Economic Evaluation for Global Health Programs

Evaluation encompasses a broad range of methods that measure real or expected changes in operational and impact indicators associated with health service delivery and technologies during all stages of the project life cycle. Evaluation addresses different program and project components, generally focusing on inputs and outputs and processes and outcomes. These indicators should tell how well a project or program is functioning and how well it is meeting the intended goals and objectives.

Evaluations of clinical trials focus primarily on health outcomes that generate important information on the safety, efficacy or effectiveness of a single intervention. However, they reveal little about how resources were used to achieve health outcomes.

Economic evaluations provide decision makers with information on the tradeoffs in resource costs and public health benefits involved in choosing one intervention over another. The most popular method has been cost-effectiveness analysis, which simultaneously evaluates the outcomes and costs of interventions, designed to improve health. In theory, cost-effectiveness analysis is an important tool for improving the efficiency of health service delivery. In practice, it is only one of many considerations influencing health policies and programs. Other key factors are national awareness of the burden of disease, political will to address the problem, and access to financial resources to support long-term interventions. Economic evaluations, along with research on safety, efficacy, and effectiveness are crucial inputs for assessing health technologies and interventions for use in low-resource settings. Evidence of cost-effectiveness supports awareness raising and advocacy activities. It also enables program planners to allocate resources to those interventions with the greatest impact on the burden of disease, ultimately improving human and social development in low-resource settings.

This overview will define various methods of economic evaluation, the operational steps for organizing them, and a strategic approach to economic evaluation in the field. References and relevant resources are included.

What are Economic Evaluations?

A number of approaches are available to understand the economic costs and impact on health outcomes. The most common type of economic evaluation for evaluating health interventions is **cost-effectiveness analysis (CEA)**. CEA compares the costs and outcomes of two or more alternatives or compares a new intervention or treatment with the status quo. CEA relates the net costs associated with a health outcome, such as cost per disease avoided, cost per death avoided, or cost per additional expected life year. The net cost includes the cost of delivering a specific health intervention to prevent a disease or unwanted health outcome minus the treatment and other costs not incurred because of the beneficial effects of the intervention. A ratio is calculated for each alternative intervention: the numerator is the cost, expressed in money terms (dollars); the denominator is the measurable health outcome. The health outcome typically is expressed in terms of the gain in years of life, although there are many expressions of the effectiveness measure that attempt to capture both morbidity and mortality

in a single metric (see the text box). The intervention with the lowest dollar value per health benefit is the more cost-effective of the two or more alternatives.

CEA is just one of several methods for economic evaluations of health interventions. The family of economic evaluation methods is described in the box below. Three broad types of analyses are generally used: cost-minimization analysis, cost-benefit analysis, and cost-utility analysis.

The Family of Economic Evaluation Methods[1]

Cost-effectiveness analysis often is confused with several other economic evaluation methods, and for that reason it is useful to define those as well.[2] Cost-minimization analysis, the simplest form of economic evaluation, compares the costs of two or more competing interventions; the cheapest one—regardless of differences in effectiveness—wins the competition for resources. This type of analysis is a sensible approach to allocating resources efficiently when the effectiveness of two interventions is identical, a rare circumstance.

Cost-benefit analysis (CBA) is an evaluation method in which the benefits of the health intervention are expressed in money terms—that is, a dollar value is placed on the life-years gained—and thus a ratio of benefit to costs of less than one would imply that the intervention was not worth undertaking at all, while a benefit-to-cost ratio greater than one would suggest that the intervention is a good investment. While CBA is a popular method for decisions about the advisability of allocating resources to investment projects—for example, building a hydroelectric dam—it has been less well accepted for evaluating investments in the health sector (or other social sectors). Placing a dollar value on health benefits is an exercise fraught with conceptual and empirical difficulties; the sensitivity of the CBA result to assumptions about the value of life renders the method of limited practical value in the field of health policy.

Cost-utility analysis (CUA), which is often mistaken for cost-effectiveness analysis, attempts to incorporate the dimension of quality of life into the measurement of benefits. Benefits are measured as "quality-adjusted life-years," or QALYs, in which the gain in expected lifespan resulting from an intervention is weighted by the quality of that life, as assessed through some type of systematic surveying of the affected (or general) population. Thus, an intervention that leads to a ten-year gain in life expectancy, but implies considerable pain during those years might be estimated to have a lower QALY than an intervention that results in only an eight-year gain in years, but with less pain during that period. Although there is considerable debate about the optimal ways to assess the subjective "quality" dimension, analysts generally agree that QALYs are closer to the fundamental concept of health benefits than are the standard physical measures used in cost-effectiveness analysis.

