



Reference Case Guidelines for Benefit-Cost Analysis in Global Health and Development

Summary and Recommendations

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Preface

This summary of the *Reference Case Guidelines for Benefit-Cost Analysis in Global Health and Development* was prepared under the "Benefit-Cost Analysis Reference Case: Principles, Methods, and Standards" project (grant number OPP1160057) funded by the Bill & Melinda Gates Foundation. The Gates Foundation program officers are Damian Walker and David Wilson.

The aim of this project is to promote the use, and the usefulness, of benefit-cost analysis. The guidelines are designed to clarify important concepts, aid in implementation, and provide default values for key parameters including options for standardized sensitivity analysis. This summary and the detailed guidance document it references are intended for use by practitioners with some training and experience in conducting economic evaluations, including those who work for academic institutions, government agencies, international organizations, nongovernmental organizations, other nonprofit or for-profit entities, and independently. Additional materials are available on the project website: https://sites.sph.harvard.edu/bcaguidelines.

Lisa A. Robinson is the Principal Investigator and James K. Hammitt is the co-Principal Investigator (Harvard T.H. Chan School of Public Health). They received substantial support and assistance from the project Leadership Team and Advisory Group, who co-authored these guidelines.* A series of 13 methods papers and cases studies provide the foundation for these guidelines; several have been published in a special open access issue of Journal of Benefit-Cost Analysis, available here: https://www.cambridge.org/core/journals/journal-of-benefit-cost-analysis/firstview/special-issue-benefit-cost-analysis-in-low-and-middle-income-countries-methods-and-case-studies.

The project team is grateful for the advice and support provided by the many contributors to this effort, including all of those who drafted papers, provided comments, and participated in our workshops and other meetings. A full list of contributors is provided in the main guidelines document as well as on the project website.

*The views expressed in this document are solely those of the authors, and do not necessarily reflect the views of the organizations with which they are affiliated or their membership.

Summary and Recommendations

Benefit-cost analysis (BCA) and other forms of economic evaluation are powerful tools, encouraging the systematic collection and assessment of the evidence needed to support sound policy decisions. In low- and middle-income countries, where resources are especially scarce and needs are very great, such decisions are particularly difficult and economic evaluations can be especially useful. If not well conducted and clearly reported, however, these studies can lead to erroneous conclusions. Differences in analytic methods and assumptions can also obscure important differences in policy impacts.

Recognizing these challenges, the Bill & Melinda Gates Foundation is supporting the development of reference case guidelines. These guidelines are intended to increase the comparability of economic evaluations, improve their quality, and expand their use. The resulting analyses will promote understanding of the difficult trade-offs faced within and across sectors and support decisions by the Gates Foundation, other nongovernmental organizations, government agencies, and individuals. In this summary, we provide background information on this effort then describe the recommendations that are discussed in more detail in the guidelines.

The process used to develop these reference case guidelines was designed to encourage extensive involvement from stakeholders, including both BCA practitioners and consumers.[1] The goal is to ensure that the guidance incorporates multiple perspectives and types of expertise, and is both useful and used. In the first phase, we explored the potential scope of the guidelines. We reviewed available guidance and selected analyses, conducted a stakeholder survey, discussed the issues in a public workshop, and solicited comments. In the second phase, we commissioned a series of 13 papers to develop methodological recommendations in key areas and to test them through application to case studies. The drafts were posted online for public comment, discussed in a public workshop, and then revised. The third phase involved developing these guidelines, which are freely accessible online and intended to be easily updated as new research results become available and methods are further developed.

[1]More information on this project, including related reports, working papers, and workshop materials, is available on our website: https://sites.sph.harvard.edu/bcaguidelines/.

S.1 Introduction and Background

The starting point for this work is the International Decision Support Initiative (iDSI) Reference Case, which was funded by the Gates Foundation to provide general guidance for all types of health-related economic evaluations as well as specific guidance for conducting cost-effectiveness analysis (CEA). The Gates Foundation then funded this project, which expands the iDSI Reference Case to include BCA.

