

Guide to Economic Evaluation in *Health Promotion*



**Pan American
Health
Organization**

Regional Office of the
World Health Organization

Guide to Economic Evaluation in *Health* *Promotion*

AUTHORS

Ligia de Salazar
Suzanne Jackson
Allan Shiell
Marilyn Rice



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Pan American Health Organization
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Preface



In a world where demands to address the determinants of health are being placed on multiple systems, it is more important than ever for decision makers to know how best to invest their time, resources and energies. When it comes to a question of promoting health and not just treating diseases and illnesses, the decisions that need to be made go well beyond those that will affect who lives and who dies. The result of these decisions will have direct and indirect impacts on the quality and duration of life of current and future generations.

It is widely recognized that to improve health conditions in today's complex world, the collaboration of multiple partners, sectors and interests will be necessary. Collectively looking at issues, potential solutions and available resources may require a rethinking of how programs and initiatives are developed at local, national and international levels. However, there are few frameworks available to provide a context for this type of rethinking and creative collaboration.

To make a true economic assessment of health promotion options, one must be forward thinking and consider many different avenues to arrive at a given result. Through the application of this landmark *Guide to Economic Evaluation of Health Promotion*, it is hoped that people at all levels of decision-making will be in a better position to weigh out available options and make informed decisions that will promote the health and well-being of their populations for today and for many years to come.

Mirta Roses Periago
Director

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INTRODUCTION

1

The purpose of economic evaluation is to provide information of use to managers and policy makers who must decide where best to allocate society's scarce resources.

Economic evaluation helps to answer the general question: is it worthwhile for society to allocate financial, human or other resources to a particular intervention? In the health field, economic evaluation has concentrated on measuring the cost-effectiveness and cost-benefit ratios of preventive and clinical interventions such as vaccination, cholesterol lowering drugs, hip replacement and cardiac surgery. In most of these cases, it is sufficient to assess the effectiveness of the interventions in terms of the improvement in health status that they potentially bring about. Thus, the outcomes of the intervention can be easily identified and, now with advances in economic methods, they can be readily measured and valued. In contrast, health promotion, at least as we conceptualize it here, typically has multiple objectives beyond health gain. It also involves many partners and works at different levels in society. None of these considerations makes economic evaluation any less important for health promotion but it does potentially complicate the exercise.

We interpret health promotion in the same way as it is defined by the World Health Organization; namely as, '... a process of enabling people to increase control over, and to improve, their health.' (WHO, 1998). A key feature of this definition is the empowerment of individuals, organizations and communities so that each is better equipped to promote and maintain their health. This is important, not least for helping to sustain the effectiveness of health promotion programs well after the initial investment in their development and implementation has ended. Building this capacity is therefore an important objective of health promotion. To help achieve this, health promotion practices are typically participatory in nature.

The notion of health that lies at the heart of this definition of health promotion is 'a positive concept emphasizing social and personal resources as well as physical capacities.'



The notion of health that lies at the heart of this definition of health promotion is ‘a positive concept emphasizing social and personal resources as well as physical capacities.’ This view of health is much broader than the prevention of disease. Indeed, it goes beyond the promotion of healthy lifestyles and is concerned more generally with improvements in social well-being, which includes efforts to reduce inequities in health and to protect the individual’s right to health. A key characteristic of health promotion is its focus on the broad determinants of health: and since so many of the determinants of health lie outside the health care sector, so too does responsibility for health promotion.

Recognizing that the broad determinants of health also interact with each other as well as with ‘downstream’ factors such as individual lifestyle choices, this gives rise to the belief that effective health promotion strategies must include multiple components each designed to complement one another. Thus, the WHO approach suggests that health promotion programs ought to involve healthy public policy, strengthening community action, developing personal skills, and creating the conditions that support health. Such strategies operate at multiple levels, including the individual, the family, the community and society more generally. Such multi-level and multi-strategy programs pose particular challenges for the evaluation of program effectiveness in general and economic evaluation in particular.

In summary, health promotion is unavoidably social and political in character. Moreover, its focus on equity and the social determinants of health means that the evaluation of health promotion policies and programs must be based on information not only about changes in health conditions and their risks but also about health promotion’s ability to build individual, collective and institutional capacity to participate in decisions that affect health and welfare (de Salazar *et al.*, 2002).

Several guides now exist that inform the application of economic methods to evaluations in clinical and health care settings (Drummond *et al.*, 2005; Gold *et al.*, 1996). There are also guides to the use of economic evaluation in health promotion (Tolley, 1993; Hale, 2000). While both of these latter resources are broad in their view of what constitutes health promotion, in the practical examples that they use to illustrate the application of economic techniques they tend to concentrate on what are relatively simple interventions: typically single-agency interventions using single strategies to improve health. There is nothing currently available outside the academic literature that discusses the practical issues associated with the economic evaluation of more complex interventions in health promotion. To cover this gap, a group of experts in health promotion, health economics and economic evaluation took on the task of developing this guide to conducting economic evaluations of health promotion interventions.

Structure of the Guide

The Guide has four main sections in addition to the introduction:

- Section 1:** Introduction
- Section 2:** Discusses what economic evaluation is and why it is important in health promotion. It also outlines briefly the steps involved in an economic evaluation.
- Section 3:** Explains in more detail the steps involved in an economic evaluation, the importance of each step, and what will occur at each stage of the evaluation.
- Section 4:** Discusses some of the issues that will be encountered when the intervention being evaluated is more complex.
- Section 5:** Discusses issues associated with the use of economic evaluation.

Also, it includes a section for references and appendices.

A series of case studies drawn from the available research literature has been included to illustrate the points being made.

Technical material are confined to a series of ‘Technical Notes’ that provide additional supporting material and insight into some of the disputed aspects of health economic practice, skip if necessary. A glossary of common terms used in economic evaluation has been included as a general resource (Appendix 1).

To better illustrate the points raised, the case studies presented in section 3 tend to be examples of simple interventions or simple evaluations (single strategies or single outcomes for example). Section 4 discusses some of the issues that will be encountered when the intervention being evaluated is more complex; that is, one involving multiple sectors, with multiple components and multiple objectives (Campbell *et al.*, 2000). The fifth and final section discusses issues associated with the use of economic evaluation – that is how one should interpret and use the results of an evaluation in the light of its strengths and limitations.

Two longer case studies have also been included as appendices to this report. Appendix 3, examines the economic evaluation of a capacity-building intervention in schools in Columbia (SIVEA). Appendix 4 then discusses a hypothetical evaluation of the cost-effectiveness of a population health strategy to promote health in Saskatchewan, a province of Canada. Appendix 2 delves in more detail into issues associated with the evaluation of effectiveness, while Appendix 5 presents a checklist to aid critical appraisal of published economic evaluations.

Who will find the Guide useful?

The Guide is written especially for health promotion practitioners and policy makers. It assumes no prior knowledge of health economics. Instead, it is assumed that a multi-disciplinary team will conduct the evaluation and that an economist will be part of the team. In this case, one can rely on the economist to bring the necessary technical expertise, but it is up to those with expertise in health promotion and knowledge of the programs being evaluated to ensure the evaluation captures the important costs and benefits, and does so with values that remain true to the objective of the intervention. Therefore, the Guide aims to provide more than just an introduction and explanation to what the economist will be doing. It is hoped that the guide will also equip the non-economists on the team with some of the language that they will need as well as the confidence and the insights required to interrogate the economist and ensure the fidelity of the evaluation.

The Guide will be useful also to those in charge of financing, implementing and evaluating health promotion interventions or interested in advocating for health promotion strategies, by giving them access to the empirical literature on economic evaluation. Finally, it is hoped that the Guide might also be used as a teaching tool in public health education.

Given the political, social and technical nature of economic evaluation in health promotion, it is essential to have the input of an interdisciplinary team of representatives from the funding bodies, key stakeholders and potential users of the information – preferably throughout the entire evaluation planning process. Involving the end users of the information will ensure increased use of the results.

An Introduction to Economic Evaluation



What is economic evaluation?

Economic evaluation is defined as the “comparative analysis of alternative courses of action in terms of both their costs and consequences” (Drummond *et al.*, 1997)

Two features of this definition are important. *First*, it is a *comparative* analysis. Economic evaluation is about informing choice and so there needs to be two or more options to compare and to choose between. *Second*, the evaluation includes both costs *and* consequences. Criticism that economics focuses too much on costs and ignores the benefits of what is trying to be achieved is therefore misguided.

Why is economic evaluation important in health promotion?

Unfortunately, there are more things that can be done to promote health than there are resources available to support these endeavors. By ‘resources’ it is meant people and their time and skills, and the facilities and the equipment needed to deliver effective health promotion programs. It does not mean money. In economics, resources are believed to be scarce relative to what can be done with them and so it is necessary to choose where best to invest those resources. If they are invested in programs that are less effective than others, then one forgoes the opportunity to improve health and well-being. This is as true in health promotion as it is in health care. Good intentions are not enough. It is essential to know whether the programs that are supported do indeed make best use of the limited resources that are available to them.

This is the aim of economic evaluation. The results should help one choose between alternative courses of action, and do so in a way that takes into account the existing budget constraints – a factor that may limit one’s ability to produce the desired outcomes.

How is economic evaluation done?

Economic evaluation is a very structured exercise. While different authors describe the structure in different ways, one can see in any evaluation the following eight actions.

- A description of the decision context and the perspective from which the analysis will take place.
- Specification of the question being addressed.
- Description of the alternatives (the options) that will be considered.
- Identification, measurement and valuation of the costs of each alternative.
- Identification, measurement and valuation of the consequences of each alternative.
- A technical step where costs and consequences are adjusted for differences in their timing (called discounting).
- An extensive sensitivity analysis to assess the importance of uncertainties arising *inter alia* from missing information.
- Interpretation of the results of the evaluation and proposal of recommendations.

The process involved under each of these steps is described in section 3, and their application illustrated with a series of case studies taken from the research literature. Prior to that, some of the other questions that come up about economic evaluation are considered.

The pursuit of efficiency

Economic evaluation is primarily about evaluating *efficiency*. There are many different notions of efficiency, though all refer in one way or another to the relationship between what goes into an intervention (the resources, inputs or costs) and what comes out by way of consequence (the benefits, outputs or outcomes). Two sorts of efficiency are particularly important: technical efficiency and allocative efficiency. The latter is sometimes called social efficiency.

Technical efficiency is about avoiding waste. Strictly speaking, the notion of technical efficiency refers to achieving the maximum output from a given physical quantity of the input or, alternatively, to use the minimum level of inputs required to achieve a given level of output.

Allocative efficiency: The notion of allocative efficiency refers to the correct *mix* and *distribution* of programs or services. It is the balance between the correct different forms of health promotion, and is the balance between the correct health care and health promotion, or could one get better outcomes by doing more of one thing and less of something else.

In essence, where technical efficiency relates to the production process – that is how to get the largest *quantity* of output from a given set of resources – allocative efficiency refers to the best distribution of those outputs among individuals – how to get the best *value* that is possible by ensuring that services are allocated to people who will benefit most from them.

Not just efficiency, but equity also

It has already been emphasized that health promotion is interested not just in promoting health, but also in reducing inequalities in health (for example between men and women, or between social classes or other social groups). Thus, one is interested not just in efficiency but in equity as well. **Equity** refers to fairness. The concern is not only with how much is produced at what cost but also with how these costs and benefits are distributed so that one can see whether what is being done is reducing inequalities or not.

The efficient option is not always the most equitable option because interventions that benefit marginalized groups may not be as effective or may be more expensive to implement.

Why so many forms of economic evaluation?

There are five distinct forms that the economic evaluation can take. These are:

- Cost-minimization analysis
- Cost-effectiveness analysis
- Cost-consequence analysis
- Cost-utility analysis
- Cost-benefit analysis

These differ from each other only in how the benefits of the interventions being evaluated are measured and incorporated into the analysis (Table 1).

This is important however as it determines the type of question that the evaluation is able to answer. In essence, cost-minimization analysis, cost-effectiveness analysis and cost-consequence analysis are each concerned with questions of technical efficiency. Alone among the economic techniques, cost-benefit analysis is able to address questions of allocative efficiency (and because of this, it is also able to answer questions about technical efficiency as well). Cost-utility analysis sits somewhere between these two extremes. It is able to address allocative questions, but only when health outcomes are all that count.

Is economic evaluation enough?

In addition to cost and effect, efficiency and equity, it is also necessary to consider the feasibility of the intervention. This includes its *technical feasibility* (does one have the human skills and other resource capabilities to implement the intervention?); its *financial feasibility* (is the intervention affordable?); and its *social feasibility* (is the intervention acceptable to the target population and are its costs and benefits distributed in accordance with social priorities?).

TABLE 1/ Summary of the key characteristics of several economic evaluation methods

Type of analysis	Assessment of costs	Assessment of benefits	Characteristics	Strengths	Challenges
Cost-Benefit Analysis (CBA)	Monetary units	Monetary units	<p>A method designed to value and compares all of the costs (C) and benefits (B) of interventions in equivalent monetary terms.</p> <p>It provides an absolute indicator of the 'goodness' of the intervention.</p> <p>An intervention should be implemented only if $B-C > 0$ or if $B/C > 1$.</p>	Makes it possible to compare programs that generate different types of outcomes—within the health sector and outside of it.	<p>Difficult to assign a monetary value to the outcomes of the intervention.</p> <p>Ethical issues about assigning a monetary value to improvements in well-being of individuals must be resolved by evaluation team.</p>
Cost-Effectiveness Analysis (CEA)	Monetary units	Natural health units	<p>This method values the costs (C) in monetary terms, while benefits are expressed in natural health units or outcome of effectiveness (E).</p> <p>It allows comparisons among options with the same indicator of effectiveness.</p> <p>An intervention with a lower C/E ratio is <i>usually</i> preferable to one with a higher C/E ratio.</p>	<p>Comparison of health outcomes is helpful for health decision-makers.</p> <p>Interventions of same type competing for same resources can be compared.</p>	<p>Only interventions that have outcomes in the same measuring units can be compared.</p> <p>Limited to single dimension of effectiveness so it cannot capture the multidimensional outcomes of most health promotion programs.</p>
Cost-Utility Analysis (CUA)	Monetary units	QALYs (Quality-adjusted life-years)	This method estimates costs in monetary terms and the benefits are expressed as QALYs (units that incorporate length of life and quality of life).	<p>Can compare interventions with broad ranges of outcomes and from different sectors.</p> <p>Provides a common outcome measure so that different interventions can be compared.</p> <p>Can compare new programs with other programs that were evaluated with this method.</p>	<p>No consensus on the best method to evaluate quality of life.</p> <p>Many health promotion interventions have additional benefits beyond health gain.</p> <p>QALYs can be insensitive to small changes at the individual level even though those changes may be substantial at the population level.</p>
Cost-Consequence Analysis (CCA)	Monetary units	Natural units (as in CEA) but not restricted to a single outcome	This is a modification of CEA. It sets out a profile of all important changes so that none may be overlooked.	It ensures that all outcomes of importance are acknowledged.	It can be difficult to determine whether an intervention is effective if some outcomes improve while others get worse.
Cost-Minimization Analysis (CMA)	Monetary units	None – outcomes are assumed to be the same	CMA just measures the relative costs of an intervention—the assumption being that outcomes are equal.	Simplest of all the forms of economic evaluation.	Rarely the case that outcomes are equivalent.

The Economic Evaluation

of Simple Health Promotion/Disease Prevention Programs

3

Introduction

The process of conducting an economic evaluation is a very structured one. Different authors may describe the steps in slightly different ways but the essence remains the same. In general, there is a consensus among economists about what needs to be done. For example, most economists agree on the need to adjust the value of costs and benefits that occur at different points in time to render them comparable, but they might disagree on the rate at which future costs and benefits should be discounted, and whether the same rate ought to be used for benefits as that used for costs. The general steps are described here. Areas where there might be some disagreement and areas of a more technical nature requiring more explanation are restricted to a series of separate technical notes. These can be ignored without too much consequence.

To help readers who are new to economic evaluation come to a better understanding of the steps and their importance, illustrations are provided of some of the points covered in a series of examples taken from the research literature. The existing economic evidence with respect to health promotion is extremely limited in its scope, however. Of the 500 or so studies that have been published in English, more than 45% relate to clinical interventions such as vaccination, and another 40% relate to lifestyle interventions tackling individual-level lifestyle factors (Rush et al., 2004). The distribution of the evidence published in Spanish follows a similar pattern (CEDETES, 2003).



Where possible, case studies have been chosen that reflect the multi-dimensional, multi-sectoral nature of health promotion, but in some instances it is the simple interventions that better illustrate the points discussed. Problems that can arise when one tries to apply these steps to more complex interventions are discussed in section 4.

Step 1/ Describe the decision context

The first step in the evaluation process is to describe the context in which the evaluation will take place and in which its results will be used first. This step includes describing the setting, the people and their socio-economic and cultural characteristics, the local capacity for health promotion, the availability of professional skills, the local infrastructure and so on – everything that will help determine the success or the failure of the intervention and which will be needed by those who will read the results with an interest in exporting a successful program to their own community.

The decision context also includes some information on the decision makers: who they are, what their objectives are and what the time frame is. The problem being addressed and the goals (or expected outcomes) of the intervention ought to be clearly spelled out at this stage also.

It is also important to say something about the scope of the evaluation and especially the perspective that is to be adopted. The perspective of the analysis is the point of view from which the costs and benefits of the intervention are to be analyzed (Gold *et al.*, 1996). The analysis can be conducted from a range of perspectives, including that of the agency that is primarily responsible for funding the intervention, the public sector more generally, or most broadly, a societal perspective in which all costs and benefits are included irrespective of who pays the former or who enjoys the latter. Choosing the perspective is discussed below.

Finally, a description of the decision context may also need to say something about what other health promotion programs are in place or have been in place before, if one believes that either might impact on the effectiveness of the new program being evaluated.

Choosing the perspective

The implementation of any intervention will impose costs upon a range of actors. There may also be many different sorts of beneficiaries. Since health promotion typically involves many sectors of society, adopting a single agency perspective is likely to result in a partial evaluation that may exclude important costs and benefits simply because they fall on different sectors. Early child development programs for example generate costs for education departments and benefits to the health and criminal justice sectors. An intervention that appears uneconomic from a single agency perspective can in fact be very valuable once all the benefits are taken into account. Equally, an intervention that appears to be a good buy for one agency may not be so desirable from a social perspective when costs falling on other agencies and individuals are considered. Setting out the full range of costs and benefits in the form of a balance sheet allows one to see if this is the case.

Which perspective should be adopted?

It is suggested that one should strive towards adopting a social perspective, unless there are grounds not to. Health promotion interventions usually require the use of society's resources and so it is right that

the economic evaluation consider the full consequences for cost and benefit of the options being considered. A social perspective also avoids any possible bias in the evaluation caused by neglecting any costs that are incurred by agencies or groups other than the main funding agency, or by ignoring benefits that may not be regarded as health outcomes in their own right (e.g., empowerment or increased community capacity).

Why would one not always go for a social perspective? One reason is that a social perspective is not always needed. Data collection is usually more expensive using a social perspective, but it may add nothing of substance to an evaluation that was carried out from a particular institutional or agency perspective. A social perspective gives a complete description of the costs and benefits including their distribution, but this may not change the conclusions of the exercise. The additional information may be an expensive luxury.

EXAMPLE/ A societal perspective is not always needed

The smoke alarm giveaway program in Oklahoma provides a good illustration of why a social perspective is not always needed. The program distributed smoke alarms to homes in part of the city in order to reduce injury due to house fires.

Costs of the program included the costs of the alarms, their maintenance and replacement batteries, a proxy cost for the time that volunteers provided to distribute the alarm (based on the salaries that would otherwise have been paid), costs associated with fire damage, and health care costs. Outcomes were fatal and non fatal injuries caused by house fires as well as changes in production caused by reduced injury.

The evaluation adopted both a societal perspective and a narrower health care perspective.

The cost of the program to the health agency was \$498,000. The reduction in injuries led to 'savings' in healthcare use valued at nearly \$15 million and so the intervention was effective and generated savings worth more than its costs.

Costs to society as a whole were slightly higher at \$530,000 because of the volunteers, but the societal 'return' was also considerably higher, with increased production coming from the reduction in mortality and morbidity related absenteeism valued at \$15 million.

Thus, in this case, nothing substantial was gained by adopting the societal perspective. The conclusion that one reaches – that smoke alarms distributed freely to households represents a good investment – is the same in both cases

—Haddix AC, Mallonee S, Waxweiler R, Douglas MR. Cost effectiveness of a smoke alarm giveaway program in Oklahoma. *Injury Prevention*, 2001; 7:276-281

Special considerations for health promotion

While a societal perspective is the ideal, the evaluation team has a choice to make about the perspective and, in some circumstances a narrower perspective may be acceptable.

If a narrower perspective is adopted, then it is incumbent upon the evaluation team to ensure that important costs or benefits will not be ignored. A societal perspective will be essential if the intervention is truly multi-sectoral, as then costs will be incurred by a range of agencies. An intervention may be economically efficient from the perspective of society as a whole, but it may be difficult to generate support for implementing the intervention if, for example, most of the costs fall on one agency while the benefits are reaped by another. For multi-level and multi-sectoral health promotion interventions, there will be a need to understand the distribution and equity of the costs and benefits, especially if the intervention is designed to reach the most marginal populations. Questions the health promoter and the health economist have to ask each other at this step are:

- ▶ If a narrower perspective is recommended (narrower than societal), are there significant costs and benefits that fall on other agencies that will be missed and change the conclusion?
- ▶ Does the perspective being adopted allow one to quantify the distributional effects?
- ▶ Does the perspective being adopted allow one to deal with equity?

