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About This Manual

This manual is a customized version of the "Introduction to Program Evaluation for Public Health Programs: A Self Study Guide" with specific information and examples for appropriate antibiotic use programs. The original manual was produced by the Centers for Disease Control and Prevention's Office of Strategy and Innovation.

To download a copy of this manual, "Introduction to Program Evaluation for Public Health Programs: Evaluating Appropriate Antibiotic Use Programs," please visit the appropriate antibiotic use program website at www.cdc.gov/getsmart.

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Contents

Executive Summary

This document is a "how to" guide for planning and implementing evaluation activities. The manual is based on CDC's *Framework for Program Evaluation in Public Health*, and is intended to assist state, local, and community managers and staff of public health programs in planning, designing, implementing, and using the results of comprehensive evaluations in a practical way. The strategy presented in this manual will help assure that evaluations meet the diverse needs of internal and external stakeholders, including assessing and documenting program implementation, outcomes, efficiency, and cost-effectiveness of activities, and taking action based on evaluation results to increase the impact of programs.

Why Evaluate Public Health Programs?

Public health programs have as their ultimate goal preventing or controlling disease, injury, disability, and death. Over time, this task has become more complex as programs themselves have become more complex. Increasingly, public health programs address large problems, the solution to which must engage large numbers of community members and organizations in a vast coalition. More often than not, public health problems—which in the last century might have been solved with a vaccine or change in sanitary systems—involve significant and difficult changes in attitudes and risk/protective behavior of consumers and/or providers.

In addition, the context in which public health programs operate has become more complex. Programs that work well in some settings fail dismally in others because of the fiscal, socioeconomic, demographic, interpersonal, and/or interorganizational setting in which they are planted. At the same time that programs have become more complex, the demands of policymakers and other stakeholders for accountability have increased.

All these changes in the environment in which public health programs operate mean that strong program evaluation is essential now more than ever, but also that there is no one "right" evaluation. Rather, a host of evaluation questions may arise over the life of the program that might reasonably be asked at any point in time. Addressing these questions about program effectiveness means paying attention to documenting and measuring the implementation of the program and its success in achieving intended outcomes, and using such information to be accountable to key stakeholders.

Program Implementation

The task of evaluation encourages us to examine the operations of a program, including which activities take place, who conducts the activities, and who is reached as a result. In addition, evaluation will show how faithfully the program adheres to implementation protocols. Through program evaluation, we can determine whether activities are implemented as planned and identify program strengths, weaknesses, and areas for improvement.

For example, a treatment program may be very effective for those who complete it, but the number of participants may be low. Program evaluation may identify the location of the program or lack of transportation as a barrier to attendance. Armed with this information, program managers can move the class location or meeting times or provide free transportation, thus enhancing the chances the program will actually produce its intended outcomes.

Program Effectiveness

CDC and the federal government have identified goals that public health programs should work toward to prevent or reduce morbidity and mortality. Comprehensive public health programs use multiple strategies to address these goals. Typically, strategies are grouped into program components that might include, for example, community mobilization, policy and regulatory action, strategic use of media and health communication, and funding of frontline programs. Program evaluation includes documenting progress on program goals and the effectiveness of these strategies in producing this progress.

Program Accountability

Program evaluation is a tool with which to demonstrate accountability to the array of stakeholders, who for a given program may include funding sources, policymakers, state and local agencies implementing the program, or community leaders. Depending on the needs of stakeholders, program evaluation findings may demonstrate that the program makes a contribution to reducing morbidity and mortality or relevant risk factors; or that money is being spent appropriately and effectively; or that further funding, increased support, and policy change might lead to even more improved health outcomes. By holding programs accountable in these ways, evaluation helps ensure that the most effective approaches are maintained and that limited resources are spent efficiently.