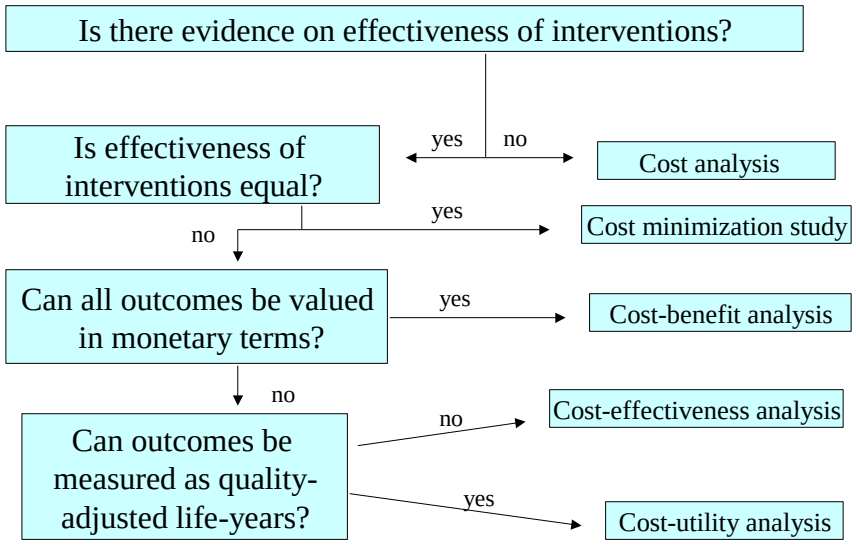
[1]This section is taken from: Levin, R. 'Cost-effectiveness of Immunization: Asking the Right Questions.' In ed. Bloom, B. and P. Lambert. The Vaccine Book, San Diego: Academic Press, 2003, with the permission of the author.

[2]Many excellent texts are available for those interested in additional information about economic evaluation methods [See the reference list at the end of this document].

The most basic type of economic evaluation is a **cost analysis**, which is a partial form of economic appraisal because it looks only at the costs of the programs and provides no information on the health outcome of interest. A cost analysis can be used when the effectiveness of an intervention is not yet known. For instance, if we are evaluating a pilot project that lasts two years, but the impact on health outcomes is not expected until several years beyond that, then we may want to have information on cost of reaching intermediate targets. Also, a cost analysis is useful for comparing two interventions where the effectiveness is not the same.

Figure 1 shows how the different economic evaluations are different, and can help determine which type of analysis is most appropriate and feasible.

Figure 1. Types of Economic evaluation



Source: Gray, A. Economic Evaluation in Dawes, et al. Ed. Evidence Based Practice: A primer for health care professionals. 2001.

Why Conduct Economic Evaluations?

Economic evaluations are used to assist in setting priorities, making resource allocation decisions and designing services when there are competing health interventions and limited resources. Economic appraisals evaluate efficiency, sustainability, and cost-effectiveness. More specifically, they assist health program managers and policy makers in a number of ways:

- To guide decisions about the most appropriate mix of strategies and the best way to allocate scarce resources.
- To provide an overview of the total amount of resources that will be needed to start or expand a project.

- To assist discussions about the relative efficiency and equity of projects.
- To assist managers in deciding on the most appropriate way to deliver a particular health intervention.
- To provide information for the advocacy of new health interventions and technologies.
- To provide evidence-based information to donors and policy makers that funding decisions resulted in cost-effective allocation of resources.

To this end, CEA can be used to inform decisions about incorporating new health interventions, health technologies, or treatments into existing health service delivery systems. CEA can also be used to support decisions to increase coverage of a service or to scale up projects from pilots to national programs. CEA is often essential for advocacy and raising awareness prior to introducing a health intervention or technology that is new to a specific country setting. CEA can provide useful information for increasing access to health care provision, and better targeting scarce resources to maximize the impact of health interventions.