EXAMPLE/ Balance Sheet of Societal Costs and Benefits

If a societal perspective is adopted, then it might be useful to consider using a balance sheet to tabulate the costs and benefits. This ensures that transfers of resources from one agency to another are correctly accounted for and not double counted.

The Table shown here is taken from the evaluation of the Perry Preschool Program in the USA (Barnet 1985). Though dated and not strictly a health promotion intervention (though it probably has health effects) the evaluation has many characteristics in common with a good evaluation of health promotion. The program was an early education intervention for children from poor families. The table summarizes some of the costs and (financial) benefits showing the net effect on society as a whole and a breakdown of the net effect to participants of the program and taxpayers who funded it.

Costs and benefits of the Perry Preschool Program

	Costs and Benefits (1988 US Dollars)		
	Society	Participants	Taxpayers
Preschool program	-12,570	0	-12,570
Custodial child care	770	770	0
School cost savings	5,500	0	5,500
Crime reduction	1,260	0	1,260
Earnings increase	620	470	150
Welfare reduction	50	-500	550
Subtotal to age 19	-4,370	740	-5,110
College costs	-670	0	-670
Crime reduction	1,500	0	1,500
Earnings increase	15,590	12,590	3,000
Welfare reduction	1,070	-10,740	11,820
Subtotal from age 19 on	17,500	1,830	15,650
TOTAL NET BENEFITS	13,130	2,570	10,540

Costs are shown as negatives. The cost of the program was \$12,570 – shown here as a cost to taxpayers and to society overall. However, this was offset slightly by a saving in the costs of schooling after the program (of \$5,500) and savings to other sectors (through reduction in crime for example).

The biggest benefit came in the form of increased earnings that the 'graduates' of the program could command – a benefit that was shared between the participants (\$12,590) and the taxpayer (\$3,000).

This example also shows the importance of time frame. By age 19, the program was still a net cost to society. It is only when we look at benefits that spread beyond the child's 19th birthday that the program generates benefits valued more than its costs (note the table excludes the intangible benefits that come from reduced crime, better education and employment).

—Barnet WS. Benefit-cost analysis of the Perry Preschool program and its policy implications. *Educational Evaluation and Policy Analysis* 1985; 7: 333-342

Step 2/ Specify the question being addressed

The economic evaluation has to provide information that will help decision-makers choose between alternative uses of resources. It is vital that the question to be addressed is properly specified so that the evaluation provides the right sorts of information. The economist is therefore quite likely to spend a large amount of time at the beginning of an evaluation in discussion with the evaluation team to make sure the question is appropriate. Questions suitable for economic evaluation include:

- ▶ Which of two or more options achieves a given objective at least cost?
- ▶ For a given budget, which of two or more options improves outcomes the most?
- ▶ Would it be better to reduce spending on program A and reallocate the resources instead to program B?
- ▶ If investment was increased in a particular health promotion program, would the extra benefits attained be worth the additional costs?
- ▶ Is the current program, at its current scale, economically worthwhile?

The question being posed for the evaluation also needs to be answerable within the constraints set by the decision context. A characteristic of each of the questions listed above is their specificity. A question such as ‘is health promotion more cost effective than treatment?’ may be of great interest to decision makers but it is not answerable. What forms of health promotion are being talked about here? With what sorts of treatment will they be compared? What aspects of effectiveness are of interest and are these comparable across prevention and cure?

Equally, a question such as “what does this program cost?” is not an economic question. There is no comparison in this instance and no consideration of outcomes.

Correct specification of the question is important for another reason. It determines which approach to economic evaluation (which method, that is) must be adopted. The first three questions listed above are each answerable with cost-effectiveness, cost consequence or cost utility analysis (with the nature of each program’s outcomes determining which of these is best). Questions (4) and (5) require a cost-benefit analysis in which the public’s values are incorporated directly into the evaluation. Later it will be shown how to do this.

Often the question to be answered by the evaluation is formulated by those who plan to use its results, whether they are decision makers, researchers, or stakeholders interested in advocating for a certain program or intervention. Ideally, the economist must be involved at this stage as he or she knows best what sorts of questions an economic evaluation can address. A discussion among stakeholders, implementers, and the evaluation team about the intervention’s objectives, outcomes, scope, and success indicators will help to refine the question and/or the evaluation plan.

Special considerations for health promotion

Knowing the health promotion intervention and especially its objectives, products, intended reach and the indicators that might be used to monitor effectiveness, helps to identify which types of economic questions are most pertinent and which questions are likely to be answerable within the constraints of the evaluation.

At the single intervention level, health-promotion economic-evaluation questions can compare investments within programs (e.g., one form of physical activity program versus another), or between programs if the outcome of interest is the same (e.g., physical activity versus smoking cessation where outcomes are measured in terms of improvements in quality-adjusted life-years). Indeed, if health is the sole outcome of interest, then we can also compare programs across sectors (road safety education versus enforcement of speed limits, for example). For multi-sector, multi-level health promotion interventions, there are some questions the health promoter and the health economist have to ask each other at this step:

- ▶ Does the question posed meet the objectives the health promoters or decision-makers have?
- ▶ Does the question posed meet all of the objectives of interest or adequately reflect the intention of the intervention?
- ▶ What is the logic model for the intervention? Which objectives can be measured? What are the limits of available evidence for the intervention products, processes or outcomes? What is and is not known (from the literature) about the connections between the elements in the logic model for this intervention? How does this affect the type of question posed?

Other special considerations for health promotion for this step when it gets more complex are described in section 4.

Step 3/ Identify and describe the options

Having specified the problem and the question to be addressed, the next step involves identifying the range of things that could be done to address the problem. Each of these options is a potential candidate for evaluation.

Sometimes it will be argued that there is no alternative to the program to be evaluated. If this were true then there would be no need for an economic evaluation. If there is no alternative, then there is no choice to make and so no need to evaluate anything. In reality however, there is usually a choice. This need not be between two health promotion programs. Sometimes the choice is between prevention and treatment (the early evaluations into childhood vaccination took this form). Sometimes the question will relate to adding a new program to the existing composite of activities, in which case the option is the existing portfolio of programs versus the enhanced portfolio. Other times the options might include more or less of the program under scrutiny (should we expand a physical activity program to other parts of the municipality or to other population groups, for example).

In fact, the range of possible options is huge, especially once one acknowledges the role played by social factors in determining health. This opens the door to an extensive range of options that includes interventions in other sectors – schools, housing, employment policy, and so on. The challenge, then, for the evaluation team is to contain the range of options to make the evaluation manageable without distorting the results (for example, by excluding interventions because their value might be hard to estimate).

Choice of the comparator is vitally important. If one chooses a comparator that represents poor value for money, then obviously the new intervention will appear more favorable. One should not go looking for poor value comparators though!

Responsibility for identifying the options rests with the evaluation team, especially those with the technical knowledge about what can be done to address the problem at hand. One of the options that should be considered is ‘current practice.’ Thus, if one were considering whether or not to implement an integrated ‘healthy schools’ policy, then the comparator could be what is happening in schools currently without the new policy. This would include whatever non-integrated strategies the comparison schools currently employed.

Current practice is sometimes described as the status quo or the ‘do nothing’ option, but it is perhaps better described as the ‘do nothing *different*’ option. Rarely is it the case that the best comparator is literally to do nothing. Even if there are no other ways of *preventing* the health problem being examined, then treatment of its consequences will always be an alternative.

Special Considerations for Health Promotion

In health promotion, the range of comparator options to be considered may be broader than the health promotion intervention itself – for example, one may want to compare a community economic development program to income support or employment programs that also address the same determinants of health. Finding a simple comparison may be difficult because the intervention is multi-level and complex with multiple objectives and it may be unlikely to find another intervention with the same objectives. In this case, it is more likely that cost-benefit or cost-consequence approaches may be appropriate.

It is difficult to compare interventions in different communities because the contexts are different and the interventions may have to be different. Intervention A in one context may have different results than intervention B in a different context and the costs may be different. These issues are discussed in more depth in section 4. The questions the health promoter and health economist need to ask each other at this step are:

- ▶ Are the comparison options being considered appropriate to the contexts?
- ▶ Is there clarity about how the intervention has been put into practice and have the major contextual influences been identified for both the intervention and the comparator?

Step 4/ Identify, measure and value the costs

This is the step of an economic evaluation that is the same for all of the different types of economic evaluation methods. The evaluation of costs (as with benefits) has a sub-structure all of its own and a good economist will take the evaluation team through three mini-steps to ensure that all costs are captured properly: (i) identifying all of the resources required for each option, (ii) measuring the resources required for each option, and (iii) valuing, wherever possible, the quantities of resources. We have adopted the same structure to illustrate what will happen at each stage.

Identify the resources required by each option

The first stage in any attempt to cost a program requires the evaluation team to identify as completely as possible all of the resources required for each of the options. In essence, this stage is equivalent to listing all of the ingredients required to produce a meal. The resources include staff time, office accommodation, transport, consumable costs and resources associated with informing participants of the program.

At this stage, it is best to identify all of the resources required for a program or intervention. It may not be possible to measure or value everything identified in this way, but listing everything ensures that nothing important gets overlooked. This is especially important if a social perspective has been adopted since this requires that all resources be included irrespective of which agency or individual is responsible for providing them. For example, the time that community members spend participating in a program will be an important resource in some interventions.

It is also important to list all resources irrespective of whether or not a financial cost is incurred. In economics, cost is related to resource-use and not necessarily spending (see Technical Note: Economic (Opportunity) Cost). Staff time that is redirected from one activity to another needs to be documented, even though the salary costs of those staff have been paid for by someone else. Equally, resources will often be donated to an intervention, especially if it involves any degree of community participation. For example, the local library might provide space without charge for a community association to meet; community members may volunteer their time to participate in activities; or a community agency may allow the field workers responsible for delivering an intervention to use its photocopier. In each of these instances a resource is used and so an economic cost is incurred even though no money changed hands. Since interest is in the best use of society's *resources*, it is the resource flows that need to be documented at this stage.

Technical Note/ Economic (Opportunity) Cost

One usually thinks of cost as the price one must pay for something. In economics cost does not refer to price directly but to sacrifice. In economics a cost is incurred if by using a resource in one way, one gives up (or sacrifices) the ability to use the same resource in another way. The time one spends reading this guide has an economic cost, as by reading this, one cannot be doing something else – responding to emails, for example. The economic cost of one's time is measured in the value one places on whatever else he or she would be doing instead of reading this guide.

The two notions of cost (financial and economic) often come together because the price one pays for something frequently reflects its value elsewhere. Thus, typically, the economic cost of employing new staff on an intervention is reflected in their salaries. But it is not always the case. What if the staff are instead employed by another agency and are redirected from these other duties to work on the intervention (for example, teachers in schools may take time out of their usual activities to work on the development of a new health promoting curriculum). Their salaries are paid for by another agency. There is no financial cost to the health promotion intervention, and yet an economic cost is incurred because the teachers cannot spend as much time supervising sports activities or marking student assignments, for example.

The same is true of voluntary community participation in health promoting interventions. Even though their time is given freely to the project, volunteers could be doing something else. The economic cost of their participation in the intervention is revealed in the value of that alternative activity.

For this reason, the economist on the evaluation team will spend time trying to identify the resources required for each project irrespective of whether there is any associated financial cost and irrespective of who pays that cost if there is one. This explains why estimates of economic cost (necessary in an economic evaluation) often differ markedly from estimates of the accounting or financial cost of a project.

Measure the amount of resources required for each option

Having listed the ‘ingredients’ required for each intervention, the next stage is to specify how much of each resource is needed – how much additional office accommodation is required and for how long; how many more hours of staff time are necessary; and what level of expertise do each of the options need, and so on.

In practice, identification and measurement of the resources will be done together. It helps to specify them as separate steps, however, to emphasize the importance of good measurement. To be able to assign costs (i.e. values) to the items of resource use, the economist on the team will need to know how much of each resource is required.

The measurement step will often be the most demanding on the time of program staff as only the staff knows how much time it has spent administering a program or encouraging support for it from key stakeholders. This effort is vital if the economist on the team is to compile an accurate picture of the resources required to sustain a successful program.

The measurement stage should also be seen as the opportunity to specify what *additional* inputs are needed for each option. For example, use can be made of existing space, or the program may need new accommodation once it reaches a certain size.

Finally, good practice in the reporting of economic evaluation requires details about the amount of resources, to be kept separate from their economic value so that readers in other jurisdictions can better assess what resources they might need and what costs they will incur locally in order to implement the intervention, should it prove cost-effective.

Value the resources required of each option

The valuation stage now assigns monetary values to each of the resources identified and quantified in the previous stages. The economist will often use information taken from the accounts of the main agencies involved to cost the resources that each one provides. Thus, expenditures on salaries will often be used to assign values to staff inputs. Usually, documented spending on things such as the office expenses (the telephone and photocopier for example) can also be used to assign values to these inputs.

It will occasionally be necessary for the economist to adjust the expenditures recorded in an organization’s accounts to better reflect the economic value of the resources. This will be done where the price that is paid for a resource includes substantial taxes or subsidies (technically taxes and subsidies are means of *reallocating* costs from one group in society to another; by themselves they are not costs to society overall). It may also be necessary to adjust the accounts to better reflect the share of the cost that should be attributed rightfully to the option being evaluated (when, for example, overhead costs are apportioned over cost-centers in ways that are not activity-based).

On other occasions, the economist will impute a value for resources that have no obvious financial expense associated with them (the room in the library, the volunteer time and the loan of equipment mentioned earlier). In these circumstances, the economist will look for a good proxy that captures the value of the resource. For example, one could use the rent that might otherwise have been paid to use the room in the library, or the salary that would otherwise be paid to people who volunteer their time.

Technical Note/ Financial Costs versus Economic Costs

The previous technical note was careful to draw a distinction between financial costs (those associated with some exchange of money) and economic costs (where it is a resource such as staff time that is involved).

In order to determine the *economic efficiency* of an intervention one needs to know whether its benefits exceed the value of the resources it requires. That is, one needs to know its economic cost.

To determine whether the intervention is *affordable*, one also needs to know its financial cost and how this cost falls on the different agencies involved. Thus a good economic evaluation – one that is useful for policy makers - will document both the financial and the economic costs.

To ascertain the best value to use in such circumstances, the economist will seek information from the evaluation team or the decision makers about what would happen if the volunteered resource were not available. In the case of a person's time, the alternative to using a volunteer might be to employ someone on a casual basis. It is then possible to match the skills required to equivalent job descriptions within the administering organization in order to find an appropriate wage rate that can be used to value the volunteer's time.

Implications for the evaluation team

Successful valuation of the costs of a program is critically dependent on the prior stages – the identification and measurement of resources. Identifying the resources requires a team effort. The economist can specify the broad categories of resource use that might be required (capital costs, staff costs, etc.) but the onus is on the practitioners and policy makers who are on the evaluation team to ensure that the list of ingredients is as comprehensive as it is possible to be.

The measurement of resource use is also something that will usually fall on the people responsible for implementing the intervention. In some cases, this can be the evaluation team, particularly where the intervention and its evaluation have been funded as part of a research project. If field staff are responsible for collecting information on the amount of resource use, then it is up to the intervention team, working collaboratively with the field workers, to devise methods of data collection that impinge as little as possible on the usual ways that the staff engage with the community (Hawe *et al.*, 2004, Riley *et al.*, 2005).

Finally, the evaluation team will need to scrutinize where the economist obtains the information that he or she needs to assign a monetary value to the resources used. It has been mentioned already that the first place to look will be the published accounts of the agencies that provide the resources in question. This is because implicit in the economist's approach is the assumption that market values are best. In most cases this is true, but the assumption needs watching. Some salary rates paid to women still lag behind those paid to men. While there are economists who argue that this is a true reflection of differences in productivity and so there is no problem, there are others who see this difference as evidence of discrimination in the labor market and not a true reflection of differences in value or opportunity cost.

Special considerations for health promotion

The use of volunteer time and community in-kind resources will be a common feature of health promotion interventions because of the importance placed on participation and collaboration. The evaluation team will need to make sure they consider and list these resources and discuss how they feature in the cost calculations.

There is a need also to be clear on terminology. A successful community development project will often see additional resources drawn to the intervention as field workers engage other agencies and organizations in collaborative partnerships (Gold *et al.*, in press). The economist will regard these additional resources as a cost, while the community workers will see them as evidence of the success of their activities. In reality, resources attracted to an intervention through successful community action represent both a cost and an outcome! They are an outcome of successful community development but become an input (and therefore a cost) into any subsequent activities designed to promote health. Questions health promoters and health economists need to ask each other at this step are:

- ▶ Have all of the relevant in-kind resources been included?
- ▶ Have the outcomes (benefits) and the costs associated with success of community development or collaboration interventions been clearly distinguished?

Step 5/ Identify, measure and value the consequences

As with costs, the evaluation of consequences is broken down into three sub-steps.

Identification of all important consequences

The aim here is to list everything that the intervention is expected to achieve. This should not be restricted to final outcomes. Intermediate changes that might show whether the intervention is working as planned ought to be identified also. It helps though, if the team can distinguish any consequences that lie along the causal pathway that are not final outcomes in themselves from those consequences that will determine ultimately whether or not an intervention is effective. Some consequences may be seen as both an intermediate variable and a final outcome. Empowerment, for example, might be seen both as an end in itself and as something that is a determinant of health (Wallerstein, 1992).

As with costs, the aim should be to be as comprehensive as possible at this stage, identifying all relevant outcomes even though it will not always be possible to measure or value them all. This ensures that nothing important is overlooked.

Measurement of the consequences

How one might measure the outcomes of health promotion is discussed in Appendix 2.

What is important here is to ensure that the choice of outcome indicator is suited to the economic question being addressed.

One does not always need final outcome measures. If reduction in tobacco use is the intention of the intervention that one is considering, then quit rates or changes in the amount of tobacco consumed represent good measures of success. These changes do not need to be translated into improved health or well being in order for one to decide which intervention best achieves the objective being considered.

For that reason, if the objective of the intervention is to promote capacity in community-based Organizations, for example, then any option that is likely to achieve this can be compared to another in a cost-effectiveness analysis with a measure of capacity as the 'outcome' indicator.

On the other hand, if one wishes to know whether adopting a capacity-building approach within an intervention is better at promoting health than approaches that do not also include capacity building as an objective, then clearly one needs a measure of health improvement. A measure of increased capacity alone does not help one choose between these options.

Similarly, if reduction in inequity is a prime objective of health promotion programs, then any evaluation of program effectiveness must document the effect that the program has on different social groups. Unfortunately, few evaluations report such evidence (Macintyre, 2003).

As with costs, the aim here ought to be to measure the changes in outcome that come about because of the program.

Valuation of the consequences

In cost minimization analysis, cost-effectiveness analysis, and cost-consequence analysis, the benefits of the intervention are all expressed in natural units – that is, just as they were measured. No explicit valuation is required therefore *at this stage*. A value judgment still has to be made by the decision maker, however, when it comes to deciding whether the benefits of the intervention are worth the costs involved (see step 8).

Valuation is therefore, a feature of cost-utility analysis and cost-benefit analysis only.

In *cost-utility analysis*, the outcome measure is the quality-adjusted life-year, which in simple terms is equivalent to a year of life adjusted for its quality. One year in good health gets assigned a score of 1 quality-adjusted life-year. One year in a health state considered equivalent to being dead gets assigned a score of zero. Intermediate states, i.e. those considered better than being dead but that still fall short of perfect health are scored somewhere between these two anchor points (Note that health states that are so severe that they are considered worse than death would be assigned a negative score).

The values that are of interest are the community's preferences for different dimensions of health and their value relative to life expectancy. The aim is to find out, for example, whether a reduction in pain is more important than improved mobility, or whether the public at large thinks it more important to reduce anxiety and depression rather than improve someone's capacity for self-care. Greater weight can then be given to interventions that achieve the most valued health outcomes (see Technical Note: Valuing Health States: Quality-Adjusted Life-Years).

To carry out a cost-utility analysis, the economist may recommend a survey of the population to ascertain its values directly. Alternatively, a generic health-related quality of life instrument such as the EQ-5D¹ (Brooks, 1996) can be used to measure the effectiveness of the intervention. This provides a description of the health states that people have achieved following the intervention. Health utility values for each of these states can then be taken from the research literature and applied to the outcome data to derive estimates of any change in quality-adjusted life-years (see www.euro-qol.org for details).

1 The EQ-5D is a generic measure of health related quality of life that defines health in terms of five dimensions: mobility, self care, usual activities, pain and distress, and anxiety and depression.

Technical Note/ Valuing Health States: Quality-Adjusted Life-Years

To carry out a cost-utility analysis one needs to ascertain the value that people ascribe to different states of health. To elicit these values, people are taken through a series of structured exercises, preferably in face-to-face interviews, designed to reveal how much improvement in one dimension of health would compensate them for reductions in other dimensions. The results of the exercises allow one to express the multidimensional nature of quality of life in terms of a single index. That is, the methods allow the economist to assign weights to states of health that fall in between full health and death. A year of life in full health is assigned an arbitrary score equal to one, with death being assigned a score of zero. A health state that might involve living for the year with some moderate degree of pain and some anxiety and depression might score 0.75. A more severe state, perhaps one involving severe pain, compromised mobility and an inability to care for oneself would score much lower – say 0.1 for example.

These weightings can now be used to compute the potential gain from successful prevention. If a health state is valued at 0.75, then restoring someone to full health leads to a gain in health worth 0.25 ($1 - 0.75$). If this improvement can be sustained for 10 years, then the intervention is worth 4 quality-adjusted life-years or 2.5 (0.25×10).

