually or collectively contributed to the expanding service and optimizing systems strategy areas, as well as how well the asthma program is functioning overall, provides evidence for making important decisions, including cost-related decisions. Integrating cost analysis into an infrastructure evaluation will offer additional insight on efficiency and lay the groundwork for comparing costs of resources to program effectiveness.

Your evaluation approach will be influenced by existing needs and preexisting conditions, as well as theoretical perspectives. We encourage a mixed-methods approach in the design and implementation of infrastructure evaluation to ensure accuracy and comprehensiveness of the findings. We also encourage the use and integration of the results from earlier evaluations' action planning. Finally, we encourage you to revisit the viability of infrastructure strategies beyond what is monitored in performance management.

Most asthma programs have had some experience designing and implementing different aspects of infrastructure strategies. It is often the case with evaluation that, in addition to guiding the program, the findings can help improve the evaluation approach. Previously generated evaluation data can help guide decisions regarding the appropriate scale for future infrastructure evaluations. In addition, using action plans from prior evaluations can help with deciding where to focus an evaluation. Given that most infrastructure strategies are already relatively developed, the focus of an infrastructure evaluation is often less on planning and more on assessing efficiency and effectiveness.

Evaluating infrastructure helps bridge the gap between past successes and current efforts. Therefore, learning from corrections made as a result of past evaluations, you can employ a more refined, efficient approach to infrastructure evaluation. In addition to ensuring follow through with earlier action plans, infrastructure evaluation provides information on how asthma programs adapt when encountering new conditions. This is especially true for innovative practices that require a constant feed of information to guide next steps (Patton, 2011). Given that systems strategies are a new area for many asthma programs, they may require innovative efforts and approaches not previously considered. If your asthma program is planning to initiate a new intervention strategy, we encourage you to evaluate the adequacy and capacity of your program infrastructure to implement the new strategy.

Sample Evaluation Questions

Efficiency and effectiveness are paramount to successfully implementing and sustaining evidence-based strategies (EXHALE) and public health-health care collaboration. Under CDC-RFA-ED19-1902, the National Asthma Control Program can benefit from knowing how asthma programs evaluate their comprehensive asthma control services and expansion strategies for effectiveness and efficiency. The following section provides some sample evaluation questions to consider when planning your infrastructure evaluation. The questions look at efficiency and effectiveness as indicators of value. Sample questions are organized around the major components of the infrastructure strategy areas.

Leadership

Efficiency

- How can leadership better facilitate sharing of resources, information, challenges, and data among asthma stakeholders?
- Are resources sufficient for leadership to develop and disseminate written summaries of experiences and outcomes across implementing sites and contribute to cross-jurisdiction communities of practice? Where are they lacking?

Effectiveness

- How has leadership contributed to the increased promotion of comprehensive asthma control services by the asthma program strategic partners?
- Which leadership activities are most helpful with increasing stakeholder input into the plans, programs, and policies of payers and health care organizations?

Partnerships

Efficiency

- How can partners' labor and material costs be reduced as they engage with school districts, community-based organizations, health care organizations, federally qualified health care centers, and hospitals?
- How can strategic partners better identify and engage interested school districts or health systems in participating in comprehensive asthma control activities and expanding partnerships to provide high-quality clinical care?

Effectiveness

- How instrumental are strategic partners in expanding access to and availability of comprehensive asthma services?
- How have strategic partners supported efforts to reduce stigma experienced by people with asthma and help them gain greater acceptance and support?

Communication

Efficiency

- How can dissemination of surveillance and evaluation findings be improved without substantial cost increases?
- How does the volume and frequency of communication products compare to the amount of resources invested?

Effectiveness

- How has targeted dissemination of surveillance and evaluation findings influenced efforts by payers and health care organizations to improve the quality of asthma care?
- To what degree has visibility of the asthma program increased as a result of strategic communication efforts?

Surveillance**Efficiency**

- How has the process of using surveillance data to identify at-risk or disproportionately affected subpopulations been improved?
- How has productivity increased in identifying, collecting, and analyzing additional data sets to guide program activities and to promote comprehensive asthma control services?

Effectiveness

- How has surveillance data been used to increase coverage for comprehensive asthma control services?
- How has the jurisdiction's asthma surveillance system been used to identify and prioritize provision of care and services for people with persistent or poorly controlled asthma?

Evaluation**Efficiency**

- What resources have been identified to minimize labor and material support used by asthma programs to conduct evaluation?
- What strategies have been identified to increase the use of evaluation findings to guide program planning and improvement?

Effectiveness

- How has evaluation contributed to the coordination of health care organizations to improve coverage, delivery, and use of clinical and other services?
- What evaluation methods have been used to assess knowledge and demonstration of appropriate self-management practices among people with asthma and their caregivers?

Focusing our evaluation efforts on these and similar types of questions can help us develop a deeper understanding of how successful public health-health care collaboration for asthma control can be fostered. With several distinct components to infrastructure, developing a systematic process of assessment and decision-making is critical to ensure synergy among and between its subcomponents. The execution of a well-planned, stakeholder-driven infrastructure evaluation is ultimately guided by the jurisdiction's program theory and its capacity to respond to emerging circumstances. Furthermore, we encourage the inclusion of efficiency and effectiveness as additional value markers to help increase the utility of findings, as these evidence standards are vital for those in the public health and health care arenas.

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Appendix D. Using Social Science Theory in Evaluation

The Asthma and Community Health Branch at CDC funded Battelle to conduct a literature review on the use of social science theory in the asthma field. The review is intended to support both the design of interventions and their evaluation. This appendix presents summary findings from this literature review of articles, published books, and dissertations and theses employing a variety of social science theories in relation to asthma. For further detail on the methodology used for this literature search, see the last section of this appendix.

Through our review of the literature, we found that a number of references in the asthma field used a theoretical approach. The summaries in this appendix can be used to understand the main theories that have been applied to asthma-related concepts and interventions and the main concepts behind these theories. We also summarize the main uses of these theories related to asthma and the main findings of these studies related to asthma outcomes and interventions. You may identify additional resources by reviewing the references used throughout the appendix and bibliography.

This appendix is meant as a general resource on the use of social science theory in the design, implementation, and evaluation of asthma interventions. We do not expect you to sit down and read it cover to cover, especially if you are new to social science theory. You may want to begin by reading the introductory information in the blue text boxes, where the theories themselves are explained. This will give you a general overview of what each theory involves. If you recognize a theory that seems applicable to the type(s) of interventions your program is implementing, you may choose to delve more deeply into the remaining subsections for that theory to learn how it has been applied to asthma intervention evaluation and what has been learned to date.

For a systematic but more general discussion of social science theories and their use in support of health behavior and health education efforts, we recommend the reference below, which covers many of the theories presented in this appendix.

Glanz, K., Rimer, B. K., & Viswanath, K., (Eds.). (2015). *Health behavior: Theory, research, and practice* (5th ed.). San Francisco, CA: Jossey-Bass.

We have organized this appendix according to the following major sections:

- Individual-level theories (Section D.1)
- Interpersonal-level theories (Section D.2)
- Organizational-level theories (Section D.3)
- Planning models (Section D.4)
- Methodology for the literature search (Section D.5)

D.1 Individual-Level Theories

Theories discussed in this section relating to behavior of individuals include:

- The Health Belief Model (HBM)
- The Transtheoretical Model (TTM) and Stages of Change
- Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB), and the Integrated Behavioral Model
- Self-Regulation Model
- Stress, Coping, and Human Behavior

These theories are presented in Sections D.1.1 through D.1.5 below.

D.1.1 The Health Belief Model (HBM)

The **Health Belief Model (HBM)** is one of the most widely used theories in health behavior research and is used both to predict health behaviors and to develop interventions. Several constructs are involved in the HBM, including

- Perceived susceptibility
- Perceived severity
- Perceived barriers
- Perceived benefits
- Cues to action
- Self-efficacy

For health-promoting behaviors, the HBM theory posits that if individuals believe that they are susceptible to a condition, that the consequences of not taking action are severe (serious), and that the benefits of taking action outweigh the barriers, they are more likely to engage in a given behavior. Cues to action (which include external reminders, physical symptoms, and media messages) can also help to promote action when the appropriate health beliefs are in place. The individual's belief in their ability to take action (self-efficacy) can support taking action. In the case of a chronic disease such as asthma, the focus of interventions that target perceived threat aim to affect on the extent to which an individual believes their diagnosis and feels susceptible to disease outcomes rather than the disease itself.

Skinner, C. S., Tiro, J., & Champion, V. L. (2015). The health belief model. In K. Glanz, B. K. Rimer, & K. Viswanath, (Eds.), *Health behavior: Theory, research, and practice*. (5th ed., pp. 75–94). San Francisco, CA: Jossey-Bass.

Application of Health Belief Model in Asthma Programs

References used the Health Belief Model with different types of behavior changes of interest. These included

- Medication usage and adherence (Branstetter, 2001; Depaola, Roberts, Blaiss, Frick, & McNeal, 1997; Holden, Wade, Mitchell, Ewart, & Islam, 1998; Putman, 2002; Trueman, 2000; Zimmerman, 2008).
- Trigger avoidance (Holden et al., 1998; Munro, Haire-Joshu, Fisher, & Wedner, 1996; Putman, 2002).
- Recognizing asthma attacks early (Holden et al., 1998).
- Following treatment recommendations during an asthma attack (Holden et al., 1998).
- Making and keeping appointments (Holden et al., 1998; Jones, Jones, & Katz, 1987; Putman, 2002).
- Peak flow measurement (Putman, 2002; Zimmerman, 2008).
- Following an asthma action plan (Emmer, 2005).
- Managing a child with asthma (Branstetter, 2001; Keel, 2003).
- Willingness to attend asthma self-management training (Dupclay, 2000).
- Influenza vaccination among individuals with asthma (Lyn-Cook, Halm, & Wisnivesky, 2007; Szilagyi, Rodewald, Savageau, Yoos, & Doane, 1992).