This manual is based on the CDC's *Framework for Program Evaluation in Public Health,*[1] and integrates insights from Framework-based manuals developed by CDC's Office on Smoking and Health,[2] and Division of Nutrition and Physical Activity[3] for their grantees and state and local partners, and by the Center for the Advancement of Community Based Public Health for community health programs.[4] This document is organized around the six steps of the CDC Framework:

- Engage Stakeholders
- Describe The Program
- Focus The Evaluation
- Gather Credible Evidence
- Justify Conclusions
- Ensure Use of Evaluation Findings and Share Lessons Learned

Each chapter illustrates the main points using examples inspired by real programs at the federal, state, and local levels. In addition, following each chapter are supplementary materials that apply the main points of the chapter to your specific public health problem or area. These supplementary materials include one or more crosscutting case examples relevant to the specific public health area.

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[1] Centers for Disease Control and Prevention. Framework for program evaluation in public health. Atlanta, GA: MMWR 1999;48(NoRR-11):1-40.

[2] US Department of Health and Human Services. Introduction to program evaluation for comprehensive tobacco control programs. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention, Office on Smoking and Health, November 2001.

[3] US Department of Health and Human Services. Physical activity evaluation handbook. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention, 2002.

[4] Center for Advancement of Community Based Public Health. An evaluation framework for community health programs. Durham, NC: Center for Advancement of Community Based Public Health, June 2000.

Introduction

What is Program Evaluation?

Most program managers assess the value and impact of their work all the time when they ask questions, consult partners, make assessments, and obtain feedback. They then use the information collected to improve the program. Indeed, such informal assessments fit nicely into a broad definition of evaluation as the "*examination of the worth, merit, or significance of an object.*"[5] And throughout this manual, the term "program" will be defined as "*any set of organized activities supported by a set of resources to achieve a specific and intended result.*" This definition is intentionally broad so that almost any organized public health action can be seen as able to benefit from program evaluation:

- Direct service interventions (e.g., a program that offers free breakfasts to improve nutrition for grade school children)
- Community mobilization efforts (e.g., an effort to organize a boycott of California grapes to improve the economic well-being of farm workers)
- Research initiatives (e.g., an effort to find out whether disparities in health outcomes based on race can be reduced)
- Advocacy work (e.g., a campaign to influence the state legislature to pass legislation regarding tobacco control)
- Training programs (e.g., a job training program to reduce unemployment in urban neighborhoods)

What makes true program evaluation different from the sort of informal assessment that any smart and dedicated manager is doing all the time? Mainly, it is that evaluation is conducted according to a set of guidelines (protocols) that are systematic, consistent, and comprehensive to assure the accuracy of the results. For purposes of this manual, we will define program evaluation as "*the systematic collection of information about the activities, characteristics, and outcomes of programs to make judgments about the program, improve program effectiveness, and/or inform decisions about future program development.*"[6] Program evaluation does not occur in a vacuum; rather, it is influenced by real-world constraints. Evaluation should be practical and feasible and must be conducted within the confines of resources, time, and political context. Moreover, it should serve a useful purpose, be conducted in an ethical manner, and produce accurate findings. Evaluation findings should be used both to make decisions about program implementation and to improve program effectiveness.

As you will see, many different questions can be part of a program evaluation, depending on how long the program has been in existence, who is asking the question, and why the information is needed. In general, evaluation questions fall into one of these groups:

- **Implementation:** Were your program's activities put into place as originally intended?

[5] Scriven M. Minimalist theory of evaluation: The least theory that practice requires. American Journal of Evaluation 1998;19:57-70.
[6] Patton MQ. Utilization-focused evaluation: The new century text. 3rd ed. Thousand Oaks, CA: Sage, 1997.

- **Effectiveness:** Is your program achieving the goals and objectives it was intended to accomplish?
- **Efficiency:** Are your program's activities being produced with appropriate use of resources such as budget and staff time?
- **Cost-Effectiveness:** Does the value or benefit of achieving your program's goals and objectives exceed the cost of producing them?
- **Attribution:** Can progress on goals and objectives be shown to be related to your program, as opposed to other things that are going on at the same time?