Alternatively, if neither of these courses of action is feasible, then it is still possible sometimes to take studies of preventive and health promotion interventions that have not used a cost-utility approach, and translate the outcomes of these studies into quality-adjusted life-years (Mortimer and Segal, 2005). This expands the range of interventions that can be compared with each other without requiring each one to be subject to special preference surveys.

In *cost-benefit analysis* one assigns a monetary value to the outcomes of the intervention. Strictly speaking, all of the benefits of an intervention should be valued in monetary terms. In practice, one often sees studies that have included only those costs and benefits that can be readily expressed in monetary terms labeled as cost-benefit studies.

Technical Note/ Assigning Monetary Values to Outcomes: Contingent Valuation Methods

In cost-benefit analysis, the economist will try to assign a monetary value to all the consequences of the intervention. This usually requires one to undertake a contingent valuation exercise.

The usual method for doing this is to conduct a '*willingness to pay*' study. This method uses survey techniques to find out how much people would be willing to pay hypothetically for the benefits of an intervention. The rationale underpinning the technique is that value is reflected in what one would be willing to give up in order to enjoy the benefits of the intervention in question.

Some people find it hard to answer willingness to pay questions, however, and increasingly, analysts are using an alternative approach based on Discrete Choice Experiments to ascertain values. This is also a contingent valuation technique but in this instance, participants are presented with a series of paired scenarios (perhaps as many as 16 pairs) and asked each time which of the two options they prefer. The scenarios might describe alternative configurations of an intervention or alternative combinations of the outcomes that might occur. Statistical techniques are then used to estimate the value of each attribute. If cost is included as an attribute in the scenarios, then willingness to pay values can be ascertained.

The discrete choice approach has the advantage that people often find the questions easier to answer. The results also allow one to say which of the different components of each scenario are the most important. The disadvantage though is that the evaluation is limited in the number of attributes (or sources of value) that it can include because of the cognitive capacity of the survey participants. In contrast, willingness to pay surveys allows the respondent to include whatever dimensions of benefit they themselves deem to be valuable.

To obtain such monetary values, the economist will undertake a contingent valuation exercise, essentially to see how much the community is willing to pay for the benefits that a successful intervention will provide. There are a number of methodological considerations to take into account when conducting such an exercise to ensure that the method yields valid results. It is essential, therefore, that the team has the services of an economist experienced in such methods if it is to undertake a cost-benefit study (see Technical Note: Assigning Monetary Values to Outcomes: Contingent Valuation Methods).

Special considerations for health promotion

There are two major dimensions to the evaluation of the results of health promotion interventions – one focused on outcomes and one focused on the capacity of people to act. The outcomes can be measured by indicators of the results obtained immediately, over the intermediate term or over the long term as guided by a program logic model (including changes in knowledge or attitudes, changes in public policies, behavior change or changes in mortality, morbidity or determinants of health). The capacity to act can be measured in terms of inter-sectoral collaboration, partnership formation, community engagement, degree of social participation in decision-making, social cohesion, sustainability and other such measures. It is this capacity to act that can lead to unexpected, long-term impacts such as a change in community values or creation of a new policy or a political change in leadership that go beyond the original scope of the health promotion intervention. Each type of indicator will use different data collection and analysis methods. Most health promotion interventions use a combination of strategies related to both types of results. For a more detailed description of these points, see Appendix 2.

Another key consideration for health promotion intervention evaluation is the changing nature of the context. The interventions adjust to real situations according to demands and needs not present or visualized at the beginning. The evaluation design needs to refer to the dynamics and changes of the intervention during its implementation, the interrelationships among actors, the negotiation of power relationships, and the relationship between the context and the intervention. Designs that accommodate these parameters are emerging in the Spanish literature (systematization) and the English literature (realist evaluation) (see Appendix 2). The last point to consider is that the evidence hierarchy that is used to assess epidemiological and health care studies does not necessarily apply to health promotion interventions (Rychetnik *et al.*, 2002).

In light of all of this, the questions for health promoters and health economists to ask each other at this step are:

- ▶ What are the different types of results for these interventions and what measures or indicators are there? How does one include both measures related to individual/community immediate, intermediate and long-term outcomes and to the capacity to act?
- ▶ Given that one is more likely to have missing data due to the multi-level, multi-strategy interventions in health promotion, how does one make sure not to ignore these parts in the economic evaluation?
- ▶ What aspects of the intervention are really important (not just what can be measured), including the values, principles, and less easily measured aspects? How does one include these in the economic evaluation?
- ▶ How does one make sure that the changing nature of the context has been taken into account in the effectiveness evaluation and the measures used?

Step 6/ Adjust for differential timing of costs and consequences

In any program, but especially in health promotion programs, costs will be incurred and benefits received over different time-periods. Program development costs will be incurred early in the history of an intervention. Implementation costs may then be incurred over several years depending on the type of intervention and its scale. There may be a need to re-invest periodically over the life-time of an intervention, for example to update staff training. Capital costs are incurred up front, but the asset provides a service throughout the life of the intervention and often beyond. Cost offsets, which are savings from any reduction in the use of health services brought about by successful health promotion, may only become apparent many years hence. The same is true of the benefits of interventions: some will happen early, others may take time to become manifest.

For a number of reasons, costs (and benefits) of the same *nominal* magnitude that occur at different points in time do not have the same *real* value. In general, people prefer to defer costs to the future and enjoy benefits now – a phenomenon known in the economic literature as ‘*time preference*’. This has implications for economic evaluations. Essentially, an intervention that delivers benefits sooner will be preferred (has more value, that is) to an intervention in which the pay-off is delayed. It is necessary therefore to adjust the value of costs and benefits that occur at different points in time so that they can be expressed as if they had all occurred at the same point in time.

The process for doing this is known as **discounting** (See Technical Note: Discounting). The value of costs (and benefits) occurring in the future are reduced or converted to their current value by application of a *discount rate*.

The discounting process is something that will be handled by the economist although the formulae used are explained and illustrated in Drummond *et al.* (1997). The discount rate should not be confused with adjustments for inflation. All the costs must be expressed in real terms (i.e., adjusted for inflation) before discounting.

Although *the process* is a relatively simple one, discounting is not without controversy. For one thing, there is no agreement yet about a single discount rate and while some countries recommend a discount rate for public projects, not all do. There is, however, a consensus in health economics about what to do given this situation. The economist will typically use the recommended rate for his/her country, if there is one, in what is called the base-case. He or she will then rework the analysis using alternative discount rates usually ranging from 0% (effectively not discounting) to 10%. That is, the effect of using different discount rates is one of the things that should be explored in the sensitivity analysis (see step 7). Furthermore, the US Public Health Services Task Force (Gold *et al.*, 1996) also suggests that every economic evaluation use a rate of 3% to facilitate the widest range of comparisons, and so this rate should be featured in the sensitivity analysis and may be the rate used in the base case where a country does not recommend a rate.

The results of the evaluation should then be reported in both discounted and undiscounted fashion, which allows a better understanding of the impact that discounting has on the conclusions of the study.

Technical Note/ Discounting

Imagine being offered \$1,000 that one can either take now or receive in five years time? Which would be preferred? Most people would take the money now if only because one can bank it and with interest the total will be worth more than \$1,000 in five years. This example shows that \$1,000 now is not worth the same as \$1,000 in five years time: it is worth more. Thus, in an economic evaluation, it is necessary to adjust the nominal value of costs and benefits that occur at different points in time to acknowledge this. The process by which this is done is called discounting. An example is presented here.

For simplicity, consider two options: one involves purchasing a car for a community development officer, the other involves leasing the car. Under the purchase option, the car costs \$20,000. It is expected to last five years when it will be sold at a price of \$3,000. The lease option requires an up front payment of \$8,000 and annual payments of \$2,600 (annual payments are assumed rather than monthly ones just to make the example easier).

The flow of costs over time is shown below with the total not subject to discounting.

Nominal Value of the Cash Flows (undiscounted)

OPTION	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
Purchase	\$20,000	\$0	\$0	\$0	-\$3,000	\$17,000
Lease	\$8,000	\$2,600	\$2,600	\$2,600	\$2,600	\$18,400

Looking at the simple flows, the purchase option appears to be the least expensive one, but this ignores the fact that it requires a large payment up front and the value of the eventual sale is reduced because it happens in five years time.

If the cash flows are discounted to recognize their timing the result looks like this (using a discount rate of 5%)*

Present value of the cash flows (discounted at 5%)

OPTION	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
Purchase	\$20,000	\$0	\$0	\$0	-\$2,468	\$17,532
Lease	\$8,000	\$2,476	\$2,358	\$2,246	\$2,139	\$17,219

Now the lease option is the least expensive one. The difference in this example is small, but it can be considerable over longer time frames (see the case study on discounting life years).

* The formula to use to discount future costs and benefits is shown in Drummond *et al* (1997).

Special considerations for health promotion

Though discounting has been presented as if it were a simple mathematical adjustment, its importance for health promotion should not be underestimated. Discounting reduces the value of benefits received in the future relative to costs incurred today. As the benefits of health promotion often occur in the future while its costs are incurred today, discounting will reduce the apparent cost-effectiveness of health promoting interventions. The effect of this is particularly noticeable when health promotion is compared with health care, which tends to have an immediate and highly visible effect on health (See Example: Discounting and Life Years).

It is imperative therefore, that the effects of discounting are fully explored in the evaluation (see step 7: sensitivity analysis) and the choice of discount rate is discussed.

EXAMPLE/ Discounting and Life Years

In the technical note to explain what discounting is, the difference between the discounted and undiscounted flow of resources was quite small. The effects of discounting get larger the longer the time frame and the higher the discount rate. The evaluation of bicycle helmets for children carried out by Hatziandreu and colleagues in 1995 shows this.

Hatziandreu looked at three different policies designed to get children to wear helmets while riding their bicycles. Helmets do not reduce the number of accidents experienced by child cyclists but they do reduce the severity of the injury and in some instances can mean the difference between life and death.

The evaluation concerned children between the ages of 5 and 16. The analysts assumed that the average age of death in the absence of the program would be 10 years. Average life expectancy from age 10 was then nearly 66 years. That is each death prevented would generate an additional 66 years of life – undiscounted. However, after discounting, the present value of these life years is much lower at just 19 years.

Hatziandreu adopted a conservative approach and only considered benefits over the four years that the program was implemented. Discounting therefore had little effect on the conclusions drawn by the team. And unfortunately, the paper does not provide sufficient information to allow one to rework his estimates to see the effect of discounting over the longer time frame. However, one can see that after discounting, the benefits of intervention were less than one-third what they were before discounting. Thus, the cost per life year saved will increase three-fold, once the outcomes are discounted.

—Hatziandreu EJ, Sacks JJ, Brown R, et al. The cost effectiveness of three programs to increase use of bicycle helmets among children. *Public Health Reports* 1995; 110: 251-259

Being unhappy with the results of discounting is not strong grounds for questioning the practice. Even so, there is still some dispute over the validity of discounting. Time preference may be a feature of individual preferences but this does not mean that individually one wants it to influence the decisions that are made for society as a whole (Sen, 1967). Discounting is also contentious when the time-frame involves future generations, whose values have not been included in the rate of time preference. For these reasons, the evaluation team should be prepared to discuss and defend the choice of discount rate. The questions that health promoters and health economists need to ask each other at this step are:

- ▶ Is it clear when costs will be incurred (and benefits experienced) for the intervention and the comparator?
- ▶ What is the rationale for using the chosen discount rate? What other rates if any have been considered in the sensitivity analysis?

Step 7/ Dealing with uncertainty: sensitivity analysis

Uncertainty is a pervasive feature of any economic evaluation, whether this is from measurement error, sampling variation, context changes over time or missing data. The best way to factor this into the evaluation is through a *sensitivity analysis* (Briggs *et al.*, 2002).

The evaluation is completed first using the expected values of the uncertain parameters or the best guesses for missing values. This is the base-case. The analysis is then reworked using a range of plausible values for each of the uncertain parameters or pieces of missing information. For example, past experience may suggest that participation in a particular program will average 72%, but studies have shown that this could be as low as 60% or as high as 82%. A simple sensitivity analysis would rework the evaluation using the higher and lower participation rates in order to compute best and worst case

scenarios (See Example: Sensitivity Analysis in Practice). If the intervention looks worthwhile even in the worst case scenario, then the results of the evaluation look robust. Furthermore, the participation rate can then be pushed down further still – to 55%, and 50% and so on, to find the *threshold level* at which the intervention begins to look unattractive. The evaluation team is then better positioned to decide how much confidence it can have in the conclusions it draws from the base-case evaluation.

EXAMPLE/ Sensitivity Analysis in Practice

The Heartbeat Wales programme was a multifaceted heart health initiative in the UK that engaged community groups, employers, local authorities and the health sector to tackle tobacco use, nutrition and physical activity. In this case study, Phillips and Prowle (1993) examined the cost-effectiveness of the tobacco reduction part of the initiative.

The evaluation measured the full costs of the tobacco reduction activities, adopting a societal perspective by including effects not just on the health system but on commerce and industry as well.

On the benefit side, smoking prevalence fell by 4% for men and 2.7% for women after the intervention and this was used as the baseline estimate of effectiveness. The reduction in smoking rate was translated into an increase in years of working life gained because of reduced morbidity and mortality associated with three of the most significant diseases related to smoking. The evaluators acknowledged that this was problematic however as they did not really know how much of the change in prevalence should be attributed to the intervention. Thus, the consequences of this assumption were explored in the sensitivity analysis. The results are shown below.

	Working Life Years Lost	Cost / Working Life Year Saved
At 100% impact rate	92,776	£5.80
At 50% impact rate	46,388	£11.60
At 25% impact rate	23,194	£23.10
At 10% impact rate	9,277	£57.80

The baseline estimate, which assumed that all of the change in prevalence could be attributed to the intervention, showed that the net cost per year of working life gained was less than £6.00. But even if one assumed that only 10% of the change in prevalence could be attributed to the intervention, then the cost remained less than £60 per year of working life gained. Thus, the intervention still appears to be a good buy and the conclusion drawn by the evaluators – that large scale benefits to the economy as a whole can be derived from reductions in smoking – appears to be robust to changes in this assumption, at least.

—Phillips CJ, Prowle M. *Economics of a reduction in smoking: case study from Heartbeat Wales.* *Journal of Epidemiology and Community Health* 1993; 47: 215-223

When two or more variables move together, sensitivity analysis can become quite complicated, and for this reason, it is valuable to have specialist support on hand. The important thing here is for the evaluation team to be aware of the purposes and the usefulness of the sensitivity analysis. It allows the team to push the parameters of the program to the fullest and to see just how robust the results of the evaluation are to the underlying forces that might affect the program's implementation and its effectiveness.

The sensitivity analysis also helps to answer 'what if' type questions.

For example, what if:

- ▶ The costs of the intervention were significantly higher than assumed?

- ▶ There is doubt about the extent to which the community will participate in and take ownership of the intervention, and yet both are crucial for its effectiveness?

The sensitivity analysis has four basic purposes. It can:

- ▶ Demonstrate the dependence/independence of a result on a particular assumption
- ▶ Identify critical values of variables
- ▶ Identify uncertainties that require further research
- ▶ Check the strength of the conclusions of the study.

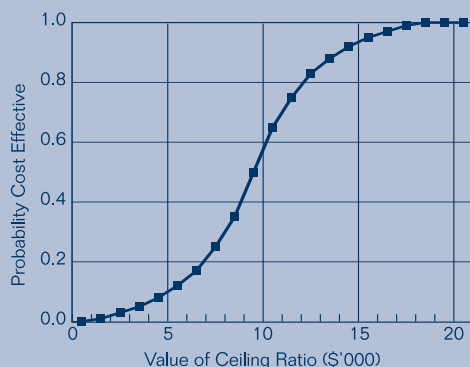
The methods that are used in the sensitivity analysis are also increasing in sophistication. For example, if the available data allow, the economist might employ what is called 'bootstrapping' to get a better handle on the effects of sampling variation. Individual level cost or outcome data is needed and from this, one observation (i.e. one respondent) is selected at random. The outcome for this person is recorded and he or she is replaced in the sample before another individual is drawn at random and the outcome recorded again. The process is repeated a large number of times – perhaps 500 or 1,000 times – to generate a distribution of the outcomes. It is then possible to calculate confidence intervals and use statistical techniques to assess how robust the conclusions of the study are (see Briggs and Gray (1999) for more information).

Technical Note/ Advanced Sensitivity Analysis

The example in sensitivity analysis from the Heartbeat Wales intervention showed a very simple case where the value taken by a single variable (in the example it was the reduction in smoking that could be attributed to the intervention) is allowed to vary in order to see its effect on the final ratio of costs to effects. With the increasing availability of individual-level data from clinical trials combined with extensive use of modeling approaches to extend trial results to longer time frames or different settings, so the methods used in a sensitivity analysis are becoming more advanced and the results potentially more informative.

One development is the use of probabilistic sensitivity analysis, the results of which can be displayed as a cost-effectiveness acceptability curve. Probabilistic sensitivity analysis is now part of the guidance provided by the National Institute of Health and Clinical Excellence in the UK. The paper by Briggs et al., (2002) describes how the technique works and we present an example of a cost-effectiveness acceptability curve below.

An Example of a Cost Effectiveness Acceptability Curve



The graph is read in this way: If the decision-maker is willing to pay \$10,000 per unit of outcome (say 1 quality-adjusted life-year), then in this instance, there is a 65% chance that the intervention will be cost-effective (i.e. that the results will come in at under \$10,000 per QALY gained). If the decision maker is only willing to spend \$5,000 per unit of outcome, then the intervention is unlikely to be seen as worthwhile as there is only a 15% chance of the intervention being cost-effective (incremental cost being less than \$5,000/QALY).

—Briggs A, O'Brien BJ, Blackhouse G. Thinking outside the box: recent advances in the analysis and presentation of uncertainty in cost-effectiveness studies. *Annual Review of Public Health* 2002; 23: 377-401

Special considerations for health promotion

The mechanics of the sensitivity analysis will be something that the economist will handle, but the evaluation team is very much a part of the process. The team should help to determine the range that each variable is allowed to take in the sensitivity analysis and also any combinations of variables that might be expected to move together and so ought to be included as such in the sensitivity analysis. As is discussed below, the sensitivity analysis may also reveal errors in the data analysis especially when any form of economic model has been used to compute costs and effects occurring beyond the time-frame of the original evaluation. The evaluation team, with its knowledge of the intervention and its impact, is best placed to spot these errors. Health promotion interventions that are multi-level and multi-strategy pose particular challenges to the sensitivity analysis. The questions health promoters and health economists need to ask each other relevant to this step are:

- ▶ Among the many variables and assumptions in this analysis, what is most important to include in the sensitivity analysis?
- ▶ What variables were missing from step 5 that should be taken into account in this step?
- ▶ What aspects of or changes in the context is it appropriate to explore in a sensitivity analysis?

Below is a discussion of how to interpret the results of the analysis.

Step 8/ Interpret the results of the economic evaluation

At this stage most of the analysis has been done and the evaluation team faces the task of interpreting the various results that the evaluation and the sensitivity analysis have provided. For ease of explanation, put the sensitivity analysis to one side and consider how best to interpret the results of the economic evaluation where the results appear more certain.

Formulating Decision Rules

The *cost-benefit* approach provides very clear decision criteria. If the monetary value of the benefits (\$B) exceeds the monetary value of the costs (\$C), then the intervention is a good thing. This means either that the net benefit is positive ($\$B - \$C > 0$) or the benefit to cost ratio exceeds 1 ($\$B/\$C > 1$). Some authors report cost:benefit ratios rather than benefit:cost ratios. In this case the decision rule is that the ratio must be less than one. Note that these decision rules reflect only the total cost and benefit, not their *distribution*.

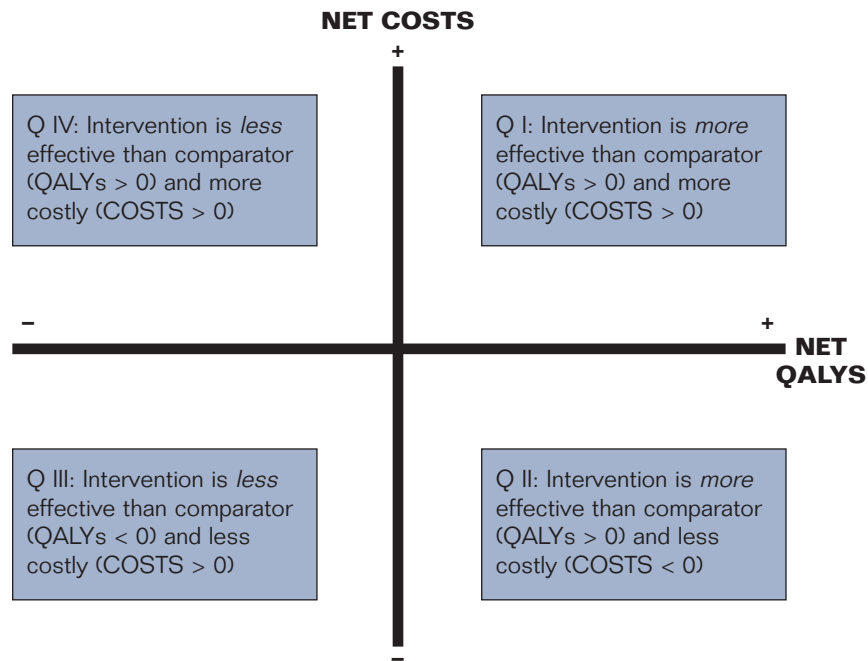
Coming up with such clear recommendations is usually more difficult and may not be possible with the other approaches to economic evaluation. The problems are essentially the same for both *cost-effectiveness* and *cost-utility* analysis and so, for ease of expression, we refer only to cost-utility analysis where effectiveness has been measured in terms only of quality-adjusted life-years.