Addressing misperceptions and providing ways to overcome barriers or drawbacks to asthma management behaviors and medications may help improve treatment adherence (Branstetter, 2001; Depaola et al., 1997). Interventions for children with asthma should also engage family members, as one study demonstrated that mothers and children influence one another's perceptions regarding asthma medication (Depaola et al., 1997).

Communication between the parents of a child with asthma and their child's school is important to understand the true level of asthma control and frequency of asthma symptoms (Crawford, 1998).

D.1.2 The Transtheoretical Model (TTM) and Stages of Change

The **Transtheoretical Model (TTM)** integrates processes and principles across major theories and presents health behavior change as a progression through six stages. These stages include precontemplation, contemplation, preparation, action, maintenance, and termination. Often individuals will cycle and recycle through the stages before making the behavior change.

- Precontemplation: Individual not planning on taking action within the next six months.
- Contemplation: Individual thinking about taking action in the next six months.
- Preparation: Individual preparing to take action in the next month.
- Action: Individual has made lifestyle modifications in the last six months.
- Maintenance: Individual has maintained the lifestyle modification for six months and continues to work on preventing relapse.
- Termination: Individual reaches 100% self-efficacy; this stage is not emphasized as much in TTM research, as it may be an unrealistic goal for most people.

The model also includes activities, called processes of change, that individuals use to progress through the stages of change. Some of the processes are used primarily in the early stages of change (experiential processes), while others are used for the later stages of change (behavioral processes). Experiential processes include consciousness raising, dramatic relief, environmental reevaluation, social liberation, and self-reevaluation. Behavioral processes are stimulus control, helping relationships, counter-conditioning, reinforcement management, and self-liberation.

Decisional balance will shift as an individual progresses through the stages of change. Decisional balance is the comparison of pros and cons for making the change. In the precontemplation and contemplation stages, the individual perceives that the cons outweigh the pros, but in the preparation and action stages, the balance has shifted to the pros outweighing the cons. To avoid relapse in the maintenance stage, it is important that the individual still perceives the pros as outweighing the cons.

Self-efficacy also influences progression through the stages of change or relapse. Self-efficacy in TTM is the individual's confidence that they can resist the temptation to relapse back into their unhealthy behavior when in high-risk situations. Temptation types may include emotional distress, positive social situations, and craving.

Prochaska, J. O., Redding, C. A., & Evers, K. E. (2015). The transtheoretical model and stages of change. In K. Glanz, B. K. Rimer, & K. Viswanath (Eds.), *Health behavior: Theory, research, and practice* (5th ed., pp. 125–148). San Francisco, CA: Jossey-Bass.

Application of the Transtheoretical Model in Asthma Programs

In the references identified, TTM was used to develop tailored interventions related to various asthma behaviors, including asthma management behaviors, medication adherence, and removal of pets from the home (Bensley et al., 2004; Cassidy, 1999; Hagan et al., 2008; Joseph et al., 2007). Interventions included a series of questions to determine whether an individual was in the precontemplation, contemplation, preparation, action, or maintenance stage. The material, information, or activities presented to individuals varied depending on their stage of change. Materials, information, and activities aimed to progress participants through the stages.

In terms of findings from these studies

- Moving through the stages of change takes time and may require multiple education sessions and follow-up with specific activities related to asthma to help individuals progress (Cassidy, 1999).
- Two of the four interventions used a web-based approach. Using web-based TTM interventions allows for broader dissemination with tailored information based on answers selected by users.

Due to the small number of studies included in the review, evidence for effectiveness of these TTM-tailored interventions varied.

D.1.3 Theory of Reasoned Action (TRA); Theory of Planned Behavior (TPB); Integrated Behavioral Model

The **Theory of Reasoned Action (TRA)** and the **Theory of Planned Behavior (TPB)** focus on individual motivational factors influencing the performance of a behavior. The TRA includes relationships between beliefs, attitudes, intentions, and behavior. An individual's attitude toward the behavior and beliefs related to others' approval or disapproval of the behavior impacts the individual's perceived likelihood of performing the behavior (behavioral intention). The TPB is an extension of TRA. It includes an additional construct of perceived behavioral control to account for influential factors outside of an individual's control. The Integrated Behavioral Model includes the TRA and the TPB, as well as other behavioral theories. Constructs for TRA and TPB include

- Behavioral belief. An individual's belief that performing the behavior is associated with particular attributes or outcomes.
- Evaluation. The value the individual attaches to a behavior's outcome or attribute.
- Normative beliefs. An individual's belief related to whether important referents approve or disapprove of the behavior.
- Motivation to comply. An individual's motivation to do what each important referent thinks.

Behavioral beliefs and evaluation feed into an individual's attitude toward the behavior, while normative beliefs and motivation to comply feed into an individual's subjective norm. Both attitude toward the behavior and subjective norm influence an individual's intention to perform the behavior.

Constructs for TPB only:

- Control beliefs. An individual's beliefs regarding the facilitators and barriers to performing the behavior.
- Perceived power. An individual's beliefs regarding the strength or impact of each factor to facilitate or inhibit their ability to perform the behavior.

Control beliefs and perceived power together make up an individual's perceived behavioral control. This construct takes into consideration factors outside of the individual's control that could influence his or her intention and behavior.

Constructs for the **Integrated Behavior Model** include

- Attitude: An individual's attitude toward a behavior consists of experiential and instrumental attitudes. Experiential attitudes are an individual's feelings about performing the behavior whether positive or negative. Instrumental attitudes are an individual's behavioral beliefs about the results of performing the behavior.
- Perceived norms: The social pressure an individual feels to perform (or not) a behavior. This consists of injunctive and descriptive norms. Injunctive (subjective) norms are an individual's normative beliefs about what others think one should do and one's motivation to comply. Descriptive beliefs are an individual's perceptions of what others in one's social networks are doing.
- Personal agency: An individual's influence on his or her own functioning. Personal agency consists of self-efficacy and perceived control. Self-efficacy is an individual's confidence that one can perform a behavior despite obstacles. Perceived control is one's perception of how easy or difficult it is to perform a behavior.

- Attitude, perceived norm, and personal agency influence an individual's intention to perform a behavior. Carrying out a behavior is also influenced by whether an individual has the knowledge and skill to perform the behavior, how salient the behavior is (if it is cued or not), whether or not there are environmental constraints that impede performing the behavior, and whether the individual has performed the behavior previously (habit).

Montano, D.E., & Kasprzyk, D. (2015). The theory of reasoned action and the theory of planned behavior and the integrated behavioral model. In K. Glanz, B. K. Rimer, K. Viswanath (Eds.), *Health behavior: Theory, research, and practice* (5th ed., pp. 95–124). San Francisco, CA: Jossey-Bass.

Application of the Theory of Reasoned Action and the Theory of Planned Behavior in Asthma Programs

Studies tested the Theory of Reasoned Action's or the Theory of Planned Behavior's ability to predict things such as

- Pharmacists' intent to provide pediatric asthma counseling (Pradel, Obeidat, & Tsoukleris, 2007).
- Onset of smoking in adolescents with asthma (Van De Ven, Engels, Otten, & Van Den Eijnden, 2007; Van De Ven, Van Den Eijnden, & Engels, 2006).
- The adherence to treatment of individuals with asthma (Blackwell, 2005; Putman, 2002).
- Doctors' intent to use asthma guidelines (Limbert & Lamb, 2002).
- Smoking parents' modification of smoking behaviors (McIntosh, 1992).
- Teachers' intent to manage symptomatic children with asthma in their classrooms (Rodehorst, 2001).

TRA and TPB components can also be applied to the development of interventions. Asthma interventions are generally directed toward individuals with asthma, parents, or caretakers of those with asthma, healthcare providers, or teachers.

- Subjective norm appears to influence healthcare provider decisions regarding asthma care (Limbert & Lamb, 2002; Pradel et al., 2007), with possibly more influence over younger healthcare providers (Limbert & Lamb, 2002).
- Subjective norm also appears to influence the decision to smoke by adolescents with asthma (Van De Ven et al., 2007).
- Two studies investigating the TPB's ability to predict asthma treatment adherence found different mechanisms. One study (Blackwell, 2005) demonstrated that perceived behavioral control significantly contributes to treatment adherence, while another study (Putman, 2002) indicated that health beliefs and behavioral intention are better predictors.

D.1.4 Self-Regulation Theories

The way individuals experience and cope with stress affects whether and how they seek medical care and social support and how well they adhere to health professional advice. Furthermore, reaction to stress can either promote or hinder healthful practices as well as motivation to engage in health-promoting behaviors.

The **Transactional Model of Stress and Coping** is one framework for evaluating the way people cope with stressful events. In this model, stressful experiences are viewed as person-environment transactions, in which the impact of an external stressor is mediated by the person's appraisal of the stressor and the resources (psychological, social, and cultural) available to them. A person's primary appraisal is their evaluation of the significance of a potential stressor (e.g., perceptions of susceptibility and severity). Secondary appraisal refers to their evaluation of the controllability of the stressor along with their coping resources.

Coping efforts refer to the actual strategies used to mediate primary and secondary appraisals and include problem management (active coping, problem solving, and information seeking) and emotional regulation (seeking social support and venting feelings, as well as avoidance and denial). The outcomes of coping are one's adaptation to a stressor and may include functional status, emotional well-being, and health behaviors. Meaning-based coping (focusing on positive events, revising goals, positively reappraising the stressor, and relying on spiritual beliefs) influence both coping efforts and coping outcomes. Dispositional coping styles, such as information seeking, benefit finding, and optimism, can moderate the way an individual responds to a stressor. Social support and positive psychological states can also influence how people adapt to stressful events.