All of these are appropriate evaluation questions and might be asked with the intention of documenting program progress, demonstrating accountability to funders and policymakers, or identifying ways to make the program better.

Evaluation Supplements Other Types of Reflection and Data Collection

Evaluation is one of several ways in which the staff of a program might answer the question "How are we doing?" In most large organizations, that question might be posed at budgeting time, during strategic planning, in constructing performance measures, or even in establishing the marketing "brand" for the organization. And the question might be answered using approaches that could be characterized as "surveillance," "research," or "program evaluation." It is important that organizations see these processes as related and do their best to integrate the insights from them. Here's how:

Planning

Planning asks, "What *are* we doing and what *should* we do to achieve our goals?" Program evaluation, by providing information on progress toward organizational goals and identifying which parts of the program are working well and/or poorly, sets up the discussion of what can be changed to help the program better meet its intended goals and objectives.

Performance Measurement

Increasingly, public health programs are called to be accountable to funders, legislators, and the general public. Many programs do this by creating, monitoring, and reporting results for a small set of markers and milestones of program progress. Such "performance measures" are a type of evaluation—answering the question "*How* are we doing?" More importantly, when performance measures show significant or sudden changes in program performance, program evaluation efforts can be directed to the troubled areas to determine "*Why* are we doing poorly or well?"

Budgeting

Linking program performance to program budget is the final step in accountability. Called "activity-based budgeting" or "performance budgeting," it requires an understanding of program components and the links between activities and intended outcomes. The early steps in the program evaluation approach (such as logic modeling) clarify these relationships, making the link between budget and performance easier and more apparent.

Surveillance and Program Evaluation

While the terms *surveillance* and *evaluation* are often used together, each makes a distinctive contribution to a program, and it is important to clarify their different purposes. *Surveillance* is the continuous monitoring or routine data collection on various factors (e.g., behaviors, attitudes, deaths) over a regular interval of time. Surveillance systems have existing resources and infrastructure. Data gathered by surveillance systems are invaluable for performance measurement and program evaluation, especially of longer term and population-based outcomes. In addition, these data serve an important function in program planning and "formative" evaluation by identifying key burden and risk factors—the descriptive and analytic epidemiology of the public health problem. There are limits to how useful surveillance data can be for evaluators. For example, some surveillance systems such as the Behavioral Risk Factor Surveillance System (BRFSS), Youth Tobacco Survey (YTS), and Youth Risk Behavior Survey (YRBS) can measure changes in large populations, but have insufficient sample sizes to detect changes in outcomes for more targeted programs or interventions. Also, these surveillance systems may have limited flexibility when it comes to adding questions that a particular program evaluation might like to have answered.

In the best of all worlds, surveillance and evaluation are companion processes that can be conducted simultaneously. *Evaluation* may supplement surveillance data by providing tailored information to answer specific questions about a program. Data collection that flows from the specific questions that are the focus of the evaluation is more flexible than surveillance and may allow program areas to be assessed in greater depth. For example, a state may supplement surveillance information with detailed surveys to evaluate how well a program was implemented and the impact of a program on participants' knowledge, attitudes, and behavior. They can also use qualitative methods (e.g., focus groups, feedback from program participants from semi-structured or open-ended interviews) to gain insight into the strengths and weaknesses of a particular program activity.

Research and Program Evaluation

Both research and program evaluation make important contributions to the body of knowledge, but fundamental differences in the purpose of research and the purpose of evaluation mean that good program evaluation need not always follow an academic research model. Even though some of these differences have tended to break down as research tends toward increasingly participatory models[7] and some evaluations aspire to make statements about attribution, "pure" research and evaluation serve somewhat different purposes ("Distinguishing Principles of Research and Evaluation" table), nicely summarized in the adage "Research seeks to prove; evaluation seeks to improve." Academic research focuses primarily on testing hypotheses; a key purpose of program evaluation is to improve practice. Research is generally thought of as requiring a controlled environment or control groups. In field settings directed at prevention and control of a public health problem, this is seldom realistic. The last three attributes in the table are especially worth noting. Unlike pure academic research models, program evaluation