Cost-utility and comparing two options

In the first instance, it is easier to consider comparing just two programs, program A (the comparator) and program B (the intervention). If one rules out the rare cases where the costs and benefits of each program are identical, then one is left with one of four possible scenarios. Option B may be more or less *expensive* than option A, and it may be more or less *effective* than option A. The

possible scenarios are depicted in Figure 1. On the vertical axis is the difference in costs between the two options. The horizontal axis shows the difference in effects measured in QALYs. The intersection of the axes shows the point where the two options are identical in terms of both cost and benefit.

FIGURE 1/ COST EFFECTIVENESS



To use the diagram, locate Option A (the comparator) at the intersection and now place option B relative to it according to the results of the economic evaluation. Option B can fall into any one of the four quadrants. If the intervention is less effective than the comparator and it is more expensive, then it falls into quadrant IV. In this case, the decision is an easy one. Option A is clearly preferred. It is said to *dominate* option B. A similar situation is shown in Quadrant II, though in this case option B dominates option A because it is both more effective and less costly.

Such instances are rare, however. The more common outcomes, and the more complicated ones to deal with, fall into Quadrants I and III. Here, one option is both more effective and more expensive than the other. Now neither option dominates. In these instances, it is no longer possible to say definitively whether one or other option is 'cost-effective'. All one can point out is how much extra it will cost to improve program effectiveness – in the case of Quadrant I by switching from program A to program B.

In such circumstances, the *incremental cost-effectiveness ratio* is the difference in cost between option A and option B divided by the difference in benefit between the two options. This is different from the average cost effectiveness ratio (total costs of the program divided by the total benefits), and it better reflects the unit price that must be paid to secure the additional benefits provided by the more effective option.

Beware of the incremental cost effectiveness ratio!

Note that the incremental cost effectiveness ratio (ICER) tells one nothing about how much it will cost in total to implement the new program. In essence, the ICER indicates the price that must be paid for each unit of outcome, but it says nothing about how much of the outcome one has to buy (or how much has to be spent) in order to qualify for that price.

Nor does the ICER say anything about where the extra resources that are required to implement the new program will come from. If the policy maker faces a fixed budget (and when it is not the case?) then some program or programs will need to be reduced in order to accommodate the increased spending. Care needs to be taken therefore to ensure that the extra benefits to be gained by investing in program B are sufficient to offset what is lost when these other programs are cut back.

Finally, care also needs to be taken when extrapolating the results of the evaluation to different levels of investment, as the ICER tells one nothing about the range or scale of investment over which the unit price remains unchanged. The fact that an evaluation shows the incremental cost-effectiveness to be \$X per QALY for a given scale does not mean that the program can continue to be increased in size at the same unit price. Eventually either the costs will increase (because more needs to be paid to secure the services of resources that become increasingly scarce) or the effectiveness of the program will fall off (perhaps as it is extended into populations that will not benefit as much from intervention).

Interpreting the results of the sensitivity analysis

Interpreting the results of the evaluation gets even more complicated when one includes the results of the sensitivity analysis, as now one has to deal with a degree of uncertainty. The economist can present the results of the sensitivity analysis but to interpret the results correctly the evaluation team now needs to get together to interpret the analysis. A structured approach will help the team to negotiate its way through the wealth of information that the evaluation will provide, and so below are a series of suggested questions to consider:

1/ Do any of the changes that one sees in the cost-effectiveness ratio as one alters the values of the underlying variables seem implausible?

The first useful thing the sensitivity analysis provides is some insight into how accurate the calculations have been – especially when any sort of model has been used to predict the long-term effects of an intervention. Errors in the model or in the calculations of cost and effects will sometimes reveal themselves in implausible changes in the cost effectiveness ratio. As the discount rate is changed, for example, one would expect to see smooth changes in costs and effectiveness in a predictable direction (options where the costs are incurred early and the benefits arrive late will look progressively worse as the discount rate is increased, for example). Any anomalies in the relationship between cost and effect, and the changing assumptions that drive the analysis should prompt one to re-examine the original calculations to rule out error.

2/ Are the cost-effectiveness/cost-benefit ratios sensitive to changes in any of the key variables?

Having eliminated any errors, the next step is to assess how sensitive the results are to the assumptions being made. The meaning of sensitive here is – is it possible that recommendations likely to emanate from

the evaluation would change if any of the variables in question took on any of the alternative values used in the sensitivity analysis? For example, does one of the options look like the best buy when the discount rate was set at 0% but not when it was set at 10%? Is the cost-effectiveness ratio unduly influenced by small changes in the participation rate or the rate of uptake in the intervention? The aim at this stage is to identify the degree of comfort that the evaluation team has with the results of the evaluation.

3/ If the results are sensitive to one or more variables, are the pivotal points in the range that these variables take plausible?

Here one is interested in gauging how realistic it is that the real world will look like the worst-case scenario described in the sensitivity analysis. If the results show that the option appears to be a good buy only if levels of participation exceed 80%, then how realistic is this value? If past experience suggests that participation in similar programs has never exceeded 60% then the program may not be feasible. Similarly, while discount rates of 0 to 10% are plausible, those above 20% are much less realistic and so it will not matter too much if the option appears to be a good buy only at discount rates below this amount.

Ideally, the results of the evaluation will be robust and clear-cut. Either the new program looks to be a good buy under all circumstances or it does not look to be a good buy under any circumstances. In cases where the result is ambiguous, then it is harder to make policy recommendations. The best course of action will depend on what the team thinks of the risks involved and the cost of obtaining any new information that might reduce the degree of uncertainty.

The team may decide that the risks associated with the project are worthwhile and that it should go ahead despite the uncertainty. In this instance, it would be prudent to monitor its implementation, scrutinizing most carefully those parameters that were most uncertain, so that policy changes can be quickly introduced should the program show signs of failing.

Alternatively, the sensitivity analysis will show where more research effort is needed before implementation can be considered. Does one know what the participation rate will be, for example, and are there steps one can take to increase it above the critical threshold levels?

Once the insights offered by the sensitivity analysis have been exhausted, there is a range of other considerations to take into account when interpreting the results of the economic evaluation.

4/ Are there factors other than economic efficiency that ought to be taken into consideration when making a recommendation?

This is the opportunity to reconsider the distribution of costs and effects. Are the burden of cost and the distribution of effects in some sense 'fair'? Alternatively, does the more efficient option concentrate costs unduly on those least able to pay or distribute the benefits to those in less need?

The distribution of costs and benefits may also affect political support for a program. Many road improvement measures, for example, confer health benefits to the community at large by reducing accident rates, but the costs are borne by the transport ministry, which may have other criteria in mind when deciding where it should invest its resources.

5/ Are there any special circumstances that might affect the costs and benefits of the preferred option if it was to be implemented in another context?

Here the team is asked to consider how feasible it would be to replicate the results if the preferred option was implemented elsewhere. Is the effectiveness of the intervention likely to be higher than could be achieved elsewhere, for example because of prior investment in health promotion interventions that may have enhanced community capacity? Does the preferred option make use of skilled resources available in this context that might not be available in others (teachers or nurses, for example)?

6/ Is the preferred option affordable?

That is, even though on balance the value of the benefits appears greater than the costs, do the financial costs of the intervention exceed the budgets of any of the agencies responsible for implementation?

7/ Are there any major impediments to implementation revealed by the evaluation?

The feasibility of each option was a major consideration in their selection for inclusion in the evaluation, but the evaluation itself may reveal barriers that undermine the feasibility of the best option. Does it rely unduly on the availability of volunteer labor and if so, what is the likelihood that such a resource will be forthcoming? Is the time required of the community to participate in the project unduly onerous?

It is the evaluation team's responsibility to analyze the efficiency of the intervention and add recommendations with respect to what would be the most reasonable decisions to make and the pros and cons of the different courses of action, based on the combined results of the different analyses. Remember that it is the decision makers who determine the selection criteria, what resources will be made available and how much should be invested in achieving a particular goal. The team's role is to use the economic evaluation results to provide input based on criteria of efficiency and equity, without forgetting that the decision makers' criteria will also carry significant weight in the decision-making process.

Dealing With Complex Interventions

4

Introduction

The examples that have been used to illustrate the application of economic methods have all been relatively simple in the sense that typically, they have involved single-strategy, single-agency interventions, often with clearly defined health or health related outcomes. In the introduction to the guide it was noted that this does not cover the full spectrum of health promotion activity. Instead, health promotion was described as involving multiple components, each integrated into an overall strategy, with participation among multiple agencies, Organizations and individuals, and addressing multiple objectives, not just the promotion of health but concerned also with reducing inequalities in health and with increasing community capacity to address threats to health.

The associated complexity has led some commentators to question whether economic evaluation is at all relevant to health promotion (Burrows *et al.*, 1995). Is health economics too rational, too linear in its thinking to cope with the difficulties that arise? Can health economics contribute to understanding the value of such programs or is there a danger that one loses too much in reducing the complex whole to something that is more amenable to economic evaluation? One must consider some of the issues that this shift in thinking, from simple interventions to more complex ones, raises for health economics and health promotion.

Health promotion interventions will often be complex ones because they will be multi-faceted, integrated, multi-sectoral and values-based. It is worthwhile, therefore, reconsidering why good health promotion needs to be complex as one might then see what aspects of health promotion, if any, pose a challenge for health economics.



The *first* reason is the fact that many of the determinants of health lie beyond the purview of the individual. While there is much that can be done by individuals to promote their own health, that ability is constrained by the social and physical environments in which they live, work, and play, and by the social and economic policies that govern those environments. For the same reasons, many of the determinants of health lie beyond the purview of the health-care system also – in policies and practices to do with housing, education, transport, employment and so on. Thus, a multi-sector approach is essential if one is to tackle the structural determinants of health and provide the right conditions for health.

Second, the determinants of health interact with each other. Lifestyle choices are not independent of the social environments in which people find themselves and vice versa – the social environment is influenced by one's behaviors. If one were to try to promote health by tackling just one set of determinants – say individual knowledge and behaviors for example – those efforts would be undermined by the continuing pressure from the unhealthy settings in which some people live their lives. Thus, a multi-level strategy is suggested to tackle each level of the determinants of health simultaneously.

Third, the chronic diseases that comprise most of the burden of illness each share common risk factors and risk conditions. Risk *factors* such as tobacco use, food choice, and physical activity underpin the incidence of cardio-vascular disease, diabetes, and many cancers. Common risk *conditions* such as one's income, education, employment opportunities and the neighborhoods in which people live, also shape the life-opportunities and the range of choices that people can make. Thus, some people suggest that an integrated approach, in which the main risk factors and risk conditions are tackled in a coordinated way, might be more effective and make more efficient use of resources.

Integration can be both *vertical* (in which the problem being addressed is tackled at different levels), or *horizontal* (in which different agencies with the same level of responsibility act in concert). The rationale for integration rests in part on economic arguments. There may be efficiencies to be gained from combining one's efforts with agencies involved in similar activities and so it may be less expensive to work together rather than alone with the incumbent risks of duplication. Working together may also help to identify and then to eliminate gaps in provision, increasing the effectiveness of the intervention. It should be remembered, however, that there are costs associated with coordination and networking and so working together may also be more expensive for some problems. It may also be less effective where, in the interests of consensus decision making, the line of least resistance (and possibly least effectiveness) is adopted.

Fourth, the fact that strategies need to be multi-sectoral, multi-level, and integrated suggests that maybe there are synergies to be exploited. That is, the effectiveness of one intervention may be magnified if it is implemented in concert with others. If one combines efforts to control tobacco use, promote physical activity and improve nutrition, and does so in an integrated fashion, then perhaps *in combination* a bigger dent in the incidence of chronic disease could be made than if one were to act on each of these risk factors separately.

Fifth, it is known that the incidence of ill-health is not a random event. Everyone is not equally exposed to the risk of ill-health. Consistently, it is people on lower incomes, with less education,

living in poorer housing, with less social support and perhaps marginalized. from society in other ways who suffer the greatest health burden and die prematurely. Thus, people who are already deprived socially and economically suffer the additional hardship of poorer health.

Sixth, health promotion interventions typically seek to affect multiple outcomes. Health improvement is important but it is not the sole objective. As was mentioned in section 3, many health promotion interventions seek also to build capacity among local agencies and population groups so that they can continue to work towards health improvement long after the support for the initial program has been withdrawn. And, as was stressed above, the distribution of outcomes is also important.

Finally, because of all of these reasons, the effectiveness of any single health promoting intervention is unlikely to be independent of the context into which it is implemented. Context here includes the social, economic and demographic characteristics of the population being addressed, the effects of past investment in health promotion which affects local capacity and receptiveness, the concurrent presence or absence of complementary programs, the existence and spread of supportive policies such as smoke-free workplaces, and so on.

All of these factors make the evaluation of health promotion difficult, but most of them pose no *additional* problems for the economic evaluation. The problems would be encountered by anyone who sought to evaluate the impact of health promotion, irrespective of whether the evaluation also involved enumeration of costs and benefits.

Can health economics deal with multi-sectoral interventions?

The fact that health promotion programs frequently involve partnerships that extend beyond the health care sector certainly makes the task of capturing the costs and consequences of any intervention more difficult, as one now needs to deal with multiple agencies in order to collect the necessary data, but this is the only difficulty that arises. Section 2 has an explanation as to why it is better to adopt a societal perspective in the evaluation and this alone will ensure that the full participation of partners in a multi-sectoral intervention is recognized and incorporated into the evaluation. This holds even for single agency interventions, many of which will have external effects beyond the principal agency.

Note however, that with multi-sectoral interventions, it is more likely that some of the things that appear like costs are actually just transfers of resources among the agencies. Care then needs to be taken to avoid double counting.

What about interventions comprising multiple components or levels?

With interventions that comprise multiple components, the main issue that arises in the economic evaluation is in deciding the correct comparator options. Take for example, a multi-component intervention designed to improve food choices in a worksite canteen. The new intervention might include the provision of information about the nutritional composition of the food choices, a pricing policy to encourage the purchase of healthier options, point of sale advertising and class room sessions in which healthy food preparation is discussed.

What should this multi-component intervention be compared with? In addition to any other relevant intervention (a social marketing campaign, for example), it could be compared with options made up of any or all permutations of these components including the ‘do-nothing’ option. This increases the range of options that might be considered and can extend the scope of the evaluation enormously (and sometimes beyond the resources available for the evaluation). In this example, if the do-nothing option is considered, then there are 15 alternative programs to consider. However, there is nothing in this example, apart from the logistics of handling so many comparisons that specifically undermines the integrity of one’s efforts to evaluate the costs and effects of these options.

The components are part of an integrated strategy – does this make a difference?

As discussed above, integration can refer either to the component parts of an intervention or to the participating agencies. Thus, from the arguments that have just been made in respect to multi-component or multi-sectoral interventions, the evaluation of an integrated intervention poses no additional or special challenges for the economist over and above those that will be faced in any case by the team trying to establish program effectiveness.

Dealing with equity

Economic evaluation is primarily concerned with efficiency (the relationship between cost and outcome). As was mentioned in the previous section, the rules for deciding which of two interventions is more efficient do not usually take into account who pays the costs or who benefits most from the intervention. That is, many economic evaluations appear to ignore equity. This is not strictly true, however. In fact, it is impossible to ignore equity because one cannot separate the production of health outcomes from who receives them. In health promotion, it is important to distinguish between equity (those who are more in need receive more) and equality (where everybody receives the same amount). Equality appears in conventional cost-utility analysis in the assumption that a QALY gained is a QALY gained no matter who receives it. Thus, one QALY is assumed to have the same social value irrespective of whether it is received by a man or woman, a rich person or a poor person, or someone who is already well versus someone who is severely ill. This is just one value judgment among many that could be made and indeed the research evidence suggests that few people agree with this view (Sassi *et al.*, 2001).

Instead, some economists have argued that one should apply different weights to the outcomes received by different social groups. Thus, if one wanted to favor people living in poverty, then one would assign a higher relative weight to the outcomes received by this group over others. One could, for example, count every quality-adjusted life-year two or three times if it is received by someone living in poverty, or divide by two or three the number of quality-adjusted life-years received by people in the highest income groups. Because this concept of equity is so important in health promotion, explicit discussion about it with decision-makers, community members and economists needs to be part of the economic evaluation process.

Others have argued for using a different approach to the way one elicits people’s preferences for health outcomes in favor of one that allows people to include their assessment of the value of the distribution of health gains directly (Nord *et al.*, 1999).

A third approach is to leave it to the decision maker to decide what weight to give to interventions that favour one group over another. This is the simplest option, but it begs the question of whose values ought to inform the decision. Is the decision maker reflecting his or her own values or those of the community on whose behalf he or she acts?

Three characteristics of health promotion do have special implications for economic evaluation, though. These are the importance of interaction effects, the multiplicity of outcomes, and context.

Integration may bring with it synergistic or interactive effects

Synergies will either reduce the costs of the intervention (through what economists call economies of scope) or they will increase the effectiveness of the intervention. Thus if one can measure the costs and benefits of the intervention, then one will generally capture any synergistic effects. The challenge posed by synergies arises primarily in the design of the intervention – that is, in conceptualizing what synergies are likely to exist and what component parts of an intervention need to be integrated in order to exploit the opportunities this provides.

There may also be problems in interpreting the results of an evaluation, since with multi-component or multi-agency interventions the evaluator will always be under pressure to try to identify precisely what components had the desired effect. It is possible to address this question in an economic evaluation, but only if one can include multiple comparators each comprising different sub-groups of the component pieces of the integrated strategy. By comparing each permutation of an intervention's sub-components, the economic evaluation will then show what additional value is gained as each new component is added, or conversely, how much is lost as the intervention is reduced in its scope. However, while technically possible, this is an expensive and logistically difficult course of action.

The intervention has multiple outcomes: does this matter?

Dealing with multiple outcomes does present a challenge for the economic evaluation. It would appear to rule out cost-effectiveness analysis for example, as this can only deal with single outcomes. To the extent that non-health outcomes are important, it would rule out cost-utility analysis also.

This view needs to be qualified, however. Health promotion interventions may involve multiple outcomes but this does not mean that all outcomes need to be considered in every evaluation. If the different dimensions of outcome all move together for example, then we can focus on one dimension and use this as a proxy for the rest knowing that this will not distort the way that the economic evaluation would rank the alternatives. Alternatively, several outcome measures could be combined into one index. For example, in the SIVEA case described in Appendix 1, the capacity-building index included different dimensions but the operational definition was consistent.

Similarly, the question being addressed may only require one to consider one outcome. If one is comparing two different ways of getting people to reduce their tobacco consumption, one can evaluate the options purely in terms of their quit rates. In this instance, the fact that tobacco use is

associated with a wide range of adverse health consequences is not necessary to discriminate between the options being evaluated.

If the multiplicity of outcomes is important (if for example, one option is likely to be better on some dimensions and worse on others) then the evaluation team is faced with a number of alternative ways forward. The first is to employ cost-benefit analysis to ascertain the relative value that the community places on the different dimensions of outcome. Alternatively, one can use cost-consequence analysis and present the results of the evaluation as a profile of the changes with each dimension reported separately. This approach at least makes explicit what each option costs and what benefits it generates, but it only provides a clear ordering of the alternatives being considered if all outcomes move in the same direction. If this is not the case, then cost-consequence analysis requires the decision maker to weigh the different dimensions of benefit in order to reach a decision. Finally, one could take the decision-makers through a formal valuation exercise (using the discrete choice approach, for example) and in this way make explicit the weightings that they would apply to the profile of outcomes (Ryan *et al.*, 2006). This method, while adding to the complexity of the evaluation process, does at least force decision makers to consider their values and it makes the basis for the necessary value judgments explicit and subject to scrutiny.

Multiplicity of outcomes will therefore, make it difficult to reach a decision. The danger then is that the evaluation is forced to be simpler than it should be by giving preference to one outcome over all others. This was seen in the United Kingdom, where the National Institute of Health and Clinical Excellence (NICE) recommended that evaluations of health care be reported in terms of cost / QALY gained. This assumes that non-health outcomes such as capacity-building are not important to health promotion.

The importance of context

Of all the features of health promotion that complicate its economic evaluation, perhaps it is the importance of context that is the most challenging. Here context means the characteristics of the setting into which the health promotion intervention is implemented.

Context is important for two reasons. First, to borrow terminology from epidemiology, context can act as a large effect-modifier. The effectiveness of an intervention will be different in context A than it will be in context B. Features of the context that might be important include the socio-demographic characteristics of the population and their health, literacy levels, the skills and capacities among members of the health promotion workforce, and any concurrent investment in programs that might complement the new intervention, to name just a few (Hawe *et al.*, 2004). In itself, this view of context does not alter how one would carry out an economic evaluation. The methods that one uses to identify, measure and evaluate the costs and benefits of different interventions, and the ease (or lack of it) with which they could be applied are not affected. What is affected is the inference that one could draw from an economic evaluation that had been carried out in a different context. To be able to transfer findings from one setting to another, one needs to know how the characteristics of the context in which the evaluation took place differ from the context in which the intervention might now be implemented. Therefore, a good economic evaluation ought also to report sufficient detail about the local context so that others who read the results can interpret them properly in the light of their own local circumstances.

Thus, the implications of seeing context as ‘effect-modifier’ means that the evaluation team has to be especially cognizant of the local factors that might influence the success or failure of the intervention and ensure that these are reported fully (Hawe *et al.*, 2004).

There is another way that context is important and potentially this has more far-reaching implications for the economic evaluation. This is when the context in which the intervention is being implemented acts as if it were a *complex system* (Hawe, 2006).