Wethington, E., Glanz, K., & Schwartz, M. D. (2015). Stress, coping, and health behavior. In K. Glanz, B. K. Rimer, & K. Viswanath (Eds.), *Health behavior: Theory, research, and practice* (5th ed., pp. 223–242). San Francisco, CA: Jossey-Bass.

Application of Self-Regulation Theories in Asthma Programs

Most of these studies tested self-regulation theories' ability to predict asthma management behaviors or outcomes (Gibson-Scipio, 2006; Kieckhefer, 1987; Lee, Lim, & Ng, 1995; Nothwehr, 1997; Preechawong et al., 2007; Zimmerman, Bonner, Evans, & Mellins, 1999), or used self-regulation theories to develop interventions (Bonner et al., 2002; Cox, 2001; Kuijer, De Ridder, Colland, Schreurs, & Sprangers, 2007). A few studies used self-regulation to develop a model (Burns, 1999) or provide the theoretical framework for the study (Preechawong, 2004).

The asthma management behaviors investigated included

- Resourceful coping (Preechawong et al., 2007).
- Attack management skills (Lee et al., 1995).
- Self-care and proactive coping (Kuijer et al., 2007).
- Illness management behaviors (Kieckhefer, 1987).

Outcomes investigated included

- Asthma-related emergency department visits (Cox, 2001; Gibson-Scipio, 2006; Zimmerman et al., 1999).

- Hospital and clinic visits related to asthma (Cox, 2001).
- Activity limitations (Bonner et al., 2002; Gibson-Scipio, 2006).
- Wheezing and sleep disturbances (Bonner et al., 2002; Zimmerman et al., 1999).

Findings from these included the following

- Progressing children with asthma and families of children with asthma through a phased process of self-regulation may help improve asthma outcomes (Bonner et al., 2002; Zimmerman et al., 1999; Gibson-Scipio, 2006).
- Self-regulation theories can be used to develop a comprehensive nursing system. The system can be used across providers to reduce healthcare system gaps and optimize access and continuity of asthma care (Cox, 2001).

D.2 Interpersonal-Level Theories

Theories discussed in this section relate to interpersonal behavior and include

- Social Support and Social Networks
- Social Cognitive Theory
- Provider-Patient Interaction Theory
- Family Functioning or Family Dynamics Theory

These theories are presented in Sections D.2.1 - D.2.4 below.

D.2.1 Social Support and Social Networks

Social support and social networks may impact health directly or indirectly by influencing health decisions, influencing preventive health behaviors, influencing exposure to stressors, or creating a buffering effect on stressors.

Social support is a function of social relationships and can be categorized into four main types of support behaviors: emotional support (e.g., empathy, caring), tangible support (e.g., direct assistance, providing money or clothes), informational support (e.g., providing information or advice), and belonging support (e.g., having a social group with which to engage). Social support can be perceived (i.e., an individual believes that others will provide support if necessary) and received (i.e., support is actually provided).

The stress prevention, stress-buffering, and direct effect models describe how social support can affect health outcomes both directly and through stress-related pathways. Social support can prevent stress by influencing stress appraisals or one's interpretation of a situation as challenging, by increasing proactive coping, and by reducing exposure to secondary stressors. Social support can also buffer stress to reduce negative health effects and enhance health behaviors and outcomes by promoting self-esteem and providing a sense of connectedness and control over one's life.

Holt-Lunstad, J., & Uchino, B. N. (2015). Social support and health. In K. Glanz, B. K. Rimer, K. Viswanath (Eds.), *Health behavior: Theory, research, and practice* (5th ed., pp. 185–204). San Francisco, CA: Jossey-Bass.

A **social network** is defined as the collection of social relationship connections surrounding a person. Social networks can offer resources and support to individuals beyond social support. Social Network Theory (SNT) can be used to understand how social networks relate to health or other outcomes. SNT can be used with individuals, organizations, governments, or other units. Social networks consist of actors (e.g., individuals, organizations, collectives). How an actor is positioned in a network influences the network's behaviors. Networks are structured systems and thus their system-level properties influence the system's performance.

The network environment is affected by influence and selection, which in turn can influence behavior. Influence happens when an actor changes its behavior to match that of its network or environment. Selection happens if an actor changes its network to match its behavior.

An actor's position in a network can influence the network's behavior. A central actor holds an important or strategic position in the network and can influence others in the network to be sensitive to communal norms and values, which can encourage or discourage change or innovation. Bridging actors connect marginalized groups and can enhance or block collective action. Peripheral actors are not constrained by community social norms and thus have freedom to innovate. They may also be more connected to other groups and networks, serving as a bridge.

SNT can be used to make predictions about how a network develops or changes over time or how it compares to other networks.

Valente, T. W. (2015). Social networks and health behavior. In K. Glanz, B. K. Rimer, & K. Viswanath (Eds.), *Health behavior: Theory, research, and practice* (5th ed., pp. 205–222). San Francisco, CA: Jossey-Bass.

Application of Social Support and Social Network Theory in Asthma Programs

Most articles discussed social support in general; they did not differentiate between social support and social networks as articulated in the blue text box. Additionally, they rarely unpacked the idea of social support. The source of social support was identified (e.g., spouse, parent, friend, teacher), but the type of support behaviors provided by these sources were typically not described.

- Two interventions for adolescents (Buckner et al., 2007; Van Es, Nagelkerke, Colland, Scholten, & Bouter, 2001) aimed to improve asthma outcomes through the use of various social supports. Buckner et al. (2007) evaluated the outcomes for adolescents attending a summer asthma camp – where peer-to-peer support was designed to reduce stigma associated with asthma through such activities as competitions to obtain the best peak expiratory flow measures, attendance at asthma education sessions, and all attendees carrying inhalers in fanny packs. Van Es et al. (2001) evaluated an intervention in which a pediatrician and (primarily) an asthma nurse met with participating adolescents on a frequent basis to help educate them about asthma and the importance of discussing asthma with their doctors and peers. This intervention also appears to have included some limited efforts to engage parents.
- Buckner et al., (2007) demonstrated increased social self-efficacy and self-management after the camp. As described above, the camp included education geared towards adolescents who were learning to increase their responsibility for self-management. The camp also provided opportunities for social interaction with other adolescents who have asthma. The increased self-management remained significant six months after the camp, but social self-efficacy did not remain significant. Although the education included transferring social skills to the home and school environments, the lack of a sustained increase in social self-efficacy may indicate a need to strengthen social skills components of asthma programs for adolescents or to have follow-up interventions. The authors recommended that school-based and clinic-based providers collaborate on interventions to support adolescent social functioning and self-management responsibility through Asthma Action Plans.

Asthma programs for adolescents may also address social support. Social support has been shown to help adolescents accept their asthma diagnosis, increase self-management, and adhere to medications. Social support can come from a variety of sources, including family members, friends, teachers, and classmates. More social support from multiple sources may better meet the needs of adolescents with asthma. Consider methods to improve teacher and classroom social support for asthma programs directed toward early adolescents and adolescents. For short-term interventions, such as a camp, follow-up interventions or activities can be considered to sustain increases in social self-efficacy.

D.2.2 Social Cognitive Theory (SCT)

Social Cognitive Theory (SCT) is a model demonstrating a constant interaction between behavior, personal cognitive factors, and socioenvironmental influences. Behaviors are actions taken by individuals that can be health-enhancing or health-compromising. Behavioral factors include behavioral skills, intentions, and reinforcement for engaging in a particular behavior. Personal cognitive factors may include expected outcomes of a behavior, self-efficacy in performing the behavior, and self-regulation.

Socioenvironmental influences include factors external to the person such as social environment (friends or family) and physical environment (availability of an item). There are several major concepts in SCT as described below.

Personal cognitive factors:

- *Self-efficacy*. One's belief in one's ability to perform the behavior and overcome barriers.
- *Collective efficacy*. A person's belief in the capacity of a group of people to carry out specific actions to accomplish a goal.
- *Response efficacy, also known as outcome expectations*. Anticipated outcomes resulting from performing the behavior.
- *Knowledge*. An understanding of the risks and benefits of health practices and the information needed to carry out a behavior.

Environmental influences:

- *Observational learning*. Learning the behavior through observation of other individuals' actions and the reinforcement they receive by performing the action.
- *Normative beliefs*. Beliefs and norms about the prevalence and acceptability of a particular behavior.
- *Social support*. Encouragement and support (perceived or real) an individual receives from their social network.
- *Barriers and opportunities*. Aspects of the physical or social environment that enable or inhibit performing a particular behavior.

Supporting behavioral factors:

- *Behavioral skills*. Capabilities necessary to carry out a particular behavior.
- *Intentions*. Setting short and long-term goals for modifying existing behaviors or adding new ones.
- *Reinforcement and punishment*. Providing tangible or social rewards or eliminating punishments to increase or reduce a particular behavior.

Kelder, S. H., Hoelscher, D., & Perry, C. L. (2015). How individuals, environments, and health behaviors interact: Social cognitive theory. In K. Glanz, B. K. Rimer, K. Viswanath (Eds.), *Health behavior: Theory, research, and practice* (5th ed., pp. 159–181). San Francisco, CA: Jossey-Bass.

Application of Social Cognitive Theory in Asthma Programs

References that used the Social Cognitive Theory tested the theory's ability to predict

- Asthma treatment adherence (Branstetter, 2001; Van Es et al., 2001).
- Asthma management behaviors (Nothwehr, 1997).
- Asthma morbidity (Clark et al., 2001; Gibson-Scipio, 2006; Lee et al., 1995).

Studies also tested the impact of self-efficacy on

- Treatment adherence (Branstetter, 2001; Zebracki & Drotar, 2004).
- Morbidity (Clark et al., 2001; Lee et al., 1995).
- Self-management skills (Creer, 2008; Nothwehr, 1997).