Even a stand-alone cost analysis provides decision makers with important information on the resources needed to introduce or expand a service or product. Once an intervention is established, a cost analysis becomes the more relevant evaluation for health program managers at the service provision level. It provides budgetary information about the actual resource needs or inputs required to provide the intervention; it improves program budgeting by monitoring costs; it helps to estimate the resources needed to expand the intervention into new districts; and it assesses the likely sustainability of the intervention nationally over time. The simpler cost analysis is also useful for assessing the replicability of the project in other settings, and informing budgetary requirements for financial planners and donors.

How to Conduct an Economic Evaluation?

This guide provides the steps that are needed to organize an economic evaluation of a health program or interventions. The example is provided for a CEA, however similar steps would be taken for cost-benefit, cost-utility and the simpler cost-analysis appraisals. The actual collection of cost and effectiveness data is not addressed in this brief overview. The reference list provides a number of costing guidelines by health topic and where they are available.

Steps in Organizing a Cost-Effectiveness Analysis (CEA)[1]

Step 1: Define the problem and objectives. As described above, economic evaluations may be done for a number of reasons. Before starting your study, make sure that the team is clear on the questions, the purpose of the work, and how the information will be used. This will help determine the methodological approach and estimate the budget for conducting the economic evaluation itself.

[1] Adapted from Chapter 5 "Cost-Effectiveness Analysis" in D. Grembowski. The Practice of Health Program Evaluation, London: Sage Publications 2001.

Step 2: Identify the alternatives. The core feature of a CEA is to compare an intervention to one or more alternatives. The choice of alternatives will determine what information is collected, how it is collected, and how the results are used. For a particular program or health technology, several alternatives are likely, such as no action (immunization versus no immunization; testing for an STI or HIV versus no testing) or comparison of different technologies for delivering the same service (detecting cervical cancer using cytology, visual inspection with acetic acid, or using an HPV rapid test); comparing the status quo to a new method or technology (syphilis testing using a rapid ICS test compared to either no testing or testing with laboratory based methods).

Step 3: Describe each alternative. Once the alternatives are identified, the goal is to identify all of the inputs required to implement the program or service for each alternative. The easiest way to do this is to describe each alternative in detail, describing the set of activities involved in providing the health service intervention. These include start-up activities (to assess capacity, raise awareness, train health workers, and mobilize beneficiaries), service delivery at the point of care (clinic based, outreach, hospital, laboratory), supervision and monitoring, and other management and administrative activities. Once the set of activities has been identified, the next step is to identify the type and quantity of inputs that will be required. For instance, what capital equipment is needed, such as buildings, equipment, vehicles, and consultancies? What recurrent inputs will be used, such as personnel, supplies, operating and maintenance for vehicles, travel costs and per diems, production of IEC or training materials, etc.?

Step 4: Define the perspective of the CEA. The choice of perspective influences which costs to consider and whose value to use. There are three basic viewpoints that are used in economic evaluations: a societal perspective, the provider's perspective, or the private (patient or household) perspective.

There are six additional steps needed to conduct the cost-effectiveness analysis. These are briefly described below. More information on each of these steps can be found in Grembowsk (2001), Drummond et al. (1997), and Gold et al. (1996).

Steps in Identifying and Collecting Cost-Effectiveness Data.

Step 5: Identify, measure, and value costs. A number of important activities take place during Step 5. These include identifying whether financial or economic data will be collected[1], collecting background data (on salaries, inflation, discount rates, CPI) from the Ministry of Health, the Ministry of Finance or other Central Economic Planning and Statistical Offices; identifying the different types of cost data that are needed, and collecting

[2] Financial costs include the actual project expenditures for all inputs and resources used by the project. However, often many resources are used to provide services that are not fully captured in budget expense reports (e.g., vaccines, drugs, devices, or other supplies that have been donated or provided with a large discount or volunteer's time to recruit beneficiaries into the program). The economic cost recognizes the cost of using resources that could have been productively used elsewhere. For most analyses, economic costs supplement the financial costs that are easily available from financial records.

these data from the program or project. Literature reviews are a great first place to start, to see what data may already exist.

Step 6: Identify and measure effectiveness. Data on outputs and outcomes of the program should be identified during the planning stages of the project, and these must be collected as part of the cost-effectiveness study, if they are not already being collected as part of a broader evaluation of the program or project. Ideally, the ultimate indicator of public health impact would reflect the impact on morbidity and mortality as a result of the intervention. In general, complete and reliable data on mortality and morbidity doesn't exist and it is expensive to collect. Population-based figures are not readily available and those data that do exist are clinic-based and may not reflect actual disease prevalence, especially in countries where access to health facilities is extremely limited. At a program or project level, collecting data on morbidity and mortality is expensive, since it requires collecting data from a large sample in order to get significant estimates.