> These BCA guidelines build on the iDSI Reference Case, which includes general guidance for conducting health-related economic evaluations and specific guidance for assessing cost-effectiveness.

The iDSI Reference Case concentrates on the use of economic evaluation for health technology assessment, including interventions to prevent or treat particular health conditions primarily within the health care system. The goal is to explore the effect of these interventions on health, usually measured as changes in quality-adjusted life years (QALYs) or disability-adjusted life years (DALYs). Both are nonmonetary measures that integrate consideration of health and longevity. In this context, CEA is typically used to determine whether funding a particular intervention is more or less cost-effective than other uses of health care resources.

BCA aims to assess the effects of policies on overall welfare rather than solely on health. It uses monetary values to measure the extent to which individuals are willing to exchange their income – which can be spent on other things – for the health and non-health outcomes they will likely experience if a policy is implemented.[2] The expansion of the reference case to include BCA reflects the goals of the Gates Foundation. While global health continues to be its primary focus, the Foundation also has a strong interest in other sectors such as agriculture, financial services for the poor, water and sanitation, and education. It expects the use of BCA will inform how it and others allocate their resources both within and across sectors.

Whether CEA, BCA, or both should be applied depends on the decision-making context, including the interests of those involved, the nature of the problem to be addressed, and the resources to be reallocated. For example, if the policy question is how to best reallocate the health care budget to improve health, then CEA is usually most appropriate. If the policy question is how to best set the health care budget, reallocate other government spending, adjust

[2] We use the term "policy" as a generic term to include projects, programs, interventions, and other actions that affect the wellbeing of multiple individuals in a society.

tax policies, or design regulations to increase societal welfare, then BCA is often most appropriate.[3] Because any analytic approach will have advantages and limitations that relate to the data and methods available as well as the underlying assumptions, conducting both CEA and BCA provides useful insights in many settings.

While the term "benefit-cost analysis" is used generically to refer to any process for weighing harms and improvements, within welfare economics it has a more precise meaning. Conceptually, it is based on two fundamental normative elements. The first is that each individual is the best, or most legitimate, judge of his or her own welfare. How individuals' concerns about other peoples' wellbeing should be incorporated raises complex issues that are not fully resolved. The second is that the preferred policy is that which maximizes social welfare, measured by summing the effects of policy across individuals. The idea is that concerns about who receives the benefits and who bears the costs should be addressed separately, through policies that directly affect distribution such as the tax and income-support system. Those who are not entirely comfortable with these normative underpinnings may still find the methods used and the information generated by this framework useful.

In benefit-cost analysis, money is not important *per se*; rather it measures the trade-offs individuals are willing to make between spending on policy outcomes (such as improved health) and on other goods and services. The goal is to recognize the opportunity costs; the labor, materials, and other resources that will not be available for other purposes if the policy is implemented.