Major concepts of Social Cognitive Theory—such as self-efficacy, self-control (monitoring or regulating), and behavioral capacity (knowledge and skill)—were further applied in the development of interventions. Interventions incorporated SCT components into

- A computer program (Shegog et al., 2001).
- A school-based program with puppetry and role play (McGhan et al., 2003).
- Teaching asthma self-management and monitoring skills (Bailey et al., 1987; Berg, 1995; Creer et al., 1988; Primomo, Johnsto, DiBiase, Nodolf, & Noren, 2006). Activities included daily peak expiratory flow (PEF) monitoring (Burkhart, 1996; Burkhart, Dunbar-Jacob, & Rohay, 2001; Burkhart et al., 2007); a focus on attitudes, social influences, and self-efficacy (Van Es et al., 2001); and the use of a written action plan (McGhan, et al., 2003; Primomo et al., 2006).

Some of these interventions were able to demonstrate an impact on treatment adherence and asthma outcomes, including asthma episodes and school days missed. Other findings included

- Higher self-efficacy in children and adolescents appears to be associated with greater asthma treatment adherence (Branstetter, 2001; Zebracki & Drotar, 2004).
- Teaching children self-management and monitoring skills may help decrease asthma attacks and school days missed due to asthma (Creer et al., 1988), as well as improve self-efficacy (Shegog et al., 2001).

PEF monitoring is one method of asthma self-management. In one study (Burkhart et al., 2007), those with greater adherence to daily PEF monitoring were less likely to have an asthma episode. However, adherence to daily PEF monitoring may be poor. Consider electronic monitoring if accuracy of self-report is questioned. For school-aged children, encourage parents to supervise treatment adherence and record keeping.

Implementing asthma programs for children in the school setting may positively influence the school environment (e.g., teacher knowledge of asthma, school policy) and facilitate optimal attendance by reducing the burdens on parent schedules and the need for transportation to a different location (McGhan et al., 2003).

D.2.3 Provider Patient Interaction Theory

Key functions of **provider-patient interaction** or communication include building the provider-patient relationship, exchanging information, responding to emotions, managing uncertainty, policy-making, and enabling patient self-management. These may have a direct or indirect influence on health outcomes. For example, an indirect pathway to health outcomes would involve providers improving patient knowledge. Key functions of provider-patient communication are described in more detail below:

- *Building the provider-patient relationship:* Mutual trust and respect between provider and patient is an important foundation for the relationship. Providers and patients need to communicate openly about expectations for the relationship (e.g., views on level of patient involvement in making decisions) to agree on standards for the relationship.
- *Exchanging and managing information:* Providers and patients need to actively participate in the exchange and management of information. Successful information exchange includes providers taking the time to learn about the patient's beliefs and understanding. Providers should also explain the health issues or risks in a manner that is clearly understood by the patient. It is important for providers and patients to have a shared understanding of the health issue.
- *Responding to emotions:* Patients with health issues may have negative emotions that could impact their quality of life. Providers may help patients handle these emotions by communicating clearly about the health issue and treatment, encouraging patients to talk about their emotions, and validating the patients' emotions.
- *Managing uncertainty:* Uncertainty will need to be managed instead of reduced because uncertainty can have both a positive and negative effect.
- *Decision-making:* Having mutually agreed-upon provider-patient relationship standards may help with making decisions. Different patients have different preferences for their level of involvement in decision-making. Knowing patient preferences and health beliefs is beneficial in the decision-making process and can lead to greater patient satisfaction. Providers and patients need to both agree on the decision being made.
- *Enabling patient self-management:* Providers can help improve patient self-efficacy by providing recommendations, instructions, and supportive guidance that allows the patient to take greater responsibility for their health and treatment. Providers need to make sure information and recommendations are clear and understandable to the patient.

Duggan, A. & Street, R. L. (2015). Interpersonal communication in health and illness. In K. Glanz, B. K. Rimer, & K. Viswanath (Eds.), *Health behavior: Theory, research, and practice* (5th ed., pp. 243–267). San Francisco, CA: Jossey-Bass.

Application of Provider-Patient Interaction Theory in Asthma Programs

Continuing education programs on effective communication strategies can be offered to providers. Optimal provider-patient communication includes a patient-focus, a collaborative self-management approach, and the use of communication behaviors associated with positive patient outcomes (e.g., interactive conversation, addressing fears, tailoring medication schedules, reaching agreement on short-term goals, providing criteria for decision-making). Such provider education programs have been shown to have a positive impact on provider communication and teaching behaviors, as well as on patient asthma outcomes (Irwin & Richardson, 2006; Worstell, 2000). Worstell (2000) also described the important role of patient support organizations to supplement the information provided by physicians.

Provider education programs that focus on communication should also address the need for cultural competency. Cultural competency is comprised of a provider's knowledge of a given culture, sensitivity to their own cultural biases and how they may influence their perceptions of a patient, and ability to interact with patients in a culturally relevant manner. Miscommunication between providers and patients due to language barriers, low health literacy, provider stereotyping, or poor communication of patient-reported symptoms may contribute to asthma health disparities (Diette & Rand, 2007). Greater provider cultural competency is correlated with patient trust and satisfaction with the provider, which could possibly lead to improved health outcomes (Lucas, Michalopoulou, Falzarano, Menon, & Cunningham, 2008).

D.2.4 Family Functioning or Family Dynamics Theory

Family functioning, dynamics, and routines are broad concepts that cover a wide range of theories and systems. Descriptions of family functioning and its dimensions varied in the studies reviewed as different aspects of family functioning were investigated.

- *Family functioning*—interaction and communication between family members and the family's ability to adapt to changes or stressors. Dimensions include adaptability and cohesiveness (Gustafsson, 2005; McClellan & Cohen, 2007; Vinson, 1996); hierarchical organization, communication, and construction of reality (Gustafsson, 2005).
- *Family dynamics*—patterns of family interactions and how those interactions change. Dimensions include enmeshment, over protectiveness, rigidity, and lack of conflict resolution (Onnis, Tortolani, & Cancrini, 1986); and attachment (Gilchrist, 2004).
- *Family routines or rituals*—regularly followed, predictable procedures or tasks and symbolic actions for special occasions. Dimensions include dinnertime or weekend routines (Spagnola, 2008) and annual celebrations (e.g., birthday), religious celebrations, or cultural tradition rituals (Markson & Fiese, 2000).

Specific theories emerging from the literature reviewed included a family systems approach, King's systems framework, attachment theory, the Circumplex Model of Family Systems, and the Resiliency Model of Family Stress, Adjustment, and Adaptation.

- *Family systems—approach considers the family as a whole and the interaction between family members instead of looking at the individual outside of their family context (Celano, 2001; Erickson, 1991; Frey, 1995; Von Schlippe, Theiling, Lob-Corzilius, & Szczepanski, 2001).*
- *King's systems framework for nursing is used to understand the interaction of various factors that influence the family and child health. King's framework is comprised of three interacting systems: personal, interpersonal, and social (Frey, 1995).*
- *Attachment theory— indicates that the attachment relationship between a child and parent is necessary for the child's emotional wellbeing. In this model, child health can be compromised by an emotional response by the parent who is unable to respond to the child's needs (Gilchrist, 2004).*
- *Circumplex Model of Family Systems hypothesizes that family cohesion (emotional bonding with each other) and family adaptability (the family's ability to change its structure and roles in response to stress) are important concepts to the family structure and function (Erickson, 1991).*
- *The Resiliency Model of Family Stress, Adjustment, and Adaptation is a theoretical framework that describes family adjustment and adaptation when families experience stressful life situations such as illness of a family member (Swartz, 2004).*

Application of Family Functioning or Family Dynamics Theory in Asthma Programs

Overall recommendations for interventions emerged from the studies based on their findings:

- Asthma demands affect the whole family, so interventions need to have a family focus instead of solely focusing on the child with asthma (Buford, 2004; Celano, 2001; Celano, 2006; Franck & Callery, 2004; Gustafsson, 2005; Nookong, 2005; Svavarsdottir, 1997; Swartz, 2004; Von Schlippe et al., 2001; Zimmerman et al., 1999).
- Interventions need to be comprehensive and include the entire family (Celano, 2006; Von Schlippe et al., 2001) as well as be tailored based on the family's readiness, strengths, relationships or dynamics, resources, or needs (Buford, 2004; Celano, 2006; Frey, 1995; Svavarsdottir, 1997; Swartz, 2004; Zimmerman et al., 1999). By identifying family needs and tailoring interventions, family functioning may be improved, which could positively impact treatment adherence, asthma symptoms, and asthma severity, as well as the ability of the family to adapt to the asthma diagnosis and management.

Assessing family needs to tailor interventions may include

- Identifying families that need assistance managing their child's asthma (Erickson, 1991), which may include younger families that need help adjusting to stressors (Donnelly, 1994).
- Identifying family stresses and needs (Gustafsson, 2005).
- Gathering information from multiple family members to obtain all perspectives (McClellan & Cohen, 2007).
- Assessing caregiver demands and available resources (Lee, Parker, DuBose, Gwinn, & Logan, 2006).

Some specific intervention components to consider:

- Involve the entire family in the intervention (Buford, 2004; Celano, 2001; Celano, 2006; Franck & Callery, 2004; Gustafsson, 2005; Hamlett, Pellegrini, & Katz, 1992; Nookong, 2005; Swartz, 2004; Von Schlippe et al., 2001; Zimmerman et al., 1999). Some examples include conducting activities in group settings with parents and children and allowing families to share experiences with each other (Von Schlippe et al., 2001), developing families' self-regulatory skills (Zimmerman et al., 1999), or education that takes into consideration the family dynamics (Swartz, 2004).
- An interdisciplinary team that combines family therapy (e.g., therapist, psychologist), to address family functioning, and medical asthma management (e.g., doctors, nurses, asthma sport coach) (Celano, 2001; Celano, 2006; Gustafsson, 2005; Von Schlippe et al., 2001).
- Components geared toward increasing treatment adherence (Nookong, 2005; Von Schlippe et al., 2001), that also bear in mind the family views or perspectives regarding asthma management (Bender, 2007; Buford, 2004).
- High-quality communication with families (Bender, 2007; Buford, 2002; Buford, 2004; Levit, 1996; Von Schlippe et al., 2001), which consists of developing a partnership between providers and families (Jokinen, 2004; Von Schlippe et al., 2001), as well as teaching and listening to families (Buford, 2002).