Since data on health outcomes are not always available, many projects will need to collect information on process measures of outcomes or on intermediate measures of outcome. Process measures of outcomes are used to record the outputs of the project or program. These data are often routinely measured and available from the project records. Process measures of outcomes may include the number of materials produced, the number of volunteers and staff trained, or the number of people reached.

Intermediate measures of outcomes reflect intermediate changes that must take place in order to achieve health impacts of the given intervention. Often, health evaluations measure the impact on specific health outputs that are strongly associated with improved health outcomes. For some health interventions, where the efficacy or the effectiveness of the intervention is well established, evaluating the intervention on intermediate outputs is an appropriate approach. For instance, in the field of immunization, coverage rates are considered a reliable measure of an intermediate output, since data on coverage has been improved and is generally available. Utilization or coverage data can assess whether the inputs are reaching the target group and provide information on the demand for services. These data may or may not be systematically monitored, and therefore, estimates from the broader project evaluation should be used.

The Final Steps of the Cost Effectiveness Analysis Include:
Step 7: Organizing the data on costs and effectiveness in a spreadsheet format.
Step 8: Discounting future costs and effectiveness for studies whose costs and effects occur over several years.
Step 9: Conducting sensitivity analysis: sensitivity analysis refers to re-estimating the model using minimum and maximum ranges for some indicators where the true values are unknown or where there is likely to be a lot of variability in the estimate. It is especially important to conduct sensitivity analysis for those variables that are expected to have a large impact on the cost-effectiveness of the intervention.
Step 10: Using the CEA results in decision making

Using a Strategic Approach to Conducting Economic Evaluations along side demonstration projects.

Planning and conducting a cost-effectiveness study can at first feel overwhelming, especially to field staff who are consumed with implementing the actual intervention and find themselves busy with day-to-day management of activities. Depending on the intervention's research and evaluation objectives and the available budget, it may be important to use a strategic approach that reduces the burden of data collection for the economic evaluation on the project. This can be achieved in the following ways.

- **Integrate cost analysis into on-going evaluation.**
  An economic evaluation is more effective if it is integrated into the broader program or project evaluation. Start planning the CEA or cost analysis during the proposal writing stages of the project. Define the objectives alongside the program evaluation objectives. The indicators to measure impact, effectiveness, or intermediate outcomes are likely to be the same ones that will be used in the CEA.

- **Use a rapid, inexpensive approach.**
  Look for inexpensive opportunities to gather the data on resources and inputs early on in the project. Start with collecting data at the highest organizational level possible for main service delivery using available budgetary expense reports. Identify the gaps in information, and then plan how to more systematically collect information using surveys or observation at the health facility or community level.

- **Use rough cost estimates to look at cost profile/breakdown of costs.**
  Focus efforts on obtaining information on the largest input categories, rather than smaller, less important categories. Costs that are not likely to matter can be estimated using rough calculations. Such costs may include operating costs or overhead costs.

- **Work closely with local counterparts to collect basic data and cost information.**
  More often than not, much of the data and information that is needed for the cost analysis is already there and it is a matter of finding it at the appropriate organizational level. Working closely with project managers and Ministry of Health staff can help reduce the time spent in searching for information and reduce the burden on clinical staff. Look for local health economists who are able to direct you to previous cost-effectiveness studies in the health sector.

Written by Carol Levin, University of Washington, Department of Global Health, 206-744-3790, clevin@uw.edu

References and Relevant Resources

General References

Drummond MF, O'Brien B, Stoddart GL, Torrance GW. *Methods for the Economic Evaluation of Health Care Programmes*, 2nd ed. Oxford Medical Publications, Oxford University Press, New York, 1997.

Gold MR, Siegel JE, Russell LB, Weinstein MC. *Cost-Effectiveness in Health and Medicine*. Oxford University Press, New York, 1996.

Cost Analysis in Primary Health Care. A Training Manual for Programme Managers. Edited by Creese A, Parker D. World Health Organization, 1994.

Gray, A. Economic Evaluation. In ed. M. Dawes, P. Davies, A. Gray ,J. Mant, K. Seers and R. Snowball, *Evidence-Based practice: A Primer for Health Care Professionals*. Churchill Livingstone, London. 1999.