Complex systems are adaptive, unpredictable, and characterized by feedback loops and non-linear movements (Plsek and Greenhalgh, 2002). As before, when it was demonstrated that context is an effect modifier, interaction effects are important but in this instance the interaction effects work in two directions as the feedback loops ensure that program effects lead to changes in the context and then the changes in context feed through into the intervention and so on. Now, one sees not only multiple outcomes but also *multiplier* effects as the feedback loops work themselves through the system (Shiell and Hawe, 1996). This can be beneficial, when the initial investment in a program induces others to invest in complementary activities that reinforce each other. It can also be detrimental, as is the case when peer-influences reinforce risky behaviors, for example.

This will have implications for *when* one evaluates costs and effects (because non-linearities can lead to sudden changes in both) and *how* one carries out the evaluation (because one needs to document interactions and to track multiplier effects) (Shiell, 2006). However, understanding complex systems is not yet sufficiently advanced and so it is premature to be thinking about how one might better *apply* the methods of economic evaluation to interventions in complex systems. This is instead a topic for further methodological research by economists and health promotion practitioners alike (www.interventionresearch.ca). In the meantime, just as in cases when context acts as a giant effect modifier, it is essential that one document as much as one can about the context in which the intervention is being implemented in order to better understand its effect on program costs and outcomes. As practitioners implement a given intervention in a certain context, they will automatically alter and adapt it to fit the unique situations they encounter in the hopes of achieving similar results to similar interventions in other contexts. This will have implications for the costs of interventions in different contexts. In unpublished work with the Canadian Consortium for Health Promotion Research, it was proposed that certain interventions operating in “unorganized” communities with politically hostile conditions may identify success as being able to partner and build relationships between three organizations, whereas another partnership initiative in another community may identify success as the creation of several joint ventures engaging 10 organizations. The costs associated with the initiatives may be similar but the contexts and outcomes may be very different. Economic evaluation in this case will involve more than itemizing the context – it will need to understand the nature of the *interaction* between context, intervention and outcomes.

Summary discussion and conclusions

It has been argued that health promotion interventions will often be complex interventions because they are multi-level, multi-sectoral, and aimed at producing multiple outcomes. These features of good health promotion practice make their economic evaluation a little more difficult than would otherwise be the case. The scope of the evaluation increases as one has to decide what the best set

of comparators should be for an intervention that is itself made up of multiple components. Current methods of health-economic evaluation are not well-suited to interventions where there are important dimensions of effectiveness that are not improvements in health or where there are difficulties in measuring the improvements in health. The more agencies involved, the more difficult it becomes to track down every last aspect on the costing side. Indeed, with interventions that draw other agencies into the action, it can even be difficult to decide whether a particular cost or benefit ought to be ascribed to the intervention or whether it might have happened anyway.

Such features of health promotion complicate the economic evaluation, but the problems that one will face are no different in essence from those that would be experienced by anyone who sought to evaluate program effectiveness. That is, the special features of health promotion that serve to distinguish it from disease-prevention and clinical-care are not especially relevant to the economic evaluation alone.

If one were to single out one feature though that is important, it would be the effect that context has on the economic evaluation of health promotion, especially when the context is considered a complex system. Neighborhood communities, worksites, schools and other such settings are all examples of complex systems. It is possible (though by no means yet determined) that this will require a new approach to economic evaluation. The issue is largely an empirical one – that is, one needs to see whether or not it is the case that using methods of economic evaluation that have been developed for use with relatively simple clinical interventions do indeed distort the evaluation of health promotion. This is the focus of a new program of research into the economic evaluation of health promotion being carried out through the Population Health Intervention Research Centre at the University of Calgary and the International Collaboration on Complex Interventions (ICCI) (www.interventionresearch.ca).

Using The Results

5



The major purpose of the evaluation is to provide useful information for making decisions and every process that involves political and public decision-making involves communication. Communicating the results of the evaluation to decision-makers is as essential a part of the evaluation team's role as ensuring that the results of the evaluation and their analysis are correct.

This step will describe effective communication strategies, mechanisms and tools that can be used to design an effective communication strategy – one that will ensure that the different actors and stakeholders will make the greatest possible use of the information – as well as advocacy strategies to influence their decisions.

How is it done?

Communication should be viewed as a strategy within the evaluation process designed to ensure that the evaluation meets the criteria, expectations and needs of the decision-makers. This strategy uses techniques not only to facilitate decision-making based on results but also to foster understanding of what decisions must be taken, the reasoning process behind the decision-making, what information is most appropriate, and at what moment and in what type of presentation it should be communicated.

Instead of reducing communication to disseminating, handing over and possibly publishing the final report of the evaluation, the team must see it as a planned activity that demands the use of a variety of strategies and communication media.

Although there is no consensus about the way the results of an evaluation should be communicated, there are some steps that will definitely contribute to an organized and effective communication plan:

1/ Know who the decision makers are and what information about the evaluation they are interested in or need.

It is important to be clear exactly which decision makers have expectations for the evaluation and, more importantly, what these expectations are. It is necessary to research the interests of the decision-makers and the potential uses they may make of the evaluation, i.e., what decision do they hope to make or is it hoped they will make, when and in what context and what are their main concerns.

2/ Define communication and lobbying objectives based on the purpose of the evaluation, its potential uses, the types of decision makers that will be involved and their interests or needs.

Knowing in detail the uses decision-makers might make of the evaluation results, or the expectations they have of the evaluation, will help to set appropriate objectives for the communication process and ensure its efficacy.

However, knowing exactly with whom, what, and how one is communicating are not enough. The times and opportunities selected for communicating the results are also a decisive factor in bringing the information and the decision-making process together and in achieving the course of action recommended if the evaluation report is adopted. Generally, technical timing does not coincide with the timing of political decisions and it often comes too late.

Although decision-makers may just as well find themselves under pressure to make quick decisions as be faced with delays, it should be noted that they generally find it difficult to put off or suspend a task just for lack of the required information. Therefore, selecting the opportunity to present the results should be a key aspect of the design of the evaluation.

An economic evaluation in health promotion from the social perspective implies that there is potential interest in society for the evaluation. Although the decision-makers are the primary public, the beneficiaries of the intervention or the targeted group may also be users of the evaluation.

To select the proper communication mechanisms, it is necessary to consider, besides the objective of the evaluation, the type of question it seeks to answer and the expected use of the evaluation, especially if it was undertaken to support people who want to lobby for health promotion programs, as is often the case. The format, language and mechanism must be adapted to each audience, including society at large, and be usable for lobbying purposes. It is recommended that different formats be used for different target audiences. Two types of publications have traditionally been considered very useful for sharing the results of an evaluation in academic and political circles, namely scientific articles in indexed publications and technical reports. However, it is important to be careful about focusing on these as they easily turn into the only means of communication. Scientific articles have serious size restrictions that exclude the longer explanations and comments needed for decision-making. Scientific articles are designed to cover the generalities of a study and in many cases can be used for lobbying, but will not serve the purpose of decision makers. A technical report that is directed at decision makers must include all the comments, observations and clarifications the team considers important and details of the entire evaluation process.

On the other hand, it is essential that the evaluation results be presented in such a way as to inspire confidence in the decision-makers, so that the latter feel that there is very little risk involved in using these results as a basis for their decision. One tool that makes it easier to verify whether an economic evaluation was carried out properly is a checklist that gives an overview of the entire process. There are several good models available, including the one by Drummond and colleagues (1997) and some that can be found on the Internet, such as the checklists provided by the *British Medical Journal* and other specialized journals, which use them to index articles and assess the quality of the data obtained and the credibility of the evaluation (see Appendix 5).

The quality of an economic evaluation depends on the transparency of the results and the order in which it has been carried out. All of the steps should be completed in the right order and the sequence should match the description in this guide.

Definition of the Problem: The problem that is the justification for the economic evaluation must be clearly defined and the perspective and comparative options clearly outlined. The characteristics of the intervention in question and the comparative options with all their variations must also be described.

Data Collection: It is very important that decision-makers know the sources of the data and details about the quantities and characteristics of the data obtained. Though in some cases the privacy of the institution might have to be protected, it is necessary to clarify the collection process and how reliable the data are. A sensitivity analysis should also be done to determine whether changes in key variables would substantially affect the final results.

Analysis of the Results: In order to ensure that the results have been properly analyzed, each one of the indicators obtained must be clearly presented. The time horizon of the intervention, the discount value used, the variables submitted to a sensitivity analysis, the results of said analysis, and the economic evaluation value (e.g., cost-benefit ratio) must also be clearly identified.

To deal with the issue of uncertainty, it is important to identify the variables used for the sensitivity analysis, as well as the reasons for selecting them, pointing out which variables have the greatest effect on the results and whether the analysis shows that the evaluation results will hold true over time. The sensitivity analysis should give the decision makers information about the level of uncertainty they face when selecting a particular option.

Finally, the decision options should be clear. Although the economic evaluation may not produce conclusive results, it should provide decision-makers with adequate tools and criteria for making a decision.

The General Report

The presentation of the analysis should be clear and assist in replicating the calculations if necessary. This requires:

- Explaining the models and assumptions used
- Presenting detailed results
- Clearly presenting the statistical and sensitivity analyses
- Presenting all the limitations of the analysis in a clear manner
- Explaining how the results can contribute to the decision-making
- Explaining the equity assumptions used and any other considerations concerning the distribution of benefits.

Evaluation and decisions

The experience of some countries has shown that certain elements allow or help decision-makers to use the results of the evaluation and research.

It helps to establish a relationship between the problems of individuals and the solutions (write the results of the intervention as a story that shows the effects that the intervention has on the life of the beneficiaries or incorporate personal stories into the evaluation results to demonstrate the effectiveness of the intervention).

It is useful to prepare a report in a format that is easy and interesting for groups, communities and organizations desiring to use the information to lobby for processes they initiated.

It is important to involve the decision-makers in the evaluation process from the outset (as was suggested in this guide), since seeing their interests reflected in the evaluation question will make them feel more motivated and committed to using its results.

It is recommended to report the results in several formats – a very short executive summary for the most important decision level (generally these are very busy people); a very detailed and rigorous technical report addressed to the professional advisors of the decision makers, academic groups and other evaluation teams interested in knowing the details of the evaluation and assessing the quality and reliability of the results; and a simple version to present the results to the community where the intervention took place, to the professionals who participated and to the public in general. Preparing material for conferences and presentations in electronic or recorded format can also be very useful.

Make sure that the conclusions relate to the political agenda of the day in order to influence it. This can be very difficult in public health and health promotion since the central focus of the evaluation is often not a political priority or popular with large sectors of society (for example: No smoking in public places or regulations for the food industry, etc.).

The evaluation team should not have too many expectations with regard to the use decision makers might make of the evaluation results. There is evidence that the percentage of evaluations used to make decisions is rather low.

Politicians and other decision-makers may wish that the evaluation team publicly back up their decision. This may be difficult for some academic groups who want to maintain their image of objectivity and political independence.

Economic evaluations that compare interventions of a different nature have been known to be very helpful, as they are able to show, for example, that investing in an intervention aimed at reducing tobacco consumption might be more effective in saving lives than improving a dangerous stretch of highway.

Finally, it is essential to present a good quality report of an economic evaluation, since decision makers generally have advisors who know the issue and who are able to assess the reliability of the results and the value of the study.

Special features for health promotion

For any situation, the policy-makers and decision-makers have a different way of defining the problem and the solution than the economist and the health promoter. The issue, then, is to create the conditions for dialogue between all players. What is the best way to have a discussion with others when values, problem definition and potential solutions may be different? One key is to be involved in dialogue with all players from the beginning of the economic evaluation process so that it is anticipated that there will be different options presented for discussion. Secondly, health promoters and economists have to figure out how to present a succinct and clear set of options for discussion even though a large volume of results and calculations exist. This will be especially true when there is more than one comparator or when there are uncertainties around many of the values and the sensitivity analysis is voluminous. Several suggestions have been made in this guide for keeping the presentation of information manageable.

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Appendixes



APPENDIX 1 Glossary

Contingent valuation: this is a method for assigning monetary values to the benefits of health promoting interventions so that cost-benefit analysis can be carried out. The two main approaches to contingent valuation are the *willingness to pay* approach and *discrete choice experimentation*. In the former, monetary values are elicited directly by asking people how much they would pay to secure the benefits of the intervention. In the latter, people are presented with a series of paired scenarios each describing a different configuration of the service being evaluated and asked to indicate which they prefer. If cost of the service is included as one of the attributes, then willingness to pay values can be estimated statistically from the responses.

Cost-benefit analysis: is a form of *economic evaluation* in which *all* significant outcomes are valued in monetary terms to make them commensurate with costs. The term is often used erroneously to refer to evaluation where *only* the monetary effects are measured.

Cost-effectiveness analysis: is a form of *economic evaluation* in which the benefits of the options being compared are measured in naturally occurring units such as life-years saved or cases prevented.

Cost-utility analysis: is a form of *economic evaluation* in which the health outcomes are expressed as a single index such as *quality-adjusted life-years*.

Discounting: refers to the adjustment of costs and benefits that occur at different points in time, so that they may be compared as if they had all occurred in the same time period. This is important given the common assertion that peo-

ple prefer to defer costs to the future and enjoy benefits today (time preference). The *discount rate* describes the rate at which future costs and benefits are discounted. The higher the rate the more the value of future costs and benefits are reduced.

Economic efficiency: refers to the relationship between what goes into an intervention (the resources or costs) and what comes out (the benefits or outcomes). **Technical efficiency** is concerned with doing something well, without waste that is. **Allocative efficiency** is concerned with doing the right thing.

Equity: this is concerned with fairness in the way that the costs or benefits of an intervention are distributed. That is, it matters who pays the costs and who benefits from the intervention. We can distinguish **horizontal equity** from **vertical equity**. Horizontal equity refers to the fair treatment of people who are equal (e.g., equal allocation of resources between geographic locations). Vertical equity refers to the fair treatment of people who are unequal (e.g., making sure any extra allocation of resources to people who are socially deprived is sufficient to compensate them for their greater needs).

Economic evaluation: this is the comparative assessment of interventions to improve health in terms of both their costs and their benefits. The different forms of economic evaluation (**cost-benefit analysis**, cost-consequence analysis, **cost-effectiveness analysis**, cost-minimization analysis, and **cost-utility analysis**) all share the same framework. Each evaluates cost in the same way but they differ from each other in the way that the outcomes or benefits of the interventions are included in the evaluation. This affects the types of questions that each technique can answer.

Health utility assessment: refers to the processes used to elicit the preferences that people have over different dimensions of quality of life so that **quality-adjusted life-years** can be derived. The two most popular methods are the **standard gamble** technique and the **time trade-off** technique.

Incremental cost: refers to the difference in costs between the intervention and its comparator.

Incremental cost-effectiveness ratio: this is the difference in effectiveness between the intervention and the comparator divided by the difference in costs.

Marginal cost: this refers to the change in costs as the scale of an intervention is increased. For example if it costs \$1,000 to vaccinate 100 children and \$1,050 to vaccinate 110 children, then the marginal cost of the additional vaccinations is only \$5 per child. The concept is often confused with **incremental cost**.

Opportunity cost: this is a fundamental concept in economics. It refers to what must be given up in order to do something. The opportunity cost of a health promoting intervention is equal in value to the most highly valued alternative course of action that is forgone.

Quality-adjusted life-year: this is a summary measure of health gain that combines increases in life expectancy with an assessment of the quality of those extra life-years. It is the outcome measure most commonly used in cost-utility analysis. The advantage of this approach is the ability it provides to compare effectiveness across interventions that would otherwise be incomparable because of the different dimensions of health that each affects.

Realistic evaluation: this approach to evaluation asks what it is about an intervention that makes it work and why it works for some people in some circumstances and not others. It is a process of uncovering the underlying theory that connects the context of an intervention, the intervention “mechanism” and the outcomes. This approach tries to account for the dynamics of social phenomena and develop micro-theories as better explanations of how and why the observed changes take place when a given intervention is implemented in a certain context. (Pawson and Tilley, 1997)

Sensitivity analysis: refers to the process of reworking the estimate of economic efficiency after substituting high and low values for many of the variables in the evaluation. The idea here is to push the estimation as far as one can to see just how robust are the conclusions to critical values of key assumptions. Thus, one might use the recommended discount rate of 3% in the base case, but rework the evaluation using values of 0% and 10% to see how sensitive the results are to different assumptions about the best discount rate to use.

Standard Gamble: This is one of a number of methods that can be used to elicit the value that people place on different dimensions of health (mobility versus being pain-free for example). The respondent is presented with a series of choices, where the options are either to remain in a particular state of (ill-) health (for example, being in moderate pain that limits one’s ability to work) for a certain period of time or a risky option in which with given probabilities the outcomes are either full health or death. The probability of full health is adjusted according to the preferences of the respondent until he or she is unable to decide which of the two options is best. At this point, the probability provides an indication of the value of the specified health state relative to full health.

Systematization (Systematic documentation of and reflection upon experiences and projects): Systematization has been defined as an intentional effort to understand and transform practice. It means understanding what was done and how it was carried out, recognizing different stages of the process, the determining factors and why they occurred, the reason the experience or practice was carried out in one particular way and not in another, which changes occurred and if these changes were expected in the process of transformation (Rodríguez and co-workers, 1999). Also, systematization has been defined as “the process that leads to conceptual and formative learning based on the critical interpretation of what is lived; interpretation that is achieved by linking the objective and subjective visions of those who participated directly or indirectly in the experience, the immediate processes with their respective contexts, the practice with the theoretical assumptions that inspired it and the relationships between genders”. (Rodríguez, 1999).

Time trade-off: As with the standard gamble technique, this is also a method that can be used to elicit the value that people place on different dimensions of health (mobility versus being pain-free, for example). The respondent is presented with a series of choices in which the options are either to live for a specified period of time in a given health state (for example living twenty years in moderate pain that limits one’s ability to work) versus a shorter period of time in full health. The number of years in full health is adjusted according to the preferences of the respondent until he or she is unable to say which of the two options is best. At this point, the years in full health, expressed as a fraction of the years in the specified health state, provides an indication of the value of that state.

APPENDIX 2 Evaluation of health promotion interventions

Introduction

Effectiveness evaluation in health promotion represents not only a means for strengthening health promotion theory and practice but also a technical and political challenge around how to support decisions to improve the health and wellbeing of the population. The debates on the topic, the written literature, the efforts made to evaluate its effectiveness and the new approaches that account for methodological and ethical challenges, show the growing importance of health promotion in the last decades (Speller, 1997; McQueen, 2000; McDonald, Veen and Tones, 1996; WHO, 2001)^{i ii iii iv}.

Well controlled efficacy studies have an important place in determining causation and evidence; the problem is that the current evidence base and evaluation schemes consist almost entirely of such research with very little “effectiveness” research that attempts to study programs under typical, rather than optimal or controlled conditions^v.

The systematic review regarding *Evidence of Effectiveness in Health Promotion in Latin America* (de Salazar, Vélez and Ortiz; 2003)^{vi} developed within the framework of a project promoted by the International Union of Health Promotion and Education (IUHPE^{vii}), showed that evaluation in the Latin American region has been characterized by a lack of relevance of the questions to be answered and the weakness of its designs. In addition, evaluation in Health Promotion has responded more to academic interests than to the felt needs of decision-makers and those responsible for program management and resource allocation. This could explain, partly, why many of the results of these evaluations, even those with excellent designs, are not usually considered when decisions are made.

Therefore, a reconsideration of key aspects to evaluate effectiveness in health promotion is required, addressing issues such as: (a) what counts as evidence in what context, (b) what evaluation designs address the complex nature of health promotion interventions, (c) how can the results of an evaluation in one context be extrapolated to another, (d) what evaluation designs are most relevant to decision-makers.

The intention of this section, more than to describe the different evaluation designs, is to address issues related to the main challenges faced when conducting effectiveness evaluation in health promotion as well as when selecting a specific design. It is hoped that the reflection about these topics will contribute to the construction of methodological proposals that fulfill the expectations of planners, implementers, researchers and decision-makers.

Key issues around effectiveness evaluation in health promotion

Considering what has been said about health promotion interventions and their effectiveness, the most relevant issues and questions around evaluative approaches and utility in decision-making follow.

1. What counts as evidence, when, for whom, and in what context?

Evidence according to Rychetnik (2004)^{viii}, is defined as “facts or testimony in support of a conclusion, statement or belief” and “something serving as proof”. It is based on the premise that evaluations determine whether anticipated intervention effects occur in practice, and identify unanticipated effects.

Evidence has been considered to be a result of both quantitative and qualitative research approaches. For McQueen (2000), evidence is often restricted to quantitative facts derived from large samples and randomized experimental designs, but this does not capture the inherent complexity of health promotion. Irena Madjar and Jo Ann Walton (2001)^{ix} on the other hand, advocate for a broad notion of evidence, including qualitative research, where lived experiences (via case histories and stories) enhance the understanding of human behavior, promote holistic thinking, and offer contextual data. Responsive evaluation is seen by Guba et al (Guba & Lincoln, 1989; Stake, 1975; Stake & Abma, 2005),^{x xi xii xiii} as an orientation to evaluation that generates qualitative evidence about the effectiveness of programs.

According to WHO, evidence is context sensitive^{xiv}, and policies and decisions should be informed by good evidence that is contextualized. This implies that “evidence is plural and that the implementability of good global evidence must be triangulated with local knowledge.” This issue raises other types of concerns: (a) How standardized, useful and generalizable should evidence of effectiveness in health promotion be expected to be? (b) Should the definition of evidence be flexible and be adjusted according to the type of inquiry or to the context where decisions will be made? (c) How can the definition of evidence suit the judgment of effectiveness of complex social interventions and the demands for information by decision-makers?