[7] Green LW, George MA, Daniel M, Frankish CJ, Herbert CP, Bowie WR, et al. Study of participatory research in health promotion: Review and recommendations for the development of participatory research in health promotion in Canada. Ottawa, Canada: Royal Society of Canada, 1995.

acknowledges and incorporates differences in values and perspectives from the start, may address many questions besides attribution, and tends to produce results for varied audiences.

Distinguishing Principles of Research and Evaluation

Concept	Research Principles	Program Evaluation Principles
Planning	**Scientific method** • State hypothesis. • Collect data. • Analyze data. • Draw conclusions.	**Framework for program evaluation** • Engage stakeholders. • Describe the program. • Focus the evaluation design. • Gather credible evidence. • Justify conclusions. • Ensure use and share lessons learned.
Decision Making	**Investigator-controlled** • Authoritative.	**Stakeholder-controlled** • Collaborative.
Standards	**Validity** • Internal (accuracy, precision). • External (generalizability).	**Repeatability program evaluation standards** • Utility. • Feasibility. • Propriety. • Accuracy.
Questions	**Facts** • Descriptions. • Associations. • Effects.	**Values** • Merit (i.e., quality). • Worth (i.e., value). • Significance (i.e., importance).
Design	**Isolate changes and control circumstances** • Narrow experimental influences. • Ensure stability over time. • Minimize context dependence. • Treat contextual factors as confounding (e.g., randomization, adjustment, statistical control). • Understand that comparison groups are a necessity.	**Incorporate changes and account for circumstances** • Expand to see all domains of influence. • Encourage flexibility and improvement. • Maximize context sensitivity. • Treat contextual factors as essential information (e.g., system diagrams, logic models, hierarchical or ecological modeling). • Understand that comparison groups are optional (and sometimes harmful).
Data Collection	**Sources** • Limited number (accuracy preferred). • Sampling strategies are critical. • Concern for protecting human subjects. **Indicators/Measures** • Quantitative. • Qualitative.	**Sources** • Multiple (triangulation preferred). • Sampling strategies are critical. • Concern for protecting human subjects, organizations, and communities. **Indicators/Measures** • Mixed methods (qualitative, quantitative, and integrated).
Analysis & Synthesis	**Timing** • One-time (at the end). **Scope** • Focus on specific variables.	**Timing** • Ongoing (formative and summative). **Scope** • Integrate all data.
Judgments	**Implicit** • Attempt to remain value-free.	**Explicit** • Examine agreement on values. • State precisely whose values are used.
Conclusions	**Attribution** • Establish time sequence. • Demonstrate plausible mechanisms. • Control for confounding. • Replicate findings.	**Attribution and contribution** • Establish time sequence. • Demonstrate plausible mechanisms. • Account for alternative explanations. • Show similar effects in similar contexts.
Uses	**Disseminate to interested audiences** • Content and format varies to maximize comprehension.	**Feedback to stakeholders** • Focus on intended uses by intended users. • Build capacity. **Disseminate to interested audiences** • Content and format varies to maximize comprehension. • Emphasis on full disclosure. • Requirement for balanced assessment.

Why Evaluate Public Health Programs?

Some Reasons to Evaluate Public Health Programs

- To monitor progress toward the program's goals.
- To determine whether program components are producing the desired progress on outcomes.
- To permit comparisons among groups, particularly among populations with disproportionately high risk factors and adverse health outcomes.
- To justify the need for further funding and support.
- To find opportunities for continuous quality improvement.
- To ensure that effective programs are maintained and resources are not wasted on ineffective programs.

Program staff may be *pushed* to do evaluation by external mandates from funders, authorizers, or others, or they may be *pulled* to do evaluation by an internal need to determine how the program is performing and what can be improved. While push ***or*** pull can motivate a program to conduct good evaluations, program evaluation efforts are more likely to be sustained when staff see the results as useful information that can help *them* do their jobs better.