- Components designed to assist families with managing caregiver demands (Svavarsdottir, 1997) or decreasing stress (Nookong, 2005; Swartz, 2004).
- Include ways to promote self-esteem and resourceful coping in adolescents with asthma (Preechawong et al., 2007).

D.3 Organizational-Level Theories

Theories discussed in this section relate to organizational behavior and include

- Healthcare Theories
- Diffusion of Innovations Theories

These theories are presented in Sections D.3.1 and D.3.2 below.

D.3.1 Healthcare Theories

Several articles and one dissertation looked at various **theories of healthcare systems, healthcare delivery, and healthcare utilization** related to asthma. These theories vary but generally look at how care is organized and how that organization affects various types of asthma-related outcomes. Theories examined are listed below.

- *Family-Centered Care (FCC)*. A model that posits that families are central to dealing with chronic illness in children's healthcare and that healthcare organizations and providers should involve parents and other family members in decision-making around care. There are several models of FCC, but all are intended to guide clinical service delivery and ensure close collaboration between families and healthcare providers (Franck & Callery, 2004).
- *The Behavioral Model of Health Services Utilization*. A widely used model for studying healthcare utilization. The model has four main components: population characteristics, environmental influences, health behaviors, and health outcomes. Population characteristics—including predisposition to use services, ability to use services, and need for health services—constitute the primary determinants of health care utilization. Environmental influences—including type of health care system and contextual influences—are more distal influences on use. Health behaviors are seen as assessments of health resource utilization. Health outcomes were added to the model to look at measures of the benefit the recipient obtains from using health services (Erickson, Christian, Kirking, & Halman, 2002).
- *Systems Approach*. Systems approaches look at how the healthcare practice is organized to provide care and to influence what type of care is offered. Systems approaches also look at how providers' knowledge, attitudes, and practices may be influenced by the systems of care in which they are embedded (Tumiel-Berhalter & Hershey, 2005).
- *Medical Pluralism*. Looks at how multiple medical systems (such as home treatment, traditional healers, and Western medicine) can intermingle to produce health and health care (Schwartz, 2001).
- *Chronic Care Model*. A comprehensive model for improving the health care system in terms of dealing with patients with chronic conditions. The model looks at how to strengthen community resources and policies, health system organizations, self-management support, delivery system design, decision support, and clinical information systems to support informed and activated patients interacting with a prepared and proactive practice team to create improved outcomes (Anonymous, 2001).

Application of Health Care Theories in Asthma Programs

References used various healthcare theories to describe the applicability of an existing model to asthma (Anonymous, 2001; Franck & Callery, 2004). Some studies used the healthcare theories to understand the relationship between variables (Erickson et al., 2002; Schwartz, 2001; Tumieli-Berhalter & Hershey, 2005). Other references tended to promote the application of theory to asthma programs.

Some research articles generally used the relevant model as an organizing framework for the research. For example

- A researcher used the behavioral model of health services utilization as a way to organize measures from existing quality of life instruments (Erickson et al., 2002).
- A dissertation (Schwartz, 2001) used ethnographic methods to understand how medical pluralism affects conceptions of asthma and how asthma is treated in a U.S.-Mexico border region. Based on international surveillance data, that region has low asthma incidence.
- Finally, one study took a systems approach to understand factors, beyond clinician attitudes, that may constrain or promote the use of asthma guidelines (Tumieli-Berhalter & Hershey, 2005).

D.3.2 Diffusion of Innovation Theory

Diffusion of innovations is the process of communicating a new idea or practice over time to members of a social system. The innovation, communication channels, time, and the social system are the four main elements of diffusion of innovations. Several innovation characteristics may affect how quickly and to what extent an innovation is adopted.

- *Relative advantage*: Is the innovation perceived to be better than what is currently available?
- *Compatibility*: Is the innovation compatible with social system values and norms?
- *Complexity*: Is the innovation easy to understand and use?
- *Trialability*: Can the innovation be tested on a trial basis?
- *Observability*: Are innovation results visible to others?

An innovation is communicated to members of the social system through various channels. Communication channels include mass media channels (e.g., television, newspapers), interpersonal channels (e.g., face-to-face interaction), and the Internet. Effective communication can be difficult due to the different attributes and beliefs of members in the social system (heterophily).

The time required for diffusion of innovations is determined by the innovation-decision process, adopter categories, and the rate of adoption.

- *Innovation-decision process*: Decision-making process an individual goes through from first exposure to the innovation through the decision to adopt or reject the innovation, implement the innovation, and confirm the decision.
- *Adopter categories*: There are different categories of adopters based on the degree an individual adopts new ideas compared to other members of the social system. Categories include innovators, early adopters, early majority, late majority, and laggards. Innovators actively seek information about new ideas and are the first adopters. Laggards are the last members of the social system to adopt an innovation.
- *Rate of adoption*: How quickly is the innovation adopted by the social system?

The social system has a structure that includes established norms or behaviors for members of the social system. Diffusion of innovations can be facilitated or hindered by the social system structure. Opinion leaders and change agents can help influence individuals' attitudes or innovation decisions.

Rogers, E. M. (2003). *Diffusions of innovations* (5th ed.). New York, NY: Free Press.

Application of Diffusion of Innovations Theory in Asthma Programs

References that used the Diffusion of Innovation theory tested the adoption of asthma educational protocols (Mesters & Meertens, 1999) and asthma training materials by healthcare professionals (Rodehorst, Wilhelm, & Jensen, 2005); and asthma interventions by school districts (Wilson and Kurz, 2008). Additionally, one study investigated the innovation characteristics that would promote dissemination of an asthma protocol (Mesters & Meertens, 1999).

Two studies examined the institutionalization or sustainability of the innovation once it was adopted (Mesters & Meertens, 1999; Wilson & Kurz, 2008). Institutionalization is the long-term integration of an innovation within a social system or organization. Between these two studies, dissemination was viewed as having four slightly different phases: adoption, implementation, institutionalization, and maintenance (Wilson & Kurz, 2008) versus awareness, adoption, implementation, and continuation (Mesters & Meertens, 1999).

Diffusion of new asthma protocols or guidelines may be difficult, with more experienced healthcare providers not adopting the change as readily as others. Demonstrating that the new protocol is better than the existing protocol is very important to encourage healthcare providers to adopt the protocol. Funding or resources may also impact the individual's or organization's ability to sustain an innovation.

D.4 Planning Models

The planning model discussed in this section is the PRECEDE-PROCEED Model, presented in Section D.4.1 below.

D.4.1 PRECEDE-PROCEED Model

The **PRECEDE** (Predisposing, Reinforcing, and Enabling Constructs in Educational or Environmental Diagnosis and Evaluation)—**PROCEED** (Policy, Regulatory, and Organizational Constructs in Educational and Environmental Development) Model is a framework that helps provide a structure for applying theories and concepts systematically in planning and evaluating health behavior change programs. This framework consists of four planning phases, one implementation phase, and three evaluation phases.

Phase 1: Social Assessment, understanding of the community of interest is expanded through multiple qualitative or quantitative data collection activities. The social assessment articulates the community's needs and desires and incorporates the strengths and resources of the community members. The assessment also includes their problem-solving capacity and readiness to change.

Phase 2: Epidemiological, Behavioral, and Environmental Assessments identify health priorities and the priorities' behavioral and environmental determinants.

Phase 3: Educational and Ecological Assessment, predisposing, reinforcing, and enabling factors—factors influencing the likelihood that change will occur—are identified. Program components are selected and aligned with the previously identified determinants of change in.

Phase 4: Administrative and Policy Assessment and Intervention Alignment to form the program plan.

Phase 5: Implementation, training materials, and other resources for program delivery are developed.

Phases 6–8 cover process evaluation (Phase 6) to understand if the program was implemented as planned, impact evaluation (Phase 7) to identify changes in behavior and environment, and outcome evaluation (Phase 8) to understand effects on health and quality of life.

Bartholomew, L. K., Markham, C., Mullen, P., & Fernandez, M. E. (2015). Planning models for theory-based health promotion interventions. In K. Glanz, B. K. Rimer, & K. Viswanath (Eds.), *Health behavior: Theory, research, and practice* (5th ed., pp. 359–387). San Francisco, CA: Jossey-Bass.

Application of the PRECEDE-PROCEED Model in Asthma Programs

The PRECEDE-PROCEED framework has been used in both designing and evaluating asthma interventions:

- Two articles reported on a self-management asthma education program based on the PRECEDE-PROCEED Model (Chiang et al., 2003; Chiang et al., 2004). The authors conducted interviews with parents of children with asthma and used a content analysis to identify 12 predictor variables. Based on the PRECEDE-PROCEED Model, the variables were classified as predisposing factors (perceived severity, asthma knowledge, asthma attitude, and self-efficacy), enabling factors (facilities of environmental control, convenience of transportation, education required), and reinforcing factors (family support, health profession support, doctor-patient communication, perceived effectiveness, children’s cooperation). The authors examined the relationship of these factors to self-management behaviors.
- Another study utilized the PRECEDE-PROCEED model to develop an asthma self-management intervention—the University of Alabama at Birmingham (UAB) asthma self-management program for adults with asthma (Bailey et al., 1987). The evaluation of this program used the Asthma Opinion Survey, which was developed at UAB and includes items related to predisposing, enabling, and reinforcing factors.

The PRECEDE-PROCEED model was also used as an organizing structure for an evaluation of the Neighborhood Asthma Coalition. The Coalition was an intervention developed to engage children with asthma as well as their caregivers, friends, and neighbors using a community organization approach.