Evidence for what and for whom?: The political and ethical side of evaluation of effectiveness has been raised by Ray et al,^{xv} bringing the question – who determines what counts as evidence, the right indicators and appropriate standards in evaluation research of health programs? The other concern is how different stakeholders can reach agreement about criteria to establish effectiveness of an intervention that benefits each of them in different ways. It is well known that there are large differences about the way effectiveness is measured among those implementing the intervention, the financial supporters, and the public and decision-makers.

2. How can evaluation designs account for the complex nature of health promotion interventions?

When evaluation is defined as “a process that attempts to determine as systematically and objectively as possible the relevance, effectiveness, and impact of activities in the light of their objectives,”^{xvi} it is not addressing the interactions between context, process and outcomes. Most of the evaluation approaches in health promotion do not address the complexity of these types of interventions, and on the contrary, evaluators simplify the interventions, adjusting them to fit and respond to established quantitative research criteria. By doing so, they distort the reality as well as the utility of the results.

Given that health promotion interventions have been considered as a combination of capacity-building, community action and political processes geared to results which improve or maintain health, their evaluations should be centered as much on the evolution and effectiveness of this

process, as on its effects on the health and well-being of populations. The study of the process, besides offering information for re-orientating the programs and interventions, becomes the most important input to understand and to explain findings and to define requisites to make the interventions work. The challenge is to account for the dynamics of social phenomena and develop explanations of how and why the observed changes take place when a given intervention is implemented in a certain context.

Thus, although there are two major dimensions of effectiveness in the evaluation of health promotion interventions – one focused on impact and outcomes, and the other on the process to improve the capacity of people, institutions, and governments to act, the context and complexity of the intervention also need to be taken into account. Rychetnik (2004) argues that hypothesis testing is not the objective of evaluation research, and efforts should be made to identify the interaction between studied variables (risk factors and conditions influencing interventions and their effects). Thus one important variable to be included in effectiveness evaluation is the process by which the initiative was capable of achieving its objectives or producing effects in the short, medium, and long term (Rootman, et al., 2001)^{xvii}

Given the political and managerial nature of the evaluation, it should respond to the information needs of several audiences (be inclusive and participatory); be focused on utilization of results; be a product of successive conceptual, methodological and complementary approaches; allow the participation of different audiences in the different stages of the evaluation process; and be socially responsible, allowing dissemination and advocacy so findings are utilized.

3. How can the results of an evaluation in one context be extrapolated to another?

There are concerns about the fidelity with which intervention protocols developed in one context are translated into practice in another. There is merit to this concern, as there is likely some level beyond which modification and adaptations to a protocol results in a program that no longer resembles the original evidence base protocol and may not be effective.

One of the challenges often found when selecting the design to evaluate effectiveness in Health Promotion is the trade-off between internal and external validity. Also contradictions exist among the quantitative designs traditionally used to measure effectiveness and the premises that guide the evaluation of interventions in Health Promotion.

The context and its influence on both the implementation and results of the intervention; the extrapolation of results (replicability); the trade off between internal and external validity; and the conflict between health promotion principles and values and the criteria to rank evidence, are among the issues to be considered when the intention is to extrapolate the results to wider or different populations.

According to what was said above, one of the key aspects to keep in mind when evaluating multi-purpose and multi-component interventions, like health promotion, is the context in which they are implemented and their changing nature. The context affects the successful implementation of the intervention as well as the evaluation of a health promotion intervention. Evaluation studies have been oriented and ranked by epidemiological designs that emphasize precision, validity (internal) and relevance, using quantitative methods. External validity has not been subject to scrutiny

despite the fact that the results of these studies are extrapolated to wider populations in different scenarios. This fact has been recognized by Riegelman R, Verme D, Rochon J, El-Mohandes A. (2002)^{xviii} who argues that no effort has been made to predict the impact of multiple interventions in populations where conditions differ from the original study population.

An appropriate evaluation produces information on the effectiveness of interventions under real situations, without ignoring the utility of the etiological research obtained in controlled situations which is necessary to support the efficacy of the intervention evaluated and to test hypotheses.

4. What evaluation designs are most relevant to decision-makers?

For evaluation to contribute to the efficient allocation of resources, the results have to be available when decisions need to be made. It has been recognized that scientific evidence is merely one among other criteria for setting priorities, given the fact that government decisions about social interventions respond to market (client-financier) and political/ideological motives (Carvalho A., Bodstein R., Hartz Z., Matida A. 2004).

Pawson (2002a)^{xix} indicates that the results of evaluations with managerial purposes are used to assign and reorient resources for current and future interventions. If this is the case, only when decision-makers' points of view are considered in the selection of the evaluation criteria is it more likely that the results will be applied to their decisions. The evaluation should be incorporated into the managerial process so the results can be converted into action. In that sense, the evaluation doesn't conclude with a report; it completes its cycle when the results are considered in the decisions to improve the program or to decide about its completion or extension.

Given these issues around evaluating health promotion interventions, the following section describes the key designs for effectiveness evaluation in health promotion.

Key designs in effectiveness evaluation in health promotion

1. Framing the problem for the evaluation/scope/purpose

Before engaging in an evaluation, it is mandatory to define in practical terms which intervention is going to be evaluated, the scope of the evaluation and its purpose. This is not a straightforward task due to differences in interests and information needs of the stakeholders (practitioners, decision makers, funders, clients, and society as a whole).

Rychetnik (2004) states that “problem framing is how different people define, present, and examine a specific problem. How a problem is framed determines the research questions that are asked, and the type of evidence that becomes available as a consequence.” Also she recognized that “frames are often tied to disciplinary perspectives, ideologies, or particular historical or political contexts.” The issue here is how to assure a high level of participation by those who should be involved in the definition of the problem and research question, and how to discover their interests, ideologies and real intentions to support an evaluation.

Answering questions such as what one wants to know, what information one hopes to obtain with the evaluation, for what reason one evaluates, what one do with the results, and who requires the

evaluation, will be of great utility in defining the most appropriate design in evaluation. It is probable that there are differences between what those implementing the intervention want to know and what the financial supporters interested in extending it or repeating it need to know. The implementers could be more interested in the performance of a program and in understanding the factors that influence the implementation in order to introduce adjustments, whereas the financial supporters and decision-makers may perhaps be more interested in knowing the results and which groups benefit in connection with the investment.

For those who implement the program it will not be enough – and it is rather counterproductive – to wait until the end of the intervention to evaluate the results, so intermediate results and qualitative data constitute a good input for decisions regarding the program orientation. For the financial supporters and planners, perhaps the intermediate results, qualitative data and perceptions centered on the political process do not constitute evidence of success and, therefore, this information is insufficient to support their decisions.

2. Evaluating Outcomes/Indicators

Effectiveness evaluation in health promotion includes at least two categories of outcomes: first the *capacity of society* to change health conditions and socio-environmental determinants of health; and second, the *impact and effects* of these changes on *population health*.

The first category responds more to the questions of “How” and “Why” things happened and focus more on the process to create this capacity. Aspects related to life cycle of the intervention, strengths and limitations influencing the process, inter-sectoral collaboration, partnership formation, community engagement, social cohesion, degree of social participation in decision-making, balance of power relationships, relationships between actors, issues around sustainability, the context that favored the changes, and the intervention’s performance could all be the foci of this kind of evaluation. It is this capacity to act that can lead to unexpected, long-term impacts such as a change in community values or creation of a new policy or a political change.

The second category of evaluation outcomes refers to the impact and effects of the intervention according to defined objectives. There is interest in knowing if the intervention worked, and if it was able to accomplish the objectives for which it was created. It responds to the questions: what changes, how much change, and whether those changes are due to the intervention. These outcomes can be measured by indicators of the results obtained immediately, over the intermediate term or over the long term, guided by an intervention logic model. Such a model looks at changes in mortality, morbidity, behavioral risk factors, equity, employment, income, etc. (essentially changes in health status and social determinants of health).

Although the two studied categories respond to different interests and purposes, they are complementary and allow the assessment of effectiveness to go beyond analysis of statistical significance.

Given that health promotion deals with a wide range of outcomes including changes in behaviors and social determinants of health, as well as principles and values (such as equity), the selection of indicators should consider the synergy of multiple strategies to address a single issue, the momentum of the intervention, the socio-political and cultural context in which the evaluation is going to be conducted, and the intention to use the evaluation results (type of decisions to be made).

There are many lists of possible indicators that suit different kinds of objectives in different settings (see PAHO's Guide to Participatory Evaluation of Healthy Municipalities, Cities and Communities).

Indicators can be developed based on the operational definition of effectiveness or a logic model that establishes the connections between objectives, activities and intermediate and final outcomes. Each type of indicator will use different but complementary evaluation approaches, data collection and methods. It is important to note that depending on the level of research that has been conducted on the studied variables, there may be more or less robust connections between intermediate and final outcomes and more or less understanding about the implementation processes. The consequences of health promotion interventions extend well beyond the initial objectives and outcomes by building infrastructure and community experience to intervene and address social problems.

3. Trade-offs between Scientific Evidence and Evidence for Decision-making

It has been recognized (Dowie 2001) that evaluation for scientific purposes is fundamentally different from evaluation for decision-making. The standards for deciding whether something is true are quite different from those appropriate for choosing between alternative actions. Consideration of the context in which the evaluation recommendations are to be implemented (and the implications of that implementation) inevitably raises questions of interpretation that do not emerge when summaries of evidence are considered in isolation. This can lead to disagreement about recommendations, poor compliance with guidelines even when they are evidence based, or conflicting guidelines on the same topic from different organizations.

In addition, the criteria to judge quality of evidence in scientific research are not necessarily the best to produce precise, valid, relevant and useful information for decision making in health promotion interventions. (WHO, 2001; Susser, 1994)^{xx} It will be then necessary to balance the hierarchy of evidence quality with the feasibility of achieving it and the political viability of using the results.

Evaluators face conflicting situations when they have to decide about the appropriate evaluation design to produce valid, useful, timely, and relevant information regarding the effectiveness of an intervention. Different factors introduce complexity to the decision. Among them are the trade offs between the desired criteria of precision and accuracy of the information and ethical principles; evidence of effectiveness versus evidence of social profitability; conflicting interests and expectations between decision-makers, implementers, researchers and community leaders, and the fact that the most reliable designs are not necessarily the most appropriate for health promotion interventions.

The International Union for Health Promotion and Education (IUHPE), PAHO and other parties have recognized that there is no unique method to evaluate effectiveness in health promotion (IUHPE, 1999). Evidence of effectiveness in health promotion can be gathered from epidemiological, behavioral, social and other research that describe the existence of reasonable relationships between the short term results of the interventions and longer term impacts on individuals, populations and determinants of health.

Other aspects influencing study design are the availability of technical and financial resources, reliable sources of information, the requirements of the financial supporters and planners, the degree

of answerability of the research questions, and the decisions that will be made with the results of the evaluation.

The evaluation process is composed of a series of independent but complementary interrelated activities that try to respond to different questions in order to build a progressive hierarchy of evidence. To be viable, the evaluation has to incorporate in its design efficient and reliable ways to obtain information, making use of the existing sources and creating new options to respond to complexity. The study results could be complemented with data from different sources, such as surveillance systems, vital statistics, official socioeconomic data, stories and reports, progress reports of community projects, monitoring and evaluation reports, epidemiological and social observations, among others.

4. Evaluation designs in health promotion

The evaluation designs in Health Promotion have to be innovative to address the difficulty of establishing causal relationships in interdisciplinary, multi-focus and complex interventions. The methodological designs should vary according to the questions that have to be answered, but evidence of effectiveness should be considered as part of continuous measurements that consider the theoretical foundation of the intervention, the process to implement it, the impact and results, and the social context in which the intervention is developed.

The criteria to establish causal associations are well established, most of them being related to the study design, source and quality of the data, representativeness of the study sample, selection of control groups, the precision and reliability of measurement instruments, the quantification of the magnitude of the association, the control of confounding by the associations, among others. However, aspects associated with the complexity of the intervention being evaluated are absent or have not received enough attention.

There is recognition that evaluation in health promotion should incorporate contextual or multi-level analyses and theoretical models of disease causation that extend across levels and explain how group-level and individual-level variables interact. Ignoring the role of group or macro-level variables may lead to an incomplete understanding of the determinants of health.^{xxi}

The absence of practical instruments for measuring behavior change has been recognized^{xxii} – as well as the fact that no one model or method should be relied upon during the evaluation activity. Rather, an approach that triangulates the outputs from a number of models should be employed to achieve robust evaluation of competing designs^{xxiii}.

In health promotion, we need study designs that not only are able to identify and measure health and social changes, but that also uncover and help to understand the dynamic relationships between contexts and results, interactions between study dimensions, factors influencing implementation, dynamics of change and outcomes from the perspectives of the implementers and the clients, among others. Any evaluation design in Health Promotion should be flexible, adaptive, useful, and practical. The evaluation is recognized as a systematic process that breaks down its constituent elements for observation, description, relationship and valuation effects, but it integrates them in the analysis. In this section, a brief description of a couple of available designs and methods is made, highlighting their contribution to assess and understand health promotion achievements in the real world.

“Systematization” (or the systematic documentation of and reflection on experiences and projects) and other qualitative designs

If the changing nature of health promotion interventions is recognized, then the evaluation design should take this change into account, and more importantly, make explicit the reasons for it. This is achieved if there is a permanent process of documentation and reflection on the experience. The ‘systematization’ approach^{xxiv} and ‘realistic evaluation’ approach^{xxv}, among other qualitative designs, are examples of this type of study.

‘Systematization’ has been seen as a powerful tool to understand social phenomenon.^{xxvi xxvii xxviii} It has been defined as a systematic, permanent and technical exercise to uncover changes in the protocol design, in the implementation of the interventions and benefits for different groups. (Eizaguirre et al, 2004; Francke and Morgan, 1995; Gobierno de Chile, 2004) ‘Systematization’ provides information to understand the process and the evolution of the intervention and more importantly, makes explicit the factors influencing the changes, in order to define clearly what the intervention means in practice. It catches the perceptions, interests, contributions and ideas of partners, stakeholders, staff and clients involved in the intervention, using a participatory process, and provides information to understand and give meaning to statistical associations.

The methods to document and systematize the interventions are highly participative and incorporate the production of knowledge by different stakeholders and beneficiaries, including lay people. Lay knowledge can be difficult to access and synthesize, and a focus on quantitative forms of evidence can lead decision makers to undervalue the lay knowledge that is derived from narratives and stories (Rychetnik, 2004). Finally, ‘systematization’ helps to avoid type 3 errors when evaluating an intervention that has not been implemented appropriately.

The ‘realistic evaluation’ approach tries to account for the dynamics of social phenomena and develop micro-theories as better explanations of how and why the observed changes take place when a given intervention is implemented in a certain context. It explores the dynamic relationships between the context, the intervention (or mechanism) and the outcomes across a series of instances where the same kind of intervention is implemented in different contexts^{xxix}. The measures may be qualitative or quantitative and all aspects of the context, intervention process and outcomes need to be documented. According to Pawson (2002), “realist evaluation fundamentally targets the mechanisms sustaining programs with greater complexity in their respective contexts.”

Ecological designs

Ecological studies consist of cross-sectional surveys whose unit of analysis is populations or groups. These studies relate the frequency of certain population characteristics with the results of an intervention by geographical areas. The studied individuals are not seen as individual organisms but as members of communities in a social and geographical context (Jekel, Elmore and Katz; 1966).^{xxx}

Kelsey, Thompson and Evans (1986)^{xxxi} pointed out that the ecological study is more appropriate in cases where there is interest in widespread social and cultural processes. It has been suggested that the main justification for the ecological approach is to study health in an environmental context, looking at health of a group or community beyond the health of their individual members (Susser, 1994).

Ecological studies are often used for health planning, although in some cases they can be used in an etiological investigation, mainly to investigate disease risk factors that have long duration and that are not very common (Kelsey, Thompson and Evans; 1986). According to Jekel, Elmore and Katz (1966), repeated surveys can be used to determine changes in risk factors, and changes in illness frequency in populations over time. These studies may also allow the measurement of multiple effects of a single intervention and can be used to calculate population attributable risk, which is one of the most important association measures in public health to estimate the change in the quantity of risk that is attributable to the intervention.

Two aspects will contribute to improve the quality of evidence when these types of studies are used to evaluate the effectiveness of health promotion interventions: first, several measurements could be used over time to identify tendencies (e.g. information from surveillance systems); and second, methods could be established for systematically monitoring the implementation of the intervention to account for the factors influencing both the implementation and the outcomes.

With the execution of the two previous requirements, it would be possible to capture and to qualify the process of implementation of the intervention, and also to measure the frequency and magnitude of the changes, responding to the main obstacles of the cross-sectional studies (their inability to determine associations between intervention and results, ignoring whether the intervention precedes the effect, and the difficulty of controlling potential confounding factors).

As suggested above, the association between intervention results and effects should be explained not only through the strength of the statistical associations, but also be reinforced through logical and commendable associations identified by the systematization of the experience.

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APPENDIX 3 Case Study 1/ The Economic Evaluation of Adolescent Behavior Risk Factors Surveillance System (Sivea)

Background to the case study

Schools make excellent settings for the delivery and strengthening of health promotion programs. In Colombia, the “healthy-school” health promotion strategy is supposed to be implemented in all of the schools in the country, with the support of national and regional governments. The healthy-school strategy seeks to address the health problems of schoolchildren through the participation of different sectors, institutions and social organizations interested in this objective (República de Colombia, 1998). However, implementation is not going according to plan. In part, this is because the education sector has not taken ownership of the strategy, believing that healthy schools was a responsibility of the health sector only (CEDETES, 2003). Progress is further hampered by the lack of information to monitor, evaluate, develop action plans, and support decisions concerning the main problems of the school-age of population.

In response to these problems, the health secretariat and CEDETES, with the support of the National Institute for Science and Technology, COLCIENCIAS, started a project aimed to change risks factors affecting school-children and to enhance the healthy school strategy by applying a behavioral risk factor surveillance system, called SIVEA.

SIVEA is a school-based system designed to produce, analyze, interpret and use information about behavioral risk factors affecting the health of school-aged children. The SIVEA system links surveillance data to health promotion actions using the prevalence of risk factors as entry points to monitor, evaluate and plan interventions. “School-based” means that the system is implemented and data are produced and used by the school population. This is the main feature that distinguishes SIVEA from other public health interventions with the same aim.

The SIVEA initiative fits into the Healthy School Strategy. In addition to addressing risk factors associated with the health problems experienced by school-aged children, the SIVEA initiative has three aims: (1) to create capacity within the schools to affect the behavior of adolescents and encourage them to adopt healthy habits, (2) to help schools create and maintain psychosocial environments that are conducive to the harmonious development of the school community, and (3) to aid in the development of institutional and municipal interventions aimed at impacting health determinants and public policy by organizing inter-sectoral activities.

The goals of SIVEA are to: (i) detect risk factors affecting the health of the school population; (ii) provide guidelines for policies and interventions; (iii) empower the school community (students, teachers and parents) to intervene on risk factors affecting their health and welfare; (iv) monitor and evaluate programs, improving the relevance and quality of health interventions, and promoting inter-sectoral planning and coordination; (v) promote strategic alliances around health and quality of life; and (vi) support the creation and reinforcement of social networks.

The effectiveness of SIVEA was subsequently evaluated twice, the first time after implementation of the system in the municipality of Cali, covering four schools and 1,500 children (CEDETES, 1999), and second, in the municipality of “La Cumbre” using a before and after design, looking at trends of behavioral risk factors (CEDETES, 2004). Two types of indicators were used in these evaluations, intermediate and final indicators. The first refers to the capacity building process and the second to trends in percentage of changes in risk factors. In both evaluations, the SIVEA showed good achievements (de Salazar, 2005).

The economic component was added to the evaluation of SIVEA. The retrospective nature of the economic evaluation has meant that a comparison had to be fashioned out of whatever data were readily available and several compromises had to be made as a result. Below is a report on the economic evaluation, which illustrates the ‘real-life’ use of the techniques, described in this Guide.

Step 1: The decision context and analytic perspective

The municipality of La Cumbre is located in the southern part of the Valle del Cauca and has a population of 10,934, of which around 2,161 (20%) are school-aged children. One third of the town’s population (3,111 people) has unsatisfied basic needs and nearly 40% of the population (4,134 people) relies on subsidized health insurance.

The Office of the Mayor has executive power. Together with the health, education and planning authorities, the Mayor makes decisions but these must be approved by the Town Council, which holds legislative power. The town’s resources are very limited and serious fiscal problems have limited public investment and led to the challenge of finding non-governmental financing for social programs.

According to new national legislation, schools in the region had to reorganize into clusters of around 5 to 10 schools called “Educative Institutions.” The municipal and state governments also wanted to improve the performance of each school and for that reason gave financial support for the implementation of SIVEA. Teachers were also supportive of the initiative since they were aware of the contribution it could make to their work and the school community in general. A successful demonstration of the “healthy school” strategy was seen as a good way to gain more support from the local authorities and central government, and to increase the awareness of the community about the health risks faced by its children.

The economic evaluation addressed the needs of decision-makers in the institutions and bodies with the technical and political power to decide whether the SIVEA intervention should be continued and whether it should be expanded to include other schools in the town, region and country. The results of the evaluation was also of interest to the school community of La Cumbre – parents, teachers and students – and to other actors in the health, education, recreation, culture and administrative sectors or any other sectors with influence over circumstances that affected the quality of life of the adolescent population. The perspective adopted for this economic evaluation was that of the public sector which has to support the Healthy School Strategy.