Data gathered during evaluation enable managers and staff to create the best possible programs, to learn from mistakes, to make modifications as needed, to monitor progress toward program goals, and to judge the success of the program in achieving its short-term, intermediate, and long-term outcomes. Most public health programs aim to change behavior in one or more target groups and to create an environment that reinforces sustained adoption of these changes, with the intention that changes in environments and behaviors will prevent and control diseases and injuries. Through evaluation, you can track these changes and, with careful evaluation designs, assess the effectiveness and impact of a particular program, intervention, or strategy in producing these changes.

Recognizing the importance of evaluation in public health practice and the need for appropriate methods, the World Health Organization (WHO) established the Working Group on Health Promotion Evaluation. The Working Group prepared a set of conclusions and related recommendations to guide policymakers and practitioners.[8] Recommendations immediately relevant to the evaluation of comprehensive public health programs include:

- Encourage the adoption of participatory approaches to evaluation that provide meaningful opportunities for involvement by all of those with a direct interest in initiatives (programs, policies, and other organized activities).
- Require that a portion of total financial resources for a health promotion initiative be allocated to evaluation—they recommend 10%.
- Ensure that a mixture of process and outcome information is used to evaluate all health promotion initiatives.
- Support the use of multiple methods to evaluate health promotion initiatives.

[8] WHO European Working Group on Health Promotion Evaluation. Health promotion evaluation: Recommendations to policy-makers: Report of the WHO European working group on health promotion evaluation. Copenhagen, Denmark: World Health Organization, Regional Office for Europe, 1998.

- Support further research into the development of appropriate approaches to evaluating health promotion initiatives.
- Support the establishment of a training and education infrastructure to develop expertise in the evaluation of health promotion initiatives.
- Create and support opportunities for sharing information on evaluation methods used in health promotion through conferences, workshops, networks, and other means.

CDC's Framework for Program Evaluation in Public Health

Program evaluation is 1 of 10 essential public health services[9] and a critical organizational practice in public health.[10] Until recently, however, there has been little agreement among public health officials on the principles and procedures for conducting such studies. In 1999, CDC published the *Framework for Program Evaluation in Public Health* and some related recommendations.[11] The Framework, as depicted in Figure 1.1, defined six steps and four sets of standards for conducting good evaluations of public health programs.

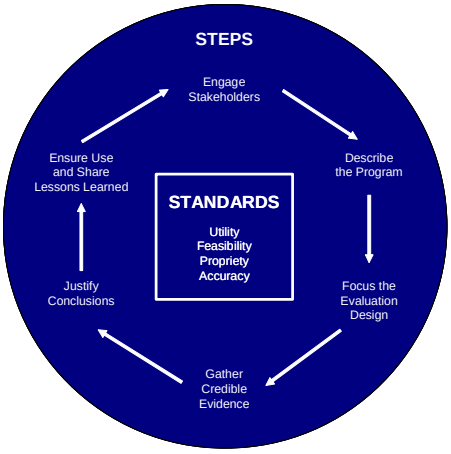

Figure 1.1
Evaluation Framework

The underlying logic of the Framework is that good evaluation does not merely gather accurate evidence and draw valid conclusions, but produces results that are *used* to make a difference. To maximize the chances evaluation results will be used, you need to create a "market" before you create the "product"—the evaluation. You determine the market by focusing your evaluations on questions that are most salient, relevant, and important. And you ensure the best evaluation focus by understanding where the questions fit into the full landscape of your program description, and especially by ensuring that you have identified and engaged stakeholders who care about these questions and want to take action on the results.