D.5 Literature Search Methodology

This appendix presents summary findings from a literature review, which was conducted for the time period 1983–2008 and included articles, published books, and dissertations and theses employing a variety of social science theories in publications related to asthma. The English-language-only literature was searched using the following databases PubMed/Medline, Cochrane, CINAHL, Sociological Abstracts, ERIC, SocSciIndex, PsychInfo, Dissertation Database, OCLC, and the University of Washington Library Catalog.

We searched these databases for references that included the terms “asthma” AND “theory.” We also specifically searched for known theories including “asthma” AND any of the following terms

- Health Belief Model (HBM)
- Transtheoretical Model OR Stages of Change
- Theory of Planned Behavior (TPB) OR Theory of Reasoned Action (TRA) OR Integrated Behavioral Model
- Precaution Adoption Process Model (PAPM) Self-Regulation Model Attribution Theory OR Decision-making Theory Control Theory Grounded Theory
- Social Cognitive Theory (SCT) OR Social Learning Theory (SLT) Social Support OR Social Network

- Provider–Patient Interaction OR Clinician–Patient Communication Stress Theory OR Coping Theory
- Family Functioning OR Social Systems Theory OR Family Dynamics Community Organization OR Community Building
- Diffusion of Innovations
- Organizational Change OR Organizational Development Theory Communication Theory PRECEDE OR PROCEED
- Social Marketing
- Ecological models OR Socio-Ecological Framework OR Ecologic theory
- RE-AIM

References returned by the search were reviewed using the following inclusion or exclusion criteria.

1. Primary condition or diagnosis must be asthma. Do not include articles where asthma is merely a symptom or complication of another disease or condition or is a passing reference.
2. The article must relate to one or more asthma outcomes (e.g., medication adherence, self-management, healthcare utilization, etc.).
3. Theory or model must be mentioned either explicitly or implicitly, but does not have to be one of the theories or models on the social science theory search list (e.g., not sufficient for the article to merely talk about the term such as patient-provider communication without discussion of a theoretical framework around this issue).

Note: Term “grounded theory” is a special case—references with this key word (in the absence of mention of other theories) should be examined for the development of new theories but should not otherwise be included.

Two reviewers independently reviewed each reference based on title, abstract, or keyword and made a determination for inclusion or exclusion. Where the reviewers disagreed, a third reviewer made a final determination. A total of 203 references were included in the review at this stage and assigned to a reviewer for abstraction. All of these references were requested and further reviewed. Sixty-nine additional references were excluded at this stage for failing to meet inclusion criteria. A total of 134 references were abstracted and included in the final review.

Based on this review, we identified a total of 134 references that discussed both asthma and an asthma outcome and used a social science theory in a substantive way. Several of these references included discussion of more than one theory. This set of 134 references discussed 43 theories to a greater or lesser extent; a large number of these theories were discussed by only one reference. For the purpose of this review, we developed summaries of 12 of the predominant theories, defined as those discussed by at least four references.

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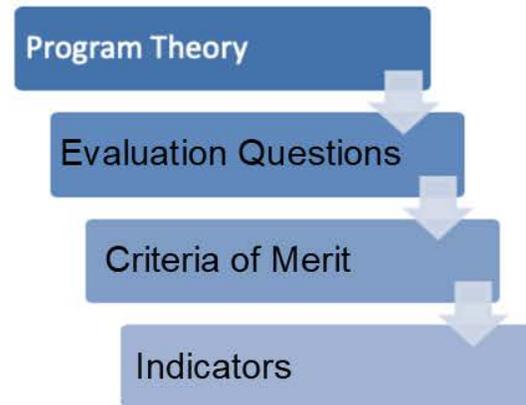
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Appendix E. Selecting Indicators

Indicators are specific, observable, and measurable statements that help define exactly what you mean. We look to indicators for the answers to our evaluation questions—to learn whether a program is operating and producing results as intended. As we gather credible evidence, guiding stakeholders to select meaningful indicators is a very important task.

To select strong indicators, we revisit earlier steps in the evaluation process. We start with a sound program theory, represented by the logic model, and then we generate and prioritize the evaluation questions that reflect stakeholders' information needs. Once we've narrowed our focus, it is time to discuss the dimensions of performance (i.e., criteria of merit) that align with the evaluation questions of interest. Criteria of merit are "...the aspects of an Evaluand [the entity that is the focus of the evaluation] that define whether it is good or bad and whether it is valuable or not valuable" (Davidson, 2005, p.23). By clearly articulating the criteria of merit, we are defining what is meant by the ambiguous words that sometimes appear in evaluation questions. Once this is established, measurement becomes an easier process and we can move on to establishing one or more indicators for each criterion—each of which will provide insight, or answers, to our evaluation questions.



In this appendix, we will illustrate how to use a logic model to create evaluation questions and select indicators. Our example will be a state-level program that is designed to support community-based home visiting programs for people with poorly controlled asthma.

Using Your Logic Model to Ask Evaluation Questions

As we have learned, a logic model is a useful tool in designing an evaluation. It provides a visual description of the intended connection between what a program does (its activities) and what it intends to change in the world (its outcomes). Once stakeholders have agreed that this picture accurately represents the program, we can use the picture to clarify evaluation questions and develop indicators.

In theory, every “box” and “arrow” in our logic model is an opportunity to ask evaluation questions and identify indicators to answer the questions. Since resources are limited, evaluators can help stakeholders prioritize the most important information needs. Together, we can scan, for example, all the boxes with short-term outcomes. Do any merit a deeper look than is possible with already available program data?

We find a balance between the ideal—collecting information about everything we may want to know, and the practical—collecting enough information to make sound program decisions. In a phrase, it's need to know versus nice to know.

After generating a list of potential evaluation questions and visually tracing, or mapping, them to the logic model, we can see whether we have selected a sufficient number of related questions and indicators to fully answer our questions. It is important to ensure that our evaluation will provide decision-makers with enough information to take action—that means once we’ve finished the evaluation, we aren’t missing a critical piece of information. Typically, for a program evaluation, we try to focus our evaluation so that, overall, we get just the right amount of information to act on. We find a balance between the ideal—collecting information about everything we may want to know, and the practical—collecting enough information to make sound program decisions. In a phrase, it’s need to know versus nice to know. (For more information on focusing your evaluation to support your evaluation’s purpose, see Module 1, *Learning and Growing*).

Below is the logic model for our home-visiting intervention (**Figure E.1**). It shows the activities a state-level program could undertake to develop a program in which community-level organizations and health care providers collaborate to ensure that people with poorly controlled asthma receive home-based services.

Following the logic model is **Table E.1**, which illustrates just some of the questions that can be derived from each of the boxes and arrows.