The target population for the SIVEA intervention was adolescents in grades 6 to 11 in the Simon Bolivar School and the education community (teachers and parents) in the urban area of La

Cumbre-Valle. The Simon Bolivar School had approximately 40% of the school population in La Cumbre. It had 1,322 students on seven campuses, of which four were in urban areas and three in rural areas. In Grades 6, 7 and 8, there were 308 young people, the majority of whom (292) belonged to the lowest social classes. Of this group, 60% lived in rural areas. The school had 52 teachers, of which 70% had degrees in education and the rest were technicians or professionals interested in the field of education. Approximately 30% of the teachers were between 25 and 35 years of age. Most of the others were aged between 35 and 45 years, with very few teachers being older than 45. Length of time employed at the school ranged from one to nine years. Sixty per cent of the teachers were women.

Step 2: The questions to be addressed

The effectiveness of SIVEA both in terms of promoting capacity in the school and in changing behavioral risk factors had already been demonstrated (de Salazar, 2005). However, decision makers and teachers were still concerned with how much they would have to invest to improve the achievements of the Healthy School Strategy using SIVEA. The economic evaluation set out to estimate the costs of the SIVEA Strategy, and to combine this with effectiveness data so that policy makers could decide whether or not the gains that were made justified the additional investment.

The question being addressed therefore was: Does SIVEA improve the achievements of the Healthy School Strategy enough to justify the additional costs associated with its implementation?

Step 3: The options that were being considered

Two options were to be compared: the Healthy Schools approach plus SIVEA versus the Healthy Schools approach without SIVEA. SIVEA was implemented in only one school in the municipality of La Cumbre (Simon Bolivar). Note, because this was a retrospective evaluation there was no formal control group. Instead, an estimate was made of what would have happened in the Simon Bolivar School had it only implemented the Healthy Schools Strategy without SIVEA. Information was taken from a variety of sources, none of which was entirely satisfactory. This included a before-and-after assessment of the changes in risk-behaviors of students in the Simon Bolivar School, plus an aggregate estimate of the resources required to implement the Healthy Schools approach in all schools in the region.

The intervention: Healthy Schools approach, plus SIVEA

SIVEA is essentially a surveillance system, the key characteristic of which is its link to health promotion programs and the participation of the school community in the production and use of information. In this way, the surveillance system can contribute to social change. The implementation of SIVEA consisted of two phases. The first phase included educational and motivational activities to create capacity in the school community to collect, process, analyze and interpret data, and disseminate the results as a permanent process. The second phase considered how to use the information. This included advocacy activities and the participatory planning and implementation of projects to reduce risk factors and guide public policy. The intervention was an iterative one and the two phases followed each other in cycles with in-between phases for evaluation.

The comparator: Healthy Schools approach without SIVEA

The implementation of the basic Healthy School Strategy in “La Cumbre” consisted of a package of activities geared to converting the school into a friendly place where children could make better use of their free time and practice a healthy life style. They held a one-week session to plan activities such as healthy holidays, countryside visits, and other activities to enjoy their free time. All the activities were supported by a teacher-coordinator who was assigned by the school principal and paid using school resources.

Step 4: Identification, measurement and valuation of costs

Identification of Resources

Since all schools were implementing the healthy schools initiative, if one wanted to, one could have simply identified the *additional resources* required in order to add the SIVEA component to the common element. This could have provided a partial analysis of the cost of the Healthy Schools + SIVEA strategy, but it would not have been enough to answer the question posed of the evaluation team. However, the results would then be of limited use to others, especially those who were trying to decide whether or not to implement the Healthy Schools initiative in the first place. Thus, presented below is a comprehensive evaluation that also includes an estimate of the costs of the Healthy Schools initiative. Although this increased the workload of the evaluation team, it provided additional information that would be valuable to subsequent users of the evidence.

The resources required to implement the Healthy Schools initiative included staff time and materials to plan, execute, evaluate and disseminate the results of the strategy. Students were also involved in all but the planning phase, while parents contributed time to the implementation and evaluation phases.

The Healthy Schools *plus* SIVEA option required these resources and more. Here staff time was required to collect and disseminate the data on risk factors, to analyze and disseminate the results, and to design and implement any subsequent plans. Students, parents and staff participated in the SIVEA process through a series of workshops associated with the different stages of the intervention (initial education, data collection, information processing, analysis, dissemination and intervention). Additional resources included materials for each of these workshops, and staff time associated with the facilitation of the workshops.

Training and Awareness Phase

- ▶ Modules: 21 guides for implementing the surveillance system
- ▶ Six workshops for students and staff each lasting 4 hours
- ▶ A facilitator for each workshop
- ▶ Materials associated with each workshop (paper, pens, projector, etc.)
- ▶ Two meetings for students and staff each lasting 4 hours
- ▶ Rooms to accommodate the meetings and workshops

Data Gathering

- ▶ Five workshops for students and staff each lasting 4 hours
- ▶ A facilitator for each of the five workshops
- ▶ Survey materials

- ▶ Administration of survey
- ▶ Rooms to accommodate the workshops

Data processing

- ▶ Four workshops for students and staff each lasting 4 hours
- ▶ A facilitator for each workshop
- ▶ Materials
- ▶ Two meetings each lasting 4 hours on average
- ▶ IT services to create a database and conduct preliminary analysis of data
- ▶ Rooms to accommodate the meetings and workshops

Data Analysis and Interpretation

- ▶ Six workshops for students and staff each lasting 4 hours on average
- ▶ A facilitator for each workshop
- ▶ Associated materials
- ▶ Three additional meetings for students and staff each lasting 2 hours
- ▶ Rooms to accommodate the meetings and workshops

Communication and Dissemination Phase

- ▶ Three workshops for students and staff
- ▶ A facilitator for each workshop
- ▶ Associated materials
- ▶ One additional meeting for students and staff
- ▶ Rooms to accommodate the meetings and workshops

Use of Information

- ▶ Four workshops for students and staff
- ▶ A facilitator for each workshop
- ▶ Associated materials
- ▶ One additional meeting for students and staff lasting 4 hours
- ▶ Rooms to accommodate the meetings and workshops

Measurement of changes in resource use

The amount of each resource required by the Healthy Schools and the Healthy Schools plus SIVEA interventions are shown in the tables that follow. Information on the quantity of resources required to implement the Healthy Schools approach has been compiled from a variety of sources including an aggregate estimate of the resources used across the whole school system. To come up with an estimate of what it would have cost to implement just the Healthy Schools intervention in the Simon Bolivar School, adjustments had to be made to the aggregate estimate.

TABLE A3.1/ Resources required by the healthy schools strategy

RESOURCE	UNITS	INTERVENTION PHASE				TOTAL
		Planning	Implementation	Evaluation	Communication	
Teacher time	Hours	507	1,783	168	96	2,554
Student time	Hours	-	6,097	186	1,480	7,763
Parent time	Hours	-	366	73	-	439
Paper	Reams	6	6	2	2	16
Printing	Unit	200	200	100	300	1,100
Pens	Number	8	100	-	24	132
Newsprint	Pages	-	140	-	40	180
CDs	Number	-	-	4	2	6
Computer disks	Boxes	-	-	2	-	2
Clips, etc.	Boxes	-	5	-	-	5
Computer time	Hours	24	160	80	80	344
Meeting rooms	Hours	10	30	4	2	46

TABLE A3.2/ Resources required by phase of the SIVEA intervention

RESOURCE	UNITS	PHASE OF THE SIVEA INTERVENTION						TOTAL
		Training	Data gathering	Data processing	Data analysis	Communication	Use	
Teacher time	Hours	1,728	240	1,760	2,392	1,456	832	8,464
Technical support (Epi)	Hours	-	-	16	40	-	-	56
Technical support (Stats)		-	64	40	40	-	-	144
Facilitation	Hours	48	40	48	390	32	72	264
Student time	Hours	7,930	2,080	2,490	3,170	280	400	16,350
Parent time	Hours	440	-	-	-	-	-	440
Module guides	Number	21	-	-	-	-	-	21
Paper	Reams	6	6	2	2	2	5	23
Printing	Unit	200	200	200	200	200	200	1,200
Pens and pencils	Number	24	332	40	56	56	32	540
Overheads	Number	40	80	40	40	40	40	280
Newsprint	Pages	120	40	16	-	-	150	326
CDs	Number	-	-	4	-	-	-	4
Computer disks	Boxes	-	-	2	2	-	-	4
Clips, etc.	Boxes	-	8	-	-	-	-	8
Envelopes	Number	-	20	-	-	-	-	20
Computer time	Hours	-	-	160	160	-	-	320
Survey forms	Number	-	300	-	-	-	-	300
Response forms	Number	-	300	-	-	-	-	300
Consent forms	Number	-	300	-	-	-	-	300
Information leaflet	Number	-	300	-	-	-	-	300
Meeting rooms	Hours	32	28	30	-	14	20	124

Valuation of costs

Salary rates including an allowance for employer expenses such as leave loadings and sickness benefits were used to value the hours of teacher time shown in Tables A3.1 and A3.2. Salary rates for teachers in the intervention school ranged from \$5,500 Colombian pesos to \$29,000 Colombian pesos (equivalent to US \$2.40 and \$12.50 per hour). To facilitate generalization to schools with different salary structures, the mid-point of the salary range in Colombian pesos (\$17,000) was used to value staff time.

Note, no additional teachers were employed to implement the SIVEA intervention. By using salary costs to value the time that teachers give to the Healthy Schools and SIVEA interventions, it was effectively assumed that teachers who were engaged in SIVEA-related activities would otherwise have been productively engaged in something else. That is, salary rates were used to value the opportunity cost of the teachers' time, not the financial cost to the educational authorities. It is also possible that SIVEA made more efficient use of staff time by exploiting slack periods during the school day. In this case, the use of salary rates to value the teachers' input into SIVEA overstated the *opportunity cost* of the intervention. This is something that should be explored in the sensitivity analysis.

The facilitator, the professional expertise required to design and analyze the survey of risk factors and technical support including IT were all carried out by research staff at no financial cost to the school. These were essential parts of the intervention, however. They were not part of the research. Therefore, other schools considering implementing SIVEA would need to find these resources from somewhere. In the economic costing, we have used the usual salary for these positions (Colombian pesos \$45,000 for the facilitator and professional expertise and Colombian pesos \$25,000 for technical and IT support).

Time given up by parents to participate in the Healthy Schools Strategy raised an interesting issue in respect to the economic costing. This time was volunteered by parents and came at no financial cost to the school. However, to the extent that parents have other things that they can do with their time, it does have an opportunity cost. There is a range of opinions about how best to factor the value of volunteer time into an economic evaluation. At one extreme, one could use the wage costs of the parent to value their time. The assumption here is that the parent could otherwise be working and so forgoes salary by agreeing to participate in the Healthy Schools intervention. At the other extreme, one could argue that a zero value should be assigned to this time. The assumption here is that the person volunteers because he or she receives some intangible benefit of equal value in return. Since the value of the benefit is not included; the value of the cost to secure should not be included either.

Unfortunately, there is no consensus among economists about what one should do in these circumstances. The answer really depends on what one believes the counter-factual to be. If volunteer time were not available, what would the school do? In some cases, it might need to employ someone to take the part of the volunteer (as might be the case with extra-curricular activities, for example). In this instance, the most likely counter-factual is that the intervention would proceed without parental involvement. In this case, it makes sense to assign a zero value to the cost of volunteer time, which is what is done in the base case evaluated here.

The same arguments can also be applied to the time that students devote to the intervention. In the base case, student time is included at zero cost – the assumption being that his/her involvement in either the Healthy Schools intervention or the SIVEA add-on is not discretionary.

The workshops and meetings all took place in the school in rooms that would otherwise have been unoccupied. The number of hours of room-time that is required for the meetings has been noted but as use was made of space that had no opportunity cost, a proxy rent was not included in the evaluation of costs. If one thought that there might be more competition for room space in other schools then this would also be something to explore in the sensitivity analysis. For brevity, this is not done here.

Finally, accounting data was used to value the materials used in each of the activities described above.

All costs were valued in constant (2004) prices in Colombian currency.

The results of the evaluation of costs are shown in Tables A3.3 and A3.4.

TABLE A3.3/ Cost of the healthy schools strategy by phase of intervention

PHASE OF THE INTERVENTION	YEAR 1 (\$)	YEAR 2 (\$)	TOTAL COST (UNDISCOUNTED)
Planning	4,873,330	3,868,650	8,741,980
Implementation	15,646,590	15,718,710	31,365,130
Evaluation	1,512,070	1,512,070	3,024,130
Analysis	929,690	911,250	1,840,930
Totals	22,961,670	22,010,670	44,972,350

TABLE A3.4/ Cost of the healthy schools plus SIVEA strategy by phase of intervention

PHASE OF THE INTERVENTION	YEAR 1 (\$)	YEAR 2 (\$)	TOTAL COST (UNDISCOUNTED)
Training and awareness	25,812,420	7,849,990	33,662,420
Data gathering	3,319,740	3,294,870	6,614,610
Data processing	17,675,970	17,675,970	35,351,930
Data analysis and interpretation	30,844,990	32,351,930	63,043,970
Communication – Dissemination	13,145,120	13,145,120	26,290,230
Use of information	8,575,110	8,935,110	17,510,220
Totals	99,373,350	83,100,040	182,473,390

Step 5: Identification, measurement and valuation of consequences

Identifying important consequences

Given the objectives of SIVEA, one can identify at least two possible intended effects of the intervention that might be used to measure its effectiveness: (1) increases in the capacity of the school community to address the health problems of school children; and (2) reductions in the prevalence of risk factors prior to changes in health outcomes. Both of these were considered although large differences in risk behaviors were not expected over the time-frame of the study.

Measurement of outcomes

(i) **Capacity building:** Capacity building was defined by the evaluation team as “the creation of opportunities for, and the acquisition of skills by the parents, teachers and students of the school to recognize, analyze and intervene in behavioral risk factors affecting the health and welfare of the student population.” To operationalize the intended outcome, the notion of capacity was conceptualized as consisting of three factors: (i) awareness among the teachers and students in the school about existing adolescent behavioral risk factors based on up-to-date, scientifically valid information (*Knowledge*); (ii) participation by students and teachers in the collection, processing, analyzing, and dissemination of risk factor information (*Participation*), and; (iii) the use of such information by students and teachers to plan strategies for dealing with behavioral risk factors (*Use*). Each of these components is related to the others and is considered indispensable to achieve the goal of capacity building in the school community.

In the SIVEA school, each component was measured separately as a percentage of staff and students who were knowledgeable, participated in the project and used the information produced (CEDETES, 2004). The evaluation team also wanted to compute a single overall score. To this end, the three dimensions were assigned weights that depended on the value given to each in terms of its ability to affect behavior. Knowledge was given a 20% weighting, as the first phase of behavior change, participation was assigned 30%, as the second phase, and use of information was given 50%, as the most important component on this scale. The scale was designed by the health promotion experts on the evaluation team, with values assigned according to Bandura’s theory of behavior (Bandura, 1977).

No comparable data was available from any of the schools that were just implementing the Healthy Schools Strategy and the change in capacity brought about directly by SIVEA could not be assessed. As an alternative, one could assume that non-SIVEA schools had no capacity. Any degree of capacity observed in the SIVEA school would therefore be attributed to the intervention. A more conservative approach would be to assume that all schools had some capacity to use risk-factor data and that SIVEA built upon this.

To assess the likely baseline level of capacity in schools prior to SIVEA, proxy data were used, taken from a study completed by the Health Secretariat in 2003, which covered all public schools that were applying the Healthy School Strategy (CEDETES & Gobernacion Valle de Cauca, 2003). These data included information about sectors participating and their responsibilities; goals and objectives accomplished; resources and infrastructure; knowledge about risk factors; ownership of the Healthy School Strategy; use of information to plan educational projects and activities within the school to promote healthy lifestyles; participation of the school community in activities to implement the Healthy School Strategy; and early detection of risk factors. By augmenting this data with interviews with key informants and focus groups it was possible to construct a measure of the average level of capacity in non-SIVEA schools.

The results are shown in Table A3.5. The table shows the percentage of students and staff who were aware of risk factors, participated in the collection and analysis of risk factor information, or who used such information to plan interventions. The weighted capacity score is the sum of these percentages multiplied by their respective weights.

TABLE A3.5/ Capacity with and without SIVEA

PROGRAM	KNOWLEDGE (WEIGHT = 0.2)	PARTICIPATION (WEIGHT = 0.3)	USE (WEIGHT=0.5)	WEIGHTED CAPACITY SCORE
Healthy School plus SIVEA	72.2%	34.4%	12.3%	30.9
Healthy School Comparator	15.9%	12.4%	1.4%	7.6

(ii) *Risk factor changes:* Again, no data were available on the prevalence of risk factors in any of the non-SIVEA schools. To assess the effectiveness of SIVEA in this respect trend data on risk factor prevalence that was collected as part of the SIVEA system were used. This allowed comparison of the prevalence of risky behaviors before and after the implementation of any SIVEA-informed policies. The results are shown in Table A3.6.

TABLE A3.6/ Changes in risk factor profiles before and after SIVEA

RISK FACTORS	PREVALENCE		SIGNIFICANCE
	Before SIVEA	After SIVEA	
Looks for help when facing problems	78.2%	89.5%	p = 0.000
Engages in protected sexual intercourse	34.1%	28.5%	p = 0.137
Academic improvement	51.6%	60.3%	p = 0.028
Friends who consume psychoactive substances	19.0%	16.9%	p = 0.542
Cigarette consumption	48.0%	36.0%	p = 0.002
Alcohol consumption	39.3%	27.9%	p = 0.002
Psychoactive substances consumption	8.7%	30.8%	p = 0.000
Suicidal ideas	35.3%	33.9%	p = 0.759
Participated in a fight in past year	36.9%	35.5%	p = 0.775
Consumed fruit and vegetables in past 7 days	28.6%	15.5%	p = 0.000
Exercised or been physically active in past 7 days	79.4%	92.8%	p = 0.000

While 12 months is too short a period to see reliable changes in risk behaviors, there are encouraging signs in these data with statistically significant improvements in help-seeking behavior, cigarette and alcohol use and exercise, albeit accompanied by a significant reduction in consumption of fruit and vegetables.

(iii) *Valuation of outcomes:* The economic evaluation is a cost-consequence analysis with outcomes presented as a profile comprising changes in capacity and changes in risk factors. Apart from the weighting of each dimension of capacity building to construct the index, no valuation of the outcome data is necessary.

Step 6: Adjustments for timing — discounting

Both the Healthy Schools and the SIVEA system were implemented over a two-year period and so to express the total costs in terms of their present value, costs incurred in the second year in each case must be discounted. In the absence of any recommended national rate for Columbia, costs were discounted at 3% (Gold *et al.*, 1996).

Discounting under these circumstances (that is, over such a short time period) is relatively easy. One simply divides the second year costs by the discount factor, which in this case is equal to 1.03.² The results are shown in Table A3.7.

TABLE A3.7 Cost of the interventions after discounting

INTERVENTION	YEAR 1	YEAR 2	TOTAL
Healthy Schools	22,961,670	21,369,580	44,331,250
Healthy Schools + SIVEA	99,373,350	80,679,650	180,053,000

Step 7: Sensitivity analysis

Candidate variables to conduct the sensitivity include: the discount rate; the weightings attached to the three dimensions of capacity building; estimates of the additional time involved for participation to implement SIVEA interventions; the unit costs of the most significant resource components (especially the value of teachers' time); the difference in infrastructure and facilities of the public schools to implement SIVEA; and the degree of participation of key actors and volunteers, such as the students and parents.

For ease of explanation, the sensitivity analysis is illustrated below by concentrating on just two variables – the discount rate and the value of teachers' time.

(i) **The discount rate:** At its simplest, sensitivity analysis involves reworking the estimates of cost and effect after substituting different plausible values for the variable being tested. With discounting, a rate of 3% was used as this is recommended by the Washington Panel on Cost-effectiveness (Gold *et al.*, 1996). It is good practice, however, to also consider rates of 0%, 5% and 10%, just to see if different rates might affect the conclusions one would draw from the evaluation. Using a range of rates in this way also facilitates comparisons of cost-effectiveness with other studies that have used the same outcome measures but a different discount rate in the base case.

The results of applying different discount rates to the costs of the Healthy Schools (HS) and SIVEA interventions are shown in Table A3.8. Changing the discount rate in this instance reduces the difference in costs between the two interventions, because so much more of the costs of the HS + SIVEA intervention falls into year 2. The difference is small however, which is not surprising since one is only talking here of an intervention spread across two years. The discount rate would have a much greater impact if costs were spread instead over several years. From this, it is safe to say that the results of the evaluation are robust with respect to choice of discount rate.

² The discount factor is given by the formula $DF = (1+r)^{t-1}$ where r is the discount rate and t is the year in which the cost is incurred. In this case, the discount rate (r) is 3%. The discount factor for costs incurred in the second year ($t=2$) is therefore equal to $(1.03)^{2-1} = (1.03)^1 = 1.03$.

TABLE A3.8/ Sensitivity analysis: choice of discount rate

CHOICE OF DISCOUNT RATE	TOTAL COSTS		
	Healthy Schools	Healthy Schools + SIVEA	DIFFERENCE
Undiscounted (discount rate = 0%)	\$44,972,340	\$182,473,390	\$137,501,050
Discount rate = 3%	\$44,331,250	\$180,053,000	\$135,721,750
Discount rate = 5%	\$43,924,220	\$178,516,250	\$134,592,030
Discount rate = 7%	\$43,532,390	\$177,036,940	\$133,504,550
Discount rate = 10%	\$42,971,370	\$174,918,840	\$131,947,470

(ii) *Opportunity cost of teachers' time*: The SIVEA intervention relied heavily on teachers to participate in the process of collecting, analyzing and using the data on student risk factor prevalence. In the base evaluation, the mid-point of the teachers' salary costs was used to value this time. The mid-point was used to help generalize the results of the evaluation. In the sensitivity analysis one could use instead both the lowest point on the salary scale and the highest point. Remember also that the teachers' salaries were used not to factor in the *financial cost* of the SIVEA intervention, but because evaluation of the *opportunity cost* of the teachers' time was being sought. By using their salary, it was effectively assumed that in the absence of SIVEA, teachers would be doing something else and the value of that something else was best proxied by their salary.