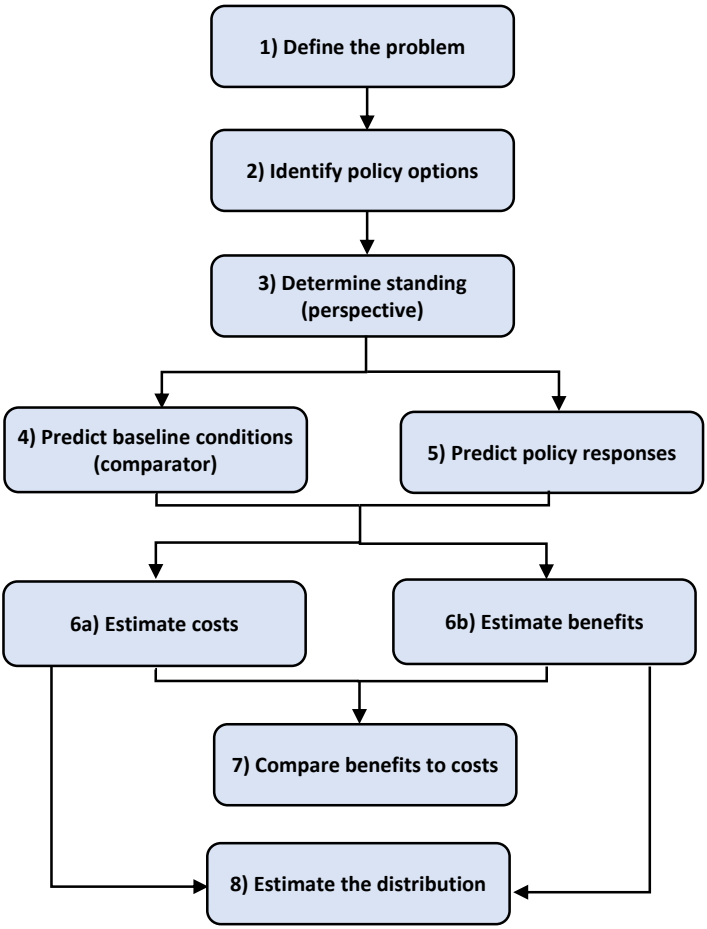
As does the iDSI Reference Case, most BCA guidance recommends that economic evaluation should play a major role in the decision-making process but should not be the sole basis for policy decisions. This recommendation in part stems from the need to address normative issues, such as concerns for others' wellbeing, that may not be adequately captured in these frameworks. Another concern is the need to examine legal, technical, budgetary, and political constraints. Finally, as is the case with any form of evaluation, addressing data gaps and inconsistencies poses many challenges. Analysts must carefully investigate the evidence, identify and assess the effects of uncertainties (including impacts that cannot be quantified), and clearly communicate the implications for decision-making.

[3] Exceptions include interventions that do not directly address the burden of disease, such as those related to contraception, abortion, palliative care, and cosmetic surgery. Because the outcomes in these cases cannot be easily measured using QALYs or DALYs. BCA may be more useful than CEA in considering how to allocate a health care budget that includes these types of interventions.

S.2 General Framework

As conventionally conducted, BCA consists of seven basic components; distributional analysis is a desirable eighth component, as illustrated in Figure S.1. While shown as if it were a sequential process, in reality these steps are iterative. As analysts acquire additional information and review their preliminary findings, they often revise earlier components to reflect improved understanding of the issues. Each of these steps requires consideration of uncertainty as well as non-quantified effects.

Figure S.1: BCA Components



We briefly introduce each component below and discuss some general implementation issues. For simplicity, this overview assumes the BCA is conducted from a prospective, *ex ante* perspective, before the policy is implemented. BCA may also be conducted from a retrospective, *ex post* perspective, after the impacts of the policy have materialized, to compare the results to what would likely have occurred in the absence of the policy.

(1) ***Define the problem:*** BCA is often motivated by a specific problem or policy goal, which may be identified by the analyst, a policymaker, or others. The problem may, for example, involve more effectively controlling tuberculosis, reducing poor nutrition, increasing agricultural yields, improving educational attainment, or other goals. It may also or instead involve prioritizing spending across interventions in different policy areas. Whatever the goal, the analysis should be comprehensive and include all significant consequences.

(2) ***Identify policy options:*** While many studies assess only a single option for addressing the problem, considering several reasonable alternatives is preferable. Evaluating only one option can lead decision-makers to ignore others that may be more cost-beneficial.

(3) ***Determine who has standing (perspective):*** Standing refers to identifying whose benefits and costs will be counted. The analysis may, for example, consider impacts on only those who reside or work in a specific country or region, or may address international impacts. This concept is related to that of "perspective" in CEA. For example, a CEA may be conducted from the societal perspective, in which case all impacts are included, or from the perspective of the health care sector, in which case only the impacts on that sector are considered.

When the question of standing or perspective raises difficult issues, it is often useful to report the results at different levels of aggregation rather than trying to fully resolve these issues prior to conducting the analysis. For example, the results could be reported for a specific region, for the country as a whole, and at the global level, or for the health care system alone and for society at large.

(4) ***Predict baseline conditions (comparator):*** Each policy option is typically compared to a "no action" baseline that reflects predicted future conditions in the absence of the policy, although other comparators may at times be used. The baseline should reflect expected changes in the status quo. For example, the health of the population and its size and composition may be changing, and the economy may be evolving, in ways that will affect the incremental impact of a policy.