Figure E.1 State-Level Model for Home-based Intervention

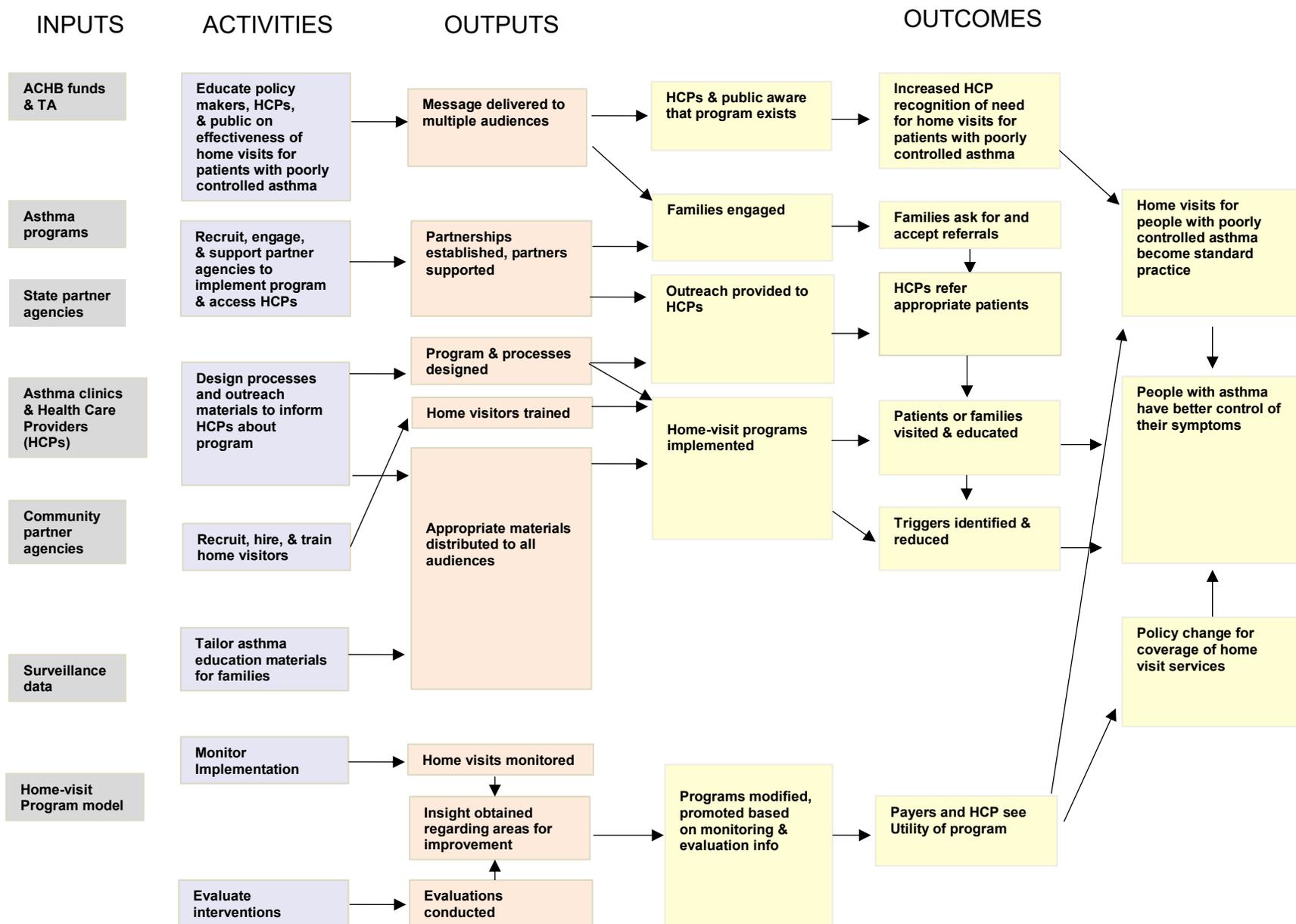


Table E.1 Sample Evaluation Questions Derived from Logic Model

Logic Model Element	Possible Evaluation Questions
Inputs	
ACHB funds and TA	To what extent are funds used to perform our activities efficiently and in line with our program goals? How, if at all, are we making use of the existing technical assistance resources?
Asthma programs	To what extent are we collaborating with other programs that exist in our jurisdiction and could contribute to or impact home-based asthma programs?
State partner agencies	To what extent are we engaging partners within our jurisdiction in our home-based asthma programs? What partners in our jurisdiction are critical to our program success who are not currently at the table?
Asthma clinics and Health Care Providers (HCPs)	To what extent are we engaging with the wide array of asthma clinics and HCPs in the jurisdiction that is the focus of our intervention efforts?
Community partner agencies	To what extent and in what ways are we working with existing infrastructures and helping to strengthen the community-level agencies that work with clinics, HCPs, and people with asthma?
Surveillance data	In what ways, if any, could we make better use of our existing surveillance data to guide the development of our home-visit programming to areas of need?
Home-visit program model	In what ways does the available home-visit model match well with our community? Where should adjustments be made?
Activities and Outputs	
Educate policy-makers, HCPs, and the public on effectiveness of home visiting programs for patients with poorly controlled asthma	Who are we currently reaching through our efforts to educate about the effectiveness of home visiting programs for patients with poorly controlled asthma? What key audiences are missing in our current outreach efforts?
Recruit and engage partner agencies who can implement program and access HCPs	What opportunities exist for improving the mix of community partner agencies engaged in implementing the home-visit program?
Design processes and outreach materials to inform HCPs about program	To what extent are community partner agencies making use of the outreach and referral processes we have put in place for informing HCPs about the program? Why are they or are they not making use of these processes?
Recruit, hire, and train home visitors	To what extent, and in what ways, do home visitors meet the basic competencies required to perform the intervention?
Tailor education materials for families	To what extent do families of people with asthma understand and resonate with the content of our educational materials? To what extent are our materials respectful and responsive to the cultural context? How many educational materials have HCPs and home visitors distributed in the past year? What are the demographic characteristics of the audiences to whom these resources have been distributed? What audiences, if any, do we still need to reach?

Table E.1 Sample Evaluation Questions Derived from Logic Model

Logic Model Element	Possible Evaluation Questions
Monitor implementation	How complete is our program monitoring data? Which data elements, if any, are lacking in quality or completeness? In what ways, if any, are partners not maintaining fidelity to the model?
Evaluate interventions	To what extent are the evaluations produced to date of high-quality?
Outcomes	
HCP and public aware of home visiting program	To what extent, if any, has awareness of the home visiting program increased among key audiences (including families of people with asthma and policy-makers)?
Families engaged	Of those eligible, how many people with asthma and their families have accepted referrals to participate in the home visiting program? What factors have contributed to accepting or declining the referral?
Outreach provided to HCP	To what extent, and in what ways, do HCPs feel supported by community partner agencies, if at all, to make referrals?
Home-visit programs are implemented	To what extent, and in what ways, does the current implementation align with NACP recommendations? Where are these programs implemented? What opportunities exist, if any, for improving the alignment of implementation with the patterns seen in surveillance data regarding disparities?
Programs modified, promoted based on monitoring and evaluation information	What modifications have programs made based upon evaluative insights? What characteristics of the existing evaluations have promoted or inhibited use?
Increased HCP recognition of need for home visits for poorly controlled patients	To what extent do HCPs recognize the need for home visits in increasing control of asthma? For those who do not agree such visits are needed, what reasons are provided?
Families ask for and accept referrals	Of those eligible, how many families accept referrals to the program? What factors contribute to accepting or declining the referral?
HCPs refer appropriate patients	Who are HCPs referring to the program? To what extent do these referral patterns align with the intended audience for the intervention?
Patients or families visited and educated	How much, if at all, did knowledge about key asthma control messages change among patients or families who participated in the program? To what extent are any knowledge gains sustained over time? How do these changes in knowledge compare to those who did not participate in the program?
Triggers identified and reduced	How much, if at all, is the presence of triggers reduced as a result of the program?
Payers and HCP see utility of program	How credible, if at all, is the evidence supporting program utility to payers and HCPs in our jurisdiction who are key players in policy change? In what ways is the evidence lacking? What is most convincing about the existing evidence?

Table E.1 Sample Evaluation Questions Derived from Logic Model

Logic Model Element	Possible Evaluation Questions
Home visits for those with poorly controlled asthma become standard practice	To what extent have home visits become routinized in existing health care processes in our jurisdiction? What differences, if any, exist between providers in the extent to which this routinization varies? What factors contribute to these differences?
People with asthma have better control of their symptoms	To what extent did the program contribute to improved control of asthma among participants?
Policy changes around asthma reimbursement for home visit services	How many institutional and governmental policies have been altered to include reimbursement for home visit services? To what extent, and in what ways (if any), did the evaluative insights from program monitoring and evaluations inform these changes?

In this example, if our stakeholders need information about how well the program is working—how well a particular outcome is met—the logic model shows a sequence of activities, or pathway, to reach that outcome. While it may be tempting to look only at the outcome box, we can look at the logic model to see the other types of information we can gain by asking questions about the boxes and arrows that feed into the outcome box. The boxes on the left, or process, side of the model may hold the key to the change we do, or don't, see in the outcome.

For example, if we want to know whether HCPs are referring appropriate patients (e.g., people with poorly controlled asthma) to the program, we can follow the arrows to see a path on the logic model. This path shows us that the answer to this question is influenced by the answers to many questions:

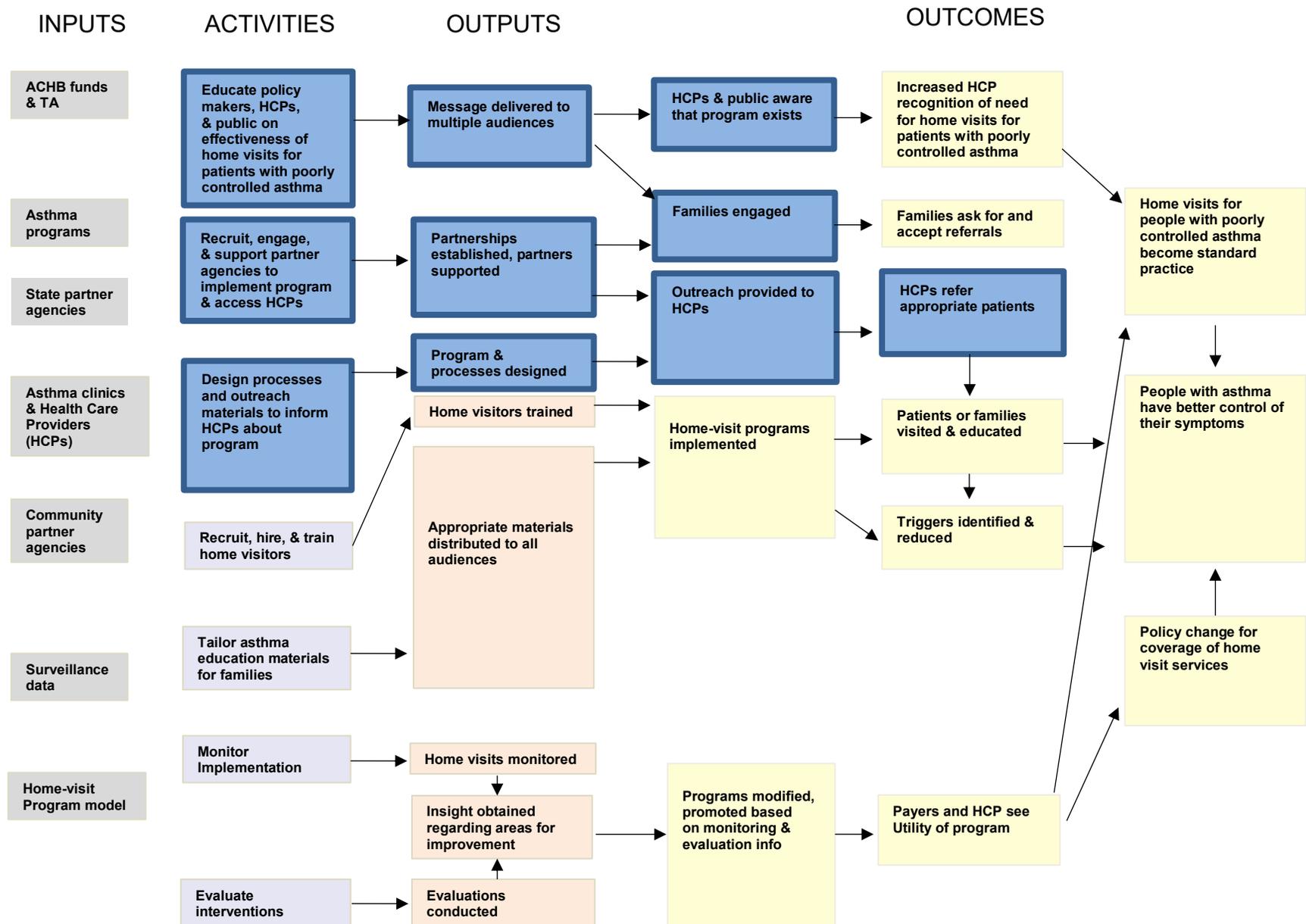
- Do HCPs and families understand the need and value of the home-visiting program in increasing control of asthma?
- Are community partner agencies effectively providing outreach to HCPs and providing them with information and support to effectively make referrals?
- Have community partner agencies developed outreach and referral materials and a strategy to inform the HCPs about making appropriate referrals?
- Have we engaged the right mix of community partner agencies to implement the home-visit program? Is our asthma program working with our existing infrastructure to strengthen the community-level agencies that work with clinics, HCPs, and people with asthma?
- Are we providing information to build awareness of the need for the program among HCPs, key policy-makers, and the public (including people with asthma and their families)?