However, SIVEA may instead have led to more efficient use of teachers' time. Perhaps participating in SIVEA did not always take away from other activities but, in part at least, it made use of slack periods during the school day when it was difficult to do anything else. In this case, use of the full salary cost overstates the opportunity cost of the teacher's time. This can be dealt with in the sensitivity analysis by reworking the estimate of costs after substituting different values for the teachers' time. The easiest way to do this is to substitute fractions of the salary – reworking the cost estimates using 75% of the salary costs, 50%, 25% and perhaps even zero. If the intervention looks expensive in the base case, then using a zero cost for teachers' time allows one to see whether it remains expensive even under the most favorable conditions. For brevity the results are reported using 50% of salary costs and then assigning a zero value to the teachers' time (Table A3.9).

TABLE A3.9/ Sensitivity analysis: opportunity cost of teachers' time

CHOICE OF SALARY RATE	COSTS OF THE INTERVENTION		
	Healthy Schools	Healthy Schools + SIVEA	DIFFERENCE
Full salary costs	\$44,972,340	\$182,473,390	\$137,501,050
50% of teachers' salary	\$23,127,350	\$110,529,390	\$87,452,040
0% of teachers' salary	\$1,282,350	\$38,585,390	\$37,303,040

Clearly, the incremental cost of the SIVEA strategy is sensitive to changing assumptions about the value of the teachers' time. However, the additional costs of SIVEA remain substantial even when it is assumed that teachers can participate in the intervention at zero opportunity cost.

Step 8: Interpretation of the results

The results can now be brought together. The results of the analysis show that SIVEA is more expensive to implement, but also more effective, certainly in terms of building capacity, but probably also in reducing the prevalence of risk factors associated with poor health outcomes among school-children. In terms of the quadrant diagram first shown in section 3 of the main Guide and repeated below, SIVEA falls into quadrant 1.

A limitation of the approach adopted here is that it does not allow one to say whether augmenting the Healthy Schools approach with SIVEA is cost-effective. All one can say with any confidence is what additional investment is needed to secure the observed improvement in desired outcomes.

In the baseline estimate, the incremental cost of SIVEA (that is, the extra cost over and above what was being spent on the Healthy Schools Strategy), is Colombian pesos \$137,500,000 (equivalent to US \$60,000). For this additional investment, an increase can be seen in the capacity of the school community to use information to help plan and evaluate interventions that promote health. The summary indicator of capacity building is perhaps a little difficult to understand, but its significance should not be overlooked. The SIVEA school is now better positioned not only to improve the health of its current intake of school children, but also to influence the health of subsequent intakes of school children. The benefits of this investment will therefore continue beyond the cohort of children that have been examined here. Most of the costs of SIVEA have been included, but in excluding the improved outcomes that these future cohorts will experience, the benefits of the intervention have been understated.

The information provided here on change in costs, capacity and risk factors, may be enough to convince decision makers to act. With sufficient time and resources invested in the evaluation, it would be possible to extrapolate from the evidence of changes in risk-factors to changes in health outcomes and health care costs. This information is of more obvious value to decision makers as they can see in comparative terms where health promoting resources are best expended. However, the modeling required to translate changes in risk factors into expected changes in the incidence of disease, health adjusted life expectancy and costs adds more uncertainty. There is a trade off therefore between the utility of the information and the confidence that one can place in the information.

The illustration of the sensitivity analysis also sheds some light on its value. In this instance, the discount rate is not important. Although the results have not been shown here, neither are any changes that might be made to the costs of the consumable items used in the workshops or any estimate that might be included about the costs of using space in the schools. The results of the evaluation are sensitive to changing assumptions about the opportunity cost of teachers' time, however. Thus, this is one thing that the evaluation team would need to discuss in some detail. Ideally, one would like to hear from the schools precisely what activities teachers would have to cut back on in order to participate in the SIVEA intervention. Armed with this information, one would be able to see whether the use of salary rates is an accurate reflection of the opportunity cost or an overstatement.

Recommendations

As it was stated previously, the results of an economic evaluation are very important but not sufficient to make decisions. Other aspects have to be considered. In this case, the recommendations were oriented to two audiences; one was the schools of the municipality where the SIVEA intervention was implemented, and the second audience was composed of the decision makers and school community where the intervention was going to be expanded. In both cases, the sociopolitical and economic aspects attached to the context should be analyzed.

Given the poor achievement of the Healthy School Strategy in relation to capacity building, re-orientation was strongly recommended, introducing new strategies to optimize the available resources. The cost to run the Healthy Schools initiative is higher with SIVEA, but it is more associated with an optimum use of resources available at the school than additional competing resources.

On the other hand, this example showed the effectiveness of SIVEA looking at one indicator only. As was shown in previous studies, SIVEA's benefits go beyond capacity building including changes in prevalence of risk factors affecting the health and well-being of this population and motivating local development by incorporating different sectors and governmental plans into strategies to promote population health.

To do this, the decision-makers at the state level could create new legislation or make the existing legislation work better. With some additional financial resources and keeping the objective of the Healthy School Strategy the same, SIVEA could be used as the entry point to develop capacity at the school, to identify and intervene in the risk factors, and create healthy environments, making a better use of available resources at the school level.

It was also demonstrated in previous evaluations that SIVEA is a feasible strategy because it uses the resources and infrastructure supported by local and national governments under the Healthy School Strategy. It also had high acceptance from teachers and students. This was not the case at the beginning, but support increased when it was demonstrated to teachers and students that SIVEA supported and qualified them to do a better job, secured health and education gains and facilitated curriculum activities involved in the "educational project, PEI," a mandatory activity for the public schools in the country.

Finally, it was highly recommended to evaluate and document the process in order to improve the quality of data produced and conduct a more informative evaluation.

Step 9: Communication and dissemination of results

Information management is not only one of the most critical activities to guarantee information use; it is also the most neglected. In order to overcome this problem, there are many activities that have to be implemented continuously such as advocacy, communication strategies, and advertising to involve and motivate parties within and outside the school.

Two functional structures in the territory, the School and the Community-Based Communication and Information System were the pillars to carry out the dissemination and reflection activities. In the School, the SIVEA intervention took advantage of such daily activities as homework, playtime,

parents meetings, flyers, billboards and the school calendar as exercises in reflection, dialogue, recognition, agreement and collective construction around the information. By means of a Community Based Communication and Information System, SIVEA took advantage of the local forms of communicating and planning local development.

A virtual structure was set up to increase the use and dissemination of the information, called “Situational Setting.” Bergonzoli (2000) defines it as the “instance for the strategic planning to facilitate negotiation and agreement around commitments among different actors involved in the social production of health, in the local environment. In it different knowledge comes together for the identification and study of health situations, the analysis of determinants and the viability and feasibility of solutions.”

Additionally, management support communication technologies were designed at local level. These involved the school government, promoters of the local and sub-local development plans, and Citizen Participation Inter-sectoral Committees, among others. Continuous use of visible gains for all parties as a product of the interventions to reduce risk factors and improve health is very useful for understanding the appropriateness of the system by different sectors. Mandatory action, along with a permanent monitoring and evaluation, and involvement of different stakeholders, supports the construction of a sustainable system.

The information has been used to design and articulate school and municipal development plans, to monitor changes in the school, to advocate for interventions related to risk factors and healthy environments, and to create public opinion about the major health determinants in the municipality.

Interventions to reduce risk factors were a product of strategic planning in which activities inside the school were linked to higher decision levels, so the intervention went beyond the school to cover wider geographic areas such as the municipality. For instance, surveillance served to create the institutional education project and is being used to create a healthy school. At the same time, surveillance results were integrated into municipal development plans to create a healthy municipality. In this regard, surveillance and information systems already in place could give a better picture not only of risk factors but of the determinants of health and behavior for the whole population in an effort to attach surveillance to health promotion initiatives and policy planning.

An example of the activities done to disseminate the results is in Table A3.10

TABLE A3.10/ Communication strategy- SIVEA

OBJECTIVES	AUDIENCE	ACTIVITIES
Public opinion around SIVEA intervention	Mass media & general population in the municipality	<ol style="list-style-type: none"> 1. Information transmitted through local communication media: radio, TV, meetings 2. Journalists' meeting in the intervention area to make them aware of the intervention and its results
Empowerment at the school and municipality levels	Education community	<ol style="list-style-type: none"> 3. Presentation of results to the school government, 4. Pamphlets for teachers and parents, highlighting key issues according to their interest 5. Meetings and workshops with parents, oriented by teachers, to plan school actions based on the evaluation 6. Cinema-forum and chats with students, parents and teachers 7. Student video and design of murals 8. "Situational settings" supported by students and teachers to display the information on a permanent basis
Positioning of the topic on the public and political agenda	Communication Media	<ol style="list-style-type: none"> 9. Information bulletins for mass media 10. Executive report of results directed to political and director levels 11. Participation of leaders of the programs on regional television 12. Presentations to the Municipal Council and policy leaders 13. Presentations of results in special events with the participation of mayoral candidates, municipal secretaries, first lady of the Department, health education and social participation secretariats and experts
Advocacy	Politicians from the municipal and state levels	<ol style="list-style-type: none"> 14. Forum with mayoral candidates to present results and to propose high-priority topics to consider in their development plans
Social appropriation of knowledge	School directors	<ol style="list-style-type: none"> 15. Inclusion of the evaluation results to support programs at the school
	Governmental institutions and research centers dealing with the problem	<ol style="list-style-type: none"> 16. Presentations of results to stakeholders and those responsible for the Healthy School Strategy 17. Scientific publications 18. Presentations of results in scientific meetings

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APPENDIX 4 The Saskatchewan Population Health Promotion Strategic Plan

Introduction

The Population Health Promotion Strategy adopted by the provincial health department in Saskatchewan, Canada provides another useful case study to examine the applicability, usefulness and limitations of economic evaluation. Unlike the SIVEA example, the cost-effectiveness of the Saskatchewan strategy is not evaluated. Rather, the example is used to illustrate how one might approach such a question. In fact, as is explained below, it probably does not make sense to think that one might carry out an economic evaluation of such a strategy. Instead, the question needs to be unpicked to work out precisely what the problem is that an economic evaluation might help overcome.

As the summary of the strategic plan indicates (see box), the strategy is multi-sectoral, multi-level, multi-factoral, and participatory in nature. It includes all of the constituent parts we identified earlier as being essential for good health promotion policy and practice. The strategy emphasizes ‘upstream’ approaches designed to address the ‘root causes of ill health’ and promote health, by focusing on the conditions and environments in which people live, work and play.

What is/are the economic question(s) to be addressed?

The Saskatchewan strategy is a multi-layered one and the types of questions that can be answered in an economic evaluation will vary according to the level that one considers.

One can see at least four layers in the plan: (i) at the level of the strategic plan as a whole (the population / settings-based approach); (ii) at the level of component strategies for action (strengthening community action, creating supportive environments and building healthy public policy); (iii) at the level of the priority areas for action (mental health, nutrition, substance abuse and physical activity); and, (iv) at the practice level (where several supposedly evidence-based interventions are described, each contrasted with the traditional individual-level approach). Each of these in turn, starting at the lowest level.

Evaluation at the practice level

It is easier to think of economic evaluation being applied at the lowest of these levels – at the practice level, that is – and so it makes sense to start there and then look to see where any problems materialize as one works back towards the integrated strategy.

To take just one example, the Saskatchewan plan refers to the Simcoe County Action on Tobacco (SCAT) Project that took place in Ontario Canada (<http://www.ptcc-cfc.on.ca/bpt/pubs/pdf/014f.pdf>) as an example of a population health intervention to tackle tobacco use. The Simcoe

CASE STUDY/ Saskatchewan's Population Health Promotion Strategy

Saskatchewan's strategy to promote population health (Healthier Places to Live, Work and Play) emphasizes 'upstream' approaches aimed at tackling root causes of ill health (the conditions and environments in which people live, work and play). The strategy aims to reduce the barriers to health that people face by combining healthy public policy, creating supportive environments and strengthening each community's ability to take action on threats to its collective health.

The strategy is guided by a set of values:

- Respect for the dignity of each individual while at the same time giving priority to the common good when conflict arises
- Support for community participation in decision-making
- Sharing of resources to meet the needs of all members of society
- Pursuing social justice to reduce health inequities
- Caring for the environment so that health and prosperity of the present generation are not purchased at the expense of future generations

A series of expected outcomes have also been identified:

Short-Term Outcomes (3 years)

- Increased community participation
- Increased use of inter-sectoral partnerships in planning, implementation and evaluation
- Increased capacity of practitioners and organizations to implement and sustain programs

Medium-Term Outcomes (5 years)

- Reduced barriers to accessing healthier choices
- Increased number of people engaged in healthy behaviors
- Increased community capacity to create healthier environments and improved access for vulnerable populations

Long-Term Outcomes (10 years)

- Improved health including quality of life
- Reduced health inequities

Four areas for action have been given priority: mental well-being, nutrition, substance (ab)use and physical activity. In each of these areas, a range of evidence-based, population-health practices have been identified that might form the basis for future action. For example, these could include creating school environments that support a variety of options for increased physical activity and integrating opportunities for increased physical activity into daily routines such as through choice of active transportation modes.

—Saskatchewan Health. *Healthier Places to Live, Work and Play* (undated). Downloaded May 31 2006 (www.health.gov.sk.ca/ic_phb_hlthbook.pdf).

Project had three primary elements each aimed at preventing young people from taking up cigarette smoking: (a) introduction of tobacco-free school communities; (b) restrictions on youth access to tobacco products; and, (c) bylaw implementation in playgrounds and parks. In the Saskatchewan plan, this multi-component project is contrasted with the traditional approach that involves one intervention, for example trying to persuade young people not to smoke through social marketing.

Evaluating the cost-effectiveness of the SCAT approach, were it to be implemented in Saskatchewan, would be relatively simple. The process evaluation that was carried out by the team responsible for implementing SCAT in Ontario already identified the resources required of the program and even measured and evaluated the costs of most of them (a notable omission is the opportunity cost of the health-unit staff who were responsible for implementing the project). For the economic evaluation, one would need to specify more fully what the comparator was going to be in Saskatchewan (i.e., exactly what is meant by the traditional approach) so that its costs and

benefits could be evaluated; and one would need to decide what outcomes were going to be considered important.

The choice of outcome indicator would depend critically on the question being posed of the economic evaluation. If it had already been decided that something was going to be done to reduce young people's exposure to tobacco products then it might be sufficient simply to measure any difference in the availability of tobacco products to young people. The cost-effectiveness study would compare the costs of achieving different levels of exposure using various levels of investment in SCAT or compare the costs of achieving different levels of exposure to tobacco products using the traditional approach vs. the SCAT approach. It would be up to the bureaucrats to decide whether the SCAT Program was worth investing in or not.

Alternatively, a stronger case could be made if the impact of the SCAT Program on tobacco use could be measured, as then one could estimate the eventual effect of the Program on health outcomes, such as quality-adjusted life years lost, converting the cost-effectiveness study into a cost-utility one. This would then enable SCAT to be compared to other kinds of policies and programs. This would be especially important if the SCAT Program competed for resources with other health promotion activities, or even healthcare and the economic evaluation had been initiated to address this broader policy issue.

Priority areas for intervention

Of course, evaluating the cost-effectiveness of a single program at this level ignores the fact that in Saskatchewan, the Simcoe Project would be nested within a broader, comprehensive tobacco control strategy. Does this matter? Well, it might, but only if there is a strong interaction between the Simcoe intervention and the other parts of the tobacco control strategy and this affected exposure to tobacco products or tobacco use.

If the effectiveness of the SCAT Project was dependent on the presence of other components of the tobacco reduction strategy, then this could be dealt with by expanding the description of the intervention to include those components. At the moment, SCAT has three components, each targeting young people, but it could just as easily have four or more. The additional components might address adult smoking for example, perhaps by implementing bans in public places, strengthening package labeling and further restricting point of sale advertising.

The question then becomes some variant of "what is the cost-effectiveness of a comprehensive tobacco control strategy" versus some alternative. The comparator could be the Simcoe strategy on its own, or some smaller subset of the combined youth and adult strategy. The economic evaluation obviously gets messy when one adds components in this way, and the range of possible comparators increases. All of this means that the evaluation requires more work, but as was discussed in the body of the guide, there is nothing inherent in a multi-component strategy that makes an economic evaluation impossible.

There may also be an interaction between the tobacco intervention and the other aspects of the Saskatchewan strategy. For example, it is possible that the tobacco intervention may be more effec-

tive if it is implemented alongside action to improve the social climate in schools as a means of promoting mental health. But again, this just affects what one regards as the intervention to be evaluated. It does not change how one would undertake the economic evaluation. In this case, the intervention should be seen as being the SCAT Project plus the schools-based intervention. Possible comparators could be the SCAT Project alone, or permutations of the SCAT components or even the traditional, individual-level educational intervention.

Evaluation at the strategic component level

At this level, the strategy identifies three areas of action: strengthening community action, creating supportive environments and building healthy public policy. One could conceive of an economic evaluation in which an intervention that combined action in all three areas was compared with interventions comprising permutations of one or two of these approaches. However, these are really no more than composite labels attached to a variety of different interventions, some tackling community capacity, some tackling environmental determinants of health and others addressing policy. An evaluation at this level means nothing unless the component elements are identified first. But at that point, the economic evaluation is reduced to one comparing different combinations of strategies or practices. The outcomes to be measured could also be single or in combinations (as discussed above) as long as the same outcomes were used in all alternatives being compared.

Population health and the settings approach

The highest level identified in the Saskatchewan strategic plan was their adoption of population health as the organizing framework and setting as the target for the interventions. One could consider the economic merits of adopting a population approach versus an individual one. One could also frame the economic question in terms of comparing the settings approach with some alternative, perhaps planning based on geographic region, client group or disease, for example. It would be difficult to answer either question from an economic perspective, because it would be difficult to obtain comparable data in the counter-factual. However, such a question is moot because as one began to firm up what was meant by either population health or the settings approach, one would begin to specify the characteristics of lower level interventions and – as was discussed above – it is these, alone or in combination, that represent the subject of the economic evaluation.

Closing discussion

The Saskatchewan population health strategy represents a good example of a comprehensive, multi-faceted health promotion intervention: here, how the economist might tackle the question of its economic evaluation. It has been argued that while it is possible to conceive of economic questions pertinent to the highest levels of the strategy, it is unlikely that an evaluation would be carried out at such levels. The question posed in the economic evaluation needs to relate to the choices that have to be made by policy makers and practitioners. Adopting a population health perspective, or locating the strategy in a settings approach to improving health are certainly the outcomes of choice that were made by the provincial health agency's senior decision makers, but such choices

become part of the portfolio of policies and practices that are implemented at lower levels. And it is here that the economic merits of the strategy can best be evaluated. It is at this lower level that one can best assess policies and practices that enshrine the comprehensive, multi-faceted approach and compare them to policies and practices that do not bear these characteristics.

APPENDIX 5 A checklist for critical appraisal of economic evaluations

The editors of the British Medical Journal have set out the questions they suggest reviewers use when assessing the quality of economic evaluations that have been submitted to the journal for publication. The checklist is useful for reviewing the quality of someone else's published evaluation. It can also be used to structure one's own evaluation. Drummond and Jefferson (1996) provide a rationale for the checklist. The checklist itself is available on the BMJ webpage (<http://bmj.bmjournals.com/advice/checklists.shtml>)

Study design

- 1/ The research question is stated
- 2/ The economic importance of the research question is stated
- 3/ The viewpoint(s) of the analysis are clearly stated and justified
- 4/ The rationale for choosing the alternative program or interventions compared is stated
- 5/ The alternatives being compared are clearly described
- 6/ The form of economic evaluation used is stated
- 7/ The choice of form of economic evaluation is justified in relation to the questions addressed

Data collection

- 8/ The source(s) of effectiveness estimates used are stated
- 9/ Details of the design and results of effectiveness study are given (if based on a single study)
- 10/ Details of the method of synthesis or meta-analysis of estimates are given (if based on an overview of a number of effectiveness studies)
- 11/ The primary outcome measure(s) for the economic evaluation are clearly stated
- 12/ Methods to value health states and other benefits are stated
- 13/ Details of the subjects from whom valuations were obtained are given
- 14/ Productivity changes (if included) are reported separately
- 15/ The relevance of productivity changes to the study question is discussed
- 16/ Quantities of resources are reported separately from their unit costs
- 17/ Methods for the estimation of quantities and unit costs are described
- 18/ Currency and price data are recorded
- 19/ Details of currency of price adjustments for inflation or currency conversion are given
- 20/ Details of any model used are given
- 21/ The choice of model used and the key parameters on which it is based are justified

Analysis and interpretation of results

- 22/ Time horizon of costs and benefits is stated
- 23/ The discount rate(s) is are stated
- 24/ The choice of rate(s) is are justified
- 25/ An explanation is given if costs or benefits are not discounted
- 26/ Details of statistical tests and confidence intervals are given for stochastic data
- 27/ The approach to sensitivity analysis is given
- 28/ The choice of variables for sensitivity analysis is justified
- 29/ The ranges over which the variables are varied are stated
- 30/ Relevant alternatives are compared
- 31/ Incremental analysis is reported
- 32/ Major outcomes are presented in a disaggregated as well as aggregated form
- 33/ The answer to the study question is given
- 34/ Conclusions follow from the data reported
- 35/ Conclusions are accompanied by the appropriate caveats

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525 Twenty-third Street, NW
Washington DC 20037

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