The steps in the CDC Framework are informed by a set of standards for evaluation.[12] These standards do not constitute a *way* to do evaluation; rather, they serve to *guide* your choice from among the many options available at each step in the Framework. The 30 standards cluster into four groups:

- **Utility:** Who needs the evaluation results? Will the evaluation provide relevant information in a timely manner for them?
- **Feasibility:** Are the planned evaluation activities realistic given the time, resources, and expertise at hand?

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[9] Public Health Functions Steering Committee. Public health in America. Fall 1994. Available at <http://www.health.gov/phfunctions/public.htm>. January 1, 2000.
[10] Dyal WW. Ten organizational practices of public health: A historical perspective. American Journal of Preventive Medicine 1995;11(6)Suppl 2:6-8.
[11] Centers for Disease Control and Prevention. op cit.
[12] Joint Committee on Standards for Educational Evaluation. The program evaluation standards: How to assess evaluations of educational programs. 2nd ed. Thousand Oaks, CA: Sage Publications, 1994.

- **Propriety:** Does the evaluation protect the rights of individuals and protect the welfare of those involved? Does it engage those most directly affected by the program and changes in the program, such as participants or the surrounding community?
- **Accuracy:** Will the evaluation produce findings that are valid and reliable, given the needs of those who will use the results?

Sometimes the standards broaden your exploration of choices; as often, they help reduce the options at each step to a manageable number. For example, in the step "Engaging Stakeholders," the standards can help you think broadly about who constitutes a stakeholder for your program, but simultaneously can reduce the potential list to a manageable number by posing the following questions based on the standards: (**Utility**) Who will use these results? (**Feasibility**) How much time and effort can be devoted to stakeholder engagement? (**Propriety**) To be ethical, which stakeholders need to be consulted, for example, those served by the program or the community in which it operates? (**Accuracy**) How broadly do you need to engage stakeholders to paint an accurate picture of this program?

Similarly, there are unlimited ways to "gather credible evidence." Asking these same kinds of questions as you approach evidence gathering will help identify ones that will be most useful, feasible, proper, and accurate for *this* evaluation at *this* time. Thus, the CDC Framework approach supports the fundamental insight that there is no such thing as *the* right program evaluation. Rather, over the life of a program, any number of evaluations may be appropriate, depending on the situation.

How to Select a Lead Evaluator and Establish an Evaluation Team

Good evaluation requires a combination of skills that are rarely found in a single person. An evaluation team that includes internal program staff, external stakeholders, and possibly consultants or contractors with evaluation expertise is the preferred approach. An initial step in the formation of a team is to decide who will be responsible for planning and implementing evaluation activities. At least one program staff person should be selected as the lead evaluator to coordinate program efforts. This person should be responsible for evaluation activities, including planning and budgeting for evaluation, developing program objectives, addressing data collection needs, reporting findings, and working with consultants. The lead evaluator is ultimately responsible for engaging stakeholders, consultants, and other collaborators who bring the skills and interests needed to plan and conduct the evaluation.

Although this staff person should have the skills necessary to competently coordinate evaluation activities, he or she can choose to look elsewhere for technical expertise to design and implement specific tasks. However, developing in-house evaluation expertise and capacity is a beneficial goal for most public health organizations.

Of the characteristics of a good evaluator listed in the accompanying text box, the evaluator's ability to work with a diverse group of stakeholders warrants highlighting. The lead evaluator should be willing and able to draw out and reconcile differences in values and standards of different stakeholders and to work with knowledgeable stakeholder representatives in designing and conducting the evaluation.

Characteristics of a Good Evaluator

- Has experience in the type of evaluation needed.
- Is comfortable with qualitative and quantitative data sources and analysis.
- Is able to work with a wide variety of stakeholders, including representatives of target populations.
- Can develop innovative approaches to evaluation while considering the realities affecting a program (e.g., a small budget).
- Incorporates evaluation into all program activities.
- Understands both the potential benefits and risks of evaluation.
- Educates program personnel about designing and conducting the evaluation.
- Will give staff the full findings (i.e., will not gloss over or fail to report certain findings for any reason).
- Has strong coordination and organization skills.
- Explains material clearly and patiently.
- Respects all levels of personnel.
- Communicates well with key personnel.
- Exhibits cultural competence.
- Delivers reports and protocols on time.