By working backwards along this path in the logic model and identifying all the boxes that contribute to the outcome we're interested in (HCPs referring appropriately), we may see how and why we're getting a particular answer to our evaluation question. Program monitoring data could easily answer a question about the number of appropriate referrals. However, if we want to understand more about how our referral process works—an evaluation rather than monitoring question—we need to look at additional boxes in the logic model. For example, we might want to examine if our program's activities, and not some other factors in the health care system, are leading to the appropriate referrals. In this case, we need to take a broader approach.

In considering the program's referral process, the stakeholders may decide to narrow or widen the path of inquiry. For example, stakeholders may want to focus on the outreach, information, and referral support provided to the HCPs; or, they might want to see how well families are being engaged so that they request referrals from their providers. The logic model in **Figure E.2** highlights this process.

While the decision about where to focus an evaluation is driven by the stakeholders, it is the evaluator's role to ensure that their choices will produce useful, accurate, and actionable, information.

Figure E.2 State-Level Model for Home-based Intervention – Focusing on Referrals



Using Indicators to Answer Evaluation Questions

Once the stakeholders have selected the questions, we are ready to identify criteria of merit and associated indicators to answer them. If we think about all we can measure about our asthma program, the list of possible indicators may be endless. Focusing the evaluation on a set of need to know questions, and criteria of merit associated with these questions, helps us narrow down the potential indicators.

Some evaluation questions have obvious criteria of merit and indicators. For instance, it is quite common to count outputs in the logic model. For example, a criterion of merit for the output “partnerships established” could be the amount. The associated indicator of this amount might be number of partnerships established. However, it is important to consider less obvious indicators of performance, even when it comes to outputs. For instance, extending our example here, another criterion of merit might be the diversity of partnerships. There are several potential indicators of partnership diversity including the number of sectors represented by partners, demographics of clients served by partners, and size of organizations represented by partners.

Some evaluation questions cannot be answered by something that can be directly and easily seen or counted. For these aspects of a program we typically create proxy indicators. These are indirect, but observable, ways of showing that something has occurred. For example, if we want to know whether people receiving home visits trust information they receive from non-medical providers, such as community health workers, we need to identify an observable way to measure one or more items that may be indicative of trust. Evaluators can rely on stakeholders and look to the existing literature to identify credible proxies.

When selecting indicators, keep in mind the following:

- Logic model components or evaluation questions can have multiple indicators.
- The same indicator can inform more than one program area, logic model component, or evaluation question.
- Select multiple indicators so that, upon completion of the evaluation, you can view the information received as credible and have sufficient information to act on.

During the process of selecting indicators, we have to clarify and agree on what we mean by the terms we choose. These are very important discussions to have with stakeholders, and they reinforce the valuing process. For example, what do we mean by appropriate HCPs? Do we mean “providers who have demonstrated a commitment to offering guidelines-based care”? Or do we mean “providers serving in high burden areas?” Or both?

In **Table E.2**, we show how the logic model elements, evaluation questions, criteria of merit, and indicators are related.

Table E.2 Possible Indicators

Logic Model Element	Possible Evaluation Question(s)	Possible Criteria of Merit and Indicators
Inputs		
Community partner agencies	How well are we engaging with asthma clinics and HCPs?	<p>Comprehensiveness</p> <ul style="list-style-type: none"> Proportion of all eligible or relevant partners in the jurisdiction who have been contacted to participate. <p>Frequency</p> <ul style="list-style-type: none"> Proportion of existing partners engaged in monthly discussions regarding program. <p>Relevance</p> <ul style="list-style-type: none"> Proportion of partners who agree that engagement activities are directly relevant to their work. Proportion of partners who agree that engagement activities are a good use of their time. Most frequent themes from content analysis of comments regarding partners' general quality of engagement with the program (as it relates to relevance).
Activities and Outputs		
Design outreach materials to inform HCPs about program and process to refer patients	To what extent are community partner agencies making use of the outreach and referral processes we have put into place for informing HCPs about the program?	<p>Use</p> <ul style="list-style-type: none"> Proportion of community partner agencies who accessed referral system in past 30 days. Frequency of referrals by community partner agency over past 30 days. Demographics of communities served by community partner agencies using system most often compared to those using it least frequently or not at all.
Outcomes		
Outreach provided to HCPs	To what extent, and in what ways, do HCPs feel supported by community partner agencies, if at all, to make referrals?	<p>Understanding of procedure</p> <ul style="list-style-type: none"> Proportion of community partner agencies who agree or strongly agree that they understand how to navigate the referral process. Proportion of referrals initiated in the past 30 days that are followed to completion. <p>Accessibility</p> <ul style="list-style-type: none"> Proportion of community partner agencies who agree or strongly agree that asthma program staff members are readily available to answer questions. Proportion of community partner agencies that report calling or emailing asthma program staff members about the referral process in the past 60 days who received a response within 48 hours.

HCPs refer appropriate patients	Who are HCPs referring to the program? To what extent do these referral patterns align with the intended priority audience for the intervention?	<p>Reach</p> <ul style="list-style-type: none"> • Number of referrals made by HCPs in past 60 days. • Demographics of individuals referred most frequently in past 60 days. <p>Alignment</p> <ul style="list-style-type: none"> • Proportion of referrals for which individual is eligible for home visit. • Most frequent reason why referral was ineligible.
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Vetting Your Indicators

Now that you have an agreed-upon list of indicators, your next task is to review them carefully and think about how you will collect the data. Indicators can be assessed according to a set of criteria that describe what a high-quality indicator includes (shown in **Table E.3**). Conducting this review with stakeholders gives the evaluator access to their insights and helps the stakeholders understand the ramifications of using various indicators.

In this review process, you may decide to eliminate some of the indicators. Be sure to document these decisions and the rationale for the choices you make.

Table E.3 Example Criteria for Indicator Selection

What will be measured?	What are the inclusion and exclusion criteria that will be applied? What stratifications or categories will be made?
Valid?	Does the indicator measure what it is intended to measure?
Reliable?	Is the indicator based upon accurate and complete data? Will it produce the same results if it is used more than once to measure the same condition or event?
Specific?	Does the indicator reflect only the issues it is meant to measure?
Sensitive?	Is the indicator able to reveal changes in the issue under consideration?
Relevant?	Does the indicator have a clear, meaningful connection with the matter at hand?
Useful?	Will the information produced by the indicator serve the information needs of intended users? Will it be action-oriented? Will it help you figure out a next step?
Timely?	Will the data used to calculate this indicator be available in time for the program to make important decisions?
Feasible?	Is it realistic, prudent, diplomatic, and frugal to collect data for this indicator?
Accessible?	Are the data sources required to calculate this indicator easily accessible and in a usable format? Is it easy to collect?
Ethical?	Are individual data obtained with informed consent? Are they kept confidential and stored securely?
What are the limitations?	What are the potential problems with data collected for the indicator (e.g., completeness, accuracy, timeliness)?

Table E.4 illustrates this review and documentation using one indicator from our example.

Table E.4 Applying Example Criteria to Hypothetical Indicator

Indicator	Proportion of all eligible or relevant partners in jurisdiction who have been contacted to participate
What will be measured?	All partners within the jurisdiction who are eligible for participation.
Valid?	Assuming a line listing of all eligible partners is available, yes. We have a complete file documenting who was contacted to participate.
Reliable?	Yes, we have a complete file that is regularly updated regarding who has been contacted to participate. Results could fluctuate if the denominator (i.e., listing of all eligible partners) is incorrect.
Specific?	Yes.
Sensitive?	This is possible but will depend on the quality of the denominator data.
Relevant?	Yes, we want to ensure that we are collaborating actively with all possible referral sources; this is one clear indicator of the extent to which this is occurring.
Useful?	On its own, it will not be completely action-oriented. We will need a sense of which specific community partner agencies have not been contacted but are eligible.
Feasible?	Yes, we have internal documentation about who has been contacted to participate. It seems feasible to obtain the denominator information from a thorough web search and through engaging our existing network.
Accessible?	Internal contact tracing log, internet websites, partner discussions (will need to be conducted for this purpose).
Ethical?	Yes, no issues identified.
What are the limitations?	Obtaining a complete listing of all community partner agencies may take a lot of time and even with intensive efforts may be incomplete.

Next Steps

With a finalized list of indicators, we are ready to plan for data collection, management, and analysis. The logic model may again be useful in the early stages of data collection. Often, mapping results to the model helps stakeholders visually analyze information and see the connections among program elements. For example, if our indicator for referrals tells us that the program is not meeting our expectations for referrals, we can revisit the various boxes and arrows in the pathway that leads to referrals. In this way, we may identify potential improvements or additional questions or data to collect. Alternately, if the referrals are exceeding expectations, using our evaluation to examine these earlier parts of the process can identify activities that are working well and should be sustained.

Finally, the visual mapping of the logic model may also help in the later evaluation steps as we interpret the findings and communicate and use our results. Throughout the process, modifications to the logic model based on stakeholder discussion and any other decisions need to be recorded in your evaluation's documentation.

References

Davidson, E.J. (2005). *Evaluation methodology basics: The nuts and bolts of sound evaluation*. Thousand Oaks, CA: Sage Publications.