National Library Medicine Glossary of Economic Evaluation Terms
http://www.nlm.nih.gov/nichsr/edu/healthecon/glossary.html

Newbrander W, Lewis E. *Hospital. A Tool for Allocating Hospital Costs.* Version 3.0. Management Sciences for Health, Boston, 2001.

Making Choices in Health: WHO Guide to Cost-Effectiveness Analysis. Edited by Tan Torres, T. R. Baltussen, T. Adam, R. Hugubessy, A. Acharya, D.B. Evans, and C. J. L. Murray. Geneva: WHO, 2003.

WHO Guide to Identifying the Economic Consequences of disease and injury. Geneva: WHO 2009.

Decision Modelling for Health Economic Evaluation
A. Briggs, K. Claxton, M. Sculpher

Nutrition

Methods for Assessing the Cost-Effectiveness of Micronutrient Programs. Opportunities for Micronutrient Interventions, November 1996. Draft Mimeograph (available from Carol Levin)

Immunization

Guidelines for Estimating Costs of Introducing New Vaccines into the National Immunization System. World Health Organization, 2002.
http://whqlibdoc.who.int/hq/2002/WHO_V&B_02.11.pdf

WHO guide for standardization of economic evaluations of immunization programs
http://whqlibdoc.who.int/hq/2008/WHO_IVB_08.14_eng.pdf

Economics of Immunization: a guide to the literature and other resources. World Health Organization, 2004.
http://whqlibdoc.who.int/hq/2004/WHO_V&B_04.02.pdf

Reproductive Health
Janowitz B, Bratt JH. *Methods for Costing Family Planning Services.* United Nations Population Fund and Family Health International, 1994.

Cost Analysis Tool. Simplifying cost Analysis for Mangers and Staff of Health Care Services. EngenderHealth, 2001.

Mother-Baby Package Costing Spreadsheet. Reproductive Health and Research, World Health Organization, 1999.

Diarrhoeal Diseases

Cost-Effectiveness Analysis. Guidelines for Managers of Diarrhoeal Disease Control Programmes. Programme for Control of Diarrhoeal Diseases, World Health Organization, 1988.

Guidelines for estimating the economic burden of diarrhoeal disease with focus on assessing the costs of rotavirus diarrhea. World Health organization. 2005.

HIV/AIDS

Costing Guidelines for HIV Prevention Strategies. Joint United Nations Programme on HIV/AIDS (UNAIDS) 2000.
http://www.hivtools.lshtm.ac.uk/downloads/costings/costgui.pdf

Tuberculosis
Guidelines for Cost and Cost-Effectiveness Analysis of Tuberculosis Control. Document 1: Introduction, Important Economic Concepts, Protocols, and Useful References. World Health Organization, 2002; Document 2: Data entry sheets for exercise and protocols.
http://whqlibdoc.who.int/hq/2002/who_cds_tb_2002.305a.pdf

Short courses in Health Economic Evaluation are available from the following Universities

1. The Health Economics Research Centre (HERC)- of Oxford University
http://www.herc.ox.ac.uk/courses
Introduction to Health Economic Evaluation
is a one-day course for health professionals and health researchers who want to understand the basics of health economics and its relevance to the health service. No previous knowledge of economics required.

All courses in 2013 will take place at St Catherine's College, Oxford
Next dates:
13 March 2014 - Space Available
14 March 2014 - Space Available

Applied Methods of Cost-Effectiveness Analysis
A three-day course for health economists and health professionals with some knowledge of health economics who wish to learn about the methodology of cost-effectiveness analysis as applied in health care.

Next dates:
30 June -2 July 2014, St Catherine's College, Oxford (Residential) - Space Available

2. Centre for Health Economics at The University of York
http://www.york.ac.uk/che/courses/short/
Decision analytic modelling for economic evaluation
This is a two-day course providing an introduction to the principles and practice of decision modelling for economic evaluation in health. The course is aimed at health professionals who wish to develop skills in decision analysis for purposes of cost effectiveness analysis. It is designed for participants who are familiar with the basic principles of economic evaluation who wish to build, interpret and appraise decision models.

3. Harvard School of Public Health
RDS 286. Decision Analysis in Clinical Research
Instructor: Milton Weinstein
July 1-26 2014
An introductory course in decision analysis methods relevant to clinical decision-making and clinical research. Topics range from Bayes theorem and evaluation of diagnostic test strategies to cost-effectiveness analysis in clinical research and health policy.