Additional evaluation expertise sometimes can be found in programs within the health department, through external partners (e.g., universities, organizations, companies), from peer programs in other states and localities, and through technical assistance offered by CDC.[13]

You can also use outside consultants as volunteers, advisory panel members, or contractors. External consultants can provide high levels of evaluation expertise from an objective point of view. Important factors to consider when selecting consultants are their level of professional training, experience, and ability to meet your needs. Overall, it is important to find a consultant whose approach to evaluation, background, and training best fit your program's evaluation needs and goals. Be sure to check all references carefully before you enter into a contract with any consultant.

To generate discussion around evaluation planning and implementation, several states have formed evaluation advisory panels. Advisory panels typically generate input from local, regional, or national experts otherwise difficult to access. Such an advisory panel will lend additional credibility to your efforts and prove useful in cultivating widespread support for evaluation activities.

The evaluation team members should clearly define their respective roles. Informal consensus may be enough; others prefer a written agreement that describes who will conduct the evaluation and assigns specific roles and responsibilities to individual team members. Either way, the team must clarify and reach consensus on the

- Purpose of the evaluation

[13] CDC's Prevention Research Centers (PRC) program is an additional resource. The PRC program is a national network of 24 academic research centers committed to prevention research and the ability to translate that research into programs and policies. The centers work with state health departments and members of their communities to develop and evaluate state and local interventions that address the leading causes of death and disability in the nation. Additional information on the PRCs is available at www.cdc.gov/prc/index.htm.

- Potential users of the evaluation findings and plans for dissemination
- Evaluation approach
- Resources available
- Protection for human subjects.

The agreement should also include a timeline and a budget for the evaluation.

Organization of This Manual

This manual is organized by the six steps of the CDC Framework. Each chapter will introduce the key questions to be answered in that step, approaches to answering those questions, and how the four evaluation standards might influence your approach. The main points are illustrated with one or more public health examples that are composites inspired by actual work being done by CDC, states, and localities.[14] Some examples that will be referred to throughout this manual:

Affordable Home Ownership Program

The program aims to provide affordable home ownership to low-income families by identifying and linking funders/sponsors, construction volunteers, and eligible families. Together, they build a house over a multi-week period. At the end of the construction period, the home is sold to the family using a no-interest loan.

Childhood Lead Poisoning Prevention (CLPP)

Lead poisoning is the most widespread environmental hazard facing young children, especially in older inner-city areas. Even at low levels, elevated blood lead levels (EBLL) have been associated with reduced intelligence, medical problems, and developmental problems. The main sources of lead poisoning in children are paint and dust in older homes with lead-based paint. Public health programs address the problem through a combination of primary and secondary prevention efforts. A typical secondary prevention program at the local level does outreach and screening of high-risk children, identifying those with EBLL, assessing their environments for sources of lead, and case managing both their medical treatment and environmental corrections. However, these programs must rely on others to accomplish the actual medical treatment and the reduction of lead in the home environment.

Provider Education in Immunization

A common initiative of state immunization programs is comprehensive provider education programs to train and motivate private providers to provide more immunizations. A typical program includes a newsletter distributed three times per year to update private providers on new developments and changes in policy, and provide a brief education on various immunization topics; immunization trainings held around the state conducted by teams of state program staff and physician educators on general immunization topics and the immunization registry; a Provider Tool Kit on how to increase immunization rates in their practice; training of nursing staff in local health departments who then conduct immunization presentations in individual

[14] These cases are composites of multiple CDC and state and local efforts that have been simplified and modified to better illustrate teaching points. While inspired by real CDC and community programs, they are not intended to reflect the current operation of these programs.

private provider clinics; and presentations on immunization topics by physician peer educators at physician grand rounds and state conferences.