(5) ***Predict policy responses:*** This component involves predicting the impacts of each option in comparison to the baseline or other comparator. One challenge is ensuring that changes likely to occur under the baseline are not inappropriately attributed to the policy; another is understanding the causal pathway that links the policy to the outcomes of concern. The goal is to represent the policy impacts as realistically as possible, taking into account real-world behavior.

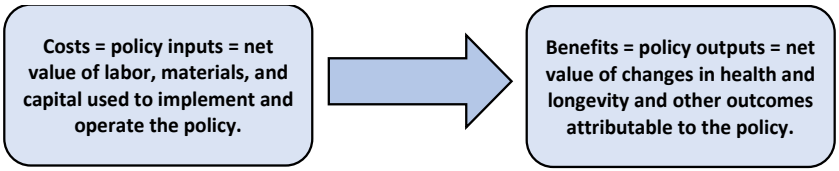
These impacts should be described both qualitatively and quantitatively, comparing predictions under baseline conditions to predictions under the policy. Related measures should include, at minimum, estimates of the expected number of individuals and entities affected in each year, along with information on their characteristics. For policies that affect health and longevity, the expected number of deaths and cases of illness, injuries, or other disabilities averted in each year should also be reported.

(6) ***Estimate costs and benefits:*** Whether a consequence is categorized as a "cost" or "benefit" is arbitrary and varies across BCAs. As long as the sign is correct (positive or negative), the categorization of an impact as a cost or a benefit will not affect the estimate of net benefits, but will affect the benefit-cost ratio. Consistent categorization is essential for comparability of benefit-cost ratios, total costs, and total benefits across analysis.

One intuitively appealing option is to distinguish between inputs and outputs as illustrated in Figure S.2. Under this scheme, costs are the required inputs or investments needed to implement and operate the policy – including real resource expenditures such as labor and materials, regardless of whether these are incurred by government, private or nonprofit organizations, or individuals. Benefits are then the outputs or outcomes of the policy; i.e., changes in welfare such as reduced risk of death, illness, or injury.

Under this framework, counterbalancing effects are assigned to the same category as the impact they offset. For example, "costs" might include expenditures on improved technology as well as any cost-savings that result from its use; "benefits" might include the reduction in disease incidence as well as any offsetting risks, such as adverse reactions to

Figure S.2: Categorizing Impacts as Costs or Benefits



medication or post-surgical infections.

These guidelines do not address the estimation of costs in detail. Generally, the same approaches are used to estimate costs in CEA and in BCA; related guidance is provided by the iDSI Reference Case these guidelines supplement as well as by the work of the Global Health Cost Consortium and others.

These guidelines focus largely on the estimation of benefits, particularly those that cannot be fully valued using market prices. For example, valuing changes in health and longevity generally requires the use of revealed- or stated-preference methods. Revealed-preference methods estimate the value of nonmarket outcomes based on the prices paid for related market goods, while stated-preference methods estimate these values based on survey data.

(7) ***Compare benefits to costs:*** The final step in the BCA involves comparing costs and benefits. As part of this calculation, future-year impacts are discounted to reflect time preferences and the opportunity costs of investments made in different periods. This discounting reflects the general desire to receive benefits early and to defer costs. The monetary values of benefits and costs should be discounted at the same rate.

The results are often reported as net benefits (benefits minus costs). Benefit-cost ratios or the internal rate of return (IRR) may also be used, but must be constructed and interpreted with care. Benefit-cost ratios depend on how components are classified as benefits or costs. The IRR, which is the discount rate at which the present value of net benefits is zero, may not be unique if net benefits change sign more than once over time. The IRR does not exist if net benefits are always positive (or always negative) in every year.

The selection among these summary measures will depend in part on the goal of the analysis. For example, when assessing options for achieving a particular policy goal, estimates of net benefits are likely to be most useful. When prioritizing spending across numerous policies, benefit-cost ratios or IRRs may be informative. It is generally useful to report net benefits along with the benefit-cost ratio or IRR to indicate the magnitude of the impacts.