At the conclusion of each chapter are three resources:

- Worksheets to help you apply the teaching points
- Customized information developed by your CDC program on applying the main points of the chapter to your particular public health program
- One or more detailed "worked cases" developed by your CDC program to illustrate how to apply the main points of the chapter to your public health program

EVALUATING APPROPRIATE ANTIBIOTIC USE PROGRAMS

Introduction

The Institute of Medicine has identified antibiotic resistance as one of the key microbial threats to health in the United States. It has listed decreasing the inappropriate use of antimicrobials as a primary solution to address this threat.[15] During the latter half of the 1990s, CDC, many state and local health departments, and other organizations responded to increases in antibiotic resistance and inappropriate prescribing by designing and implementing interventions to promote appropriate antibiotic prescribing in the community. These efforts appear to have contributed to recent decreases in prescribing rates. It is important to evaluate these programs in order to learn which components are most effective and to decide how to use limited resources to continue these efforts.

Antibiotic Resistance and Upper Respiratory Infections

Widespread use of antibiotics has resulted in the development of antibiotic resistance. When antibiotics are used, selective pressure favors the growth of organisms that are resistant to the drug's action. Today, virtually all bacterial pathogens that cause infections of public health importance in the United States and throughout the world are becoming resistant.

Numerous studies have documented the association between recent antibiotic use and carriage of nonsusceptible bacteria. Children who are colonized with *Streptococcus pneumoniae* and have recently received an antibiotic are two to seven times more likely to be colonized with a drug-resistant strain than are children without recent antibiotic use.[16] Research in Alaska showed that increased antibiotic use was strongly associated with an increased likelihood that a person would carry penicillin-resistant bacteria.[17] Furthermore, each additional course of antibiotics was associated with a 20% increase in the odds of carrying an antibiotic-nonsusceptible isolate versus an antibiotic-susceptible isolate. Antibiotic use affects the community as well as the individual.[18] When high levels of antibiotics are used in a community, resistant strains of *Streptococcus pneumoniae* are likely to be circulating. As a result, community members are twice as likely to develop a resistant infection as are people in communities with lower levels of antibiotic use.[19]

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[15] Institute of Medicine. Microbial threats to health: emergence, detection, and response. March 2003.
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Upper respiratory infections account for three quarters of all antibiotics prescribed by office-based physicians.[20] If these antibiotics were being used appropriately, the current increases in resistance rates could be seen as the inevitable consequence of proper treatment. However, this is not the case. Based on data from the 1992 National Ambulatory Medical Care Survey, a population-based survey of prescribing in physicians' offices in the United States, CDC estimated that antibiotic prescribing for upper respiratory infections could be reduced by more than 40%.[18] CDC now estimates that tens of millions of courses of antibiotics are prescribed inappropriately each year for upper respiratory infections.

Get Smart: Know When Antibiotics Work, CDC's national appropriate antibiotic use campaign, targets the five respiratory conditions that in 1992 accounted for more than 75% of all office-based prescribing for all ages combined: otitis media, sinusitis, pharyngitis, bronchitis, and the common cold.[20] CDC's appropriate antibiotic use efforts aim to reduce the spread of antibiotic resistance by:

1) promoting adherence to appropriate prescribing guidelines among providers,
2) decreasing demand for antibiotics for viral upper respiratory infections among healthy adults and parents of young children, and
3) increasing adherence to prescribed antibiotics for upper respiratory infections.

Why Evaluate Appropriate Antibiotic Use Programs?

While many states, local health departments, and other groups have implemented appropriate antibiotic use programs aimed at reducing unnecessary antibiotic use and slowing the spread of antibiotic resistance, the vast majority of these programs have not been rigorously evaluated. Since 1998, several controlled trials promoting appropriate antibiotic use for outpatient respiratory tract infections in a variety of settings in the United States have been published.[17,21,22,23,24] Data from these trials have shown that educational interventions targeting both providers and patients can result in reduced prescribing for respiratory tract infections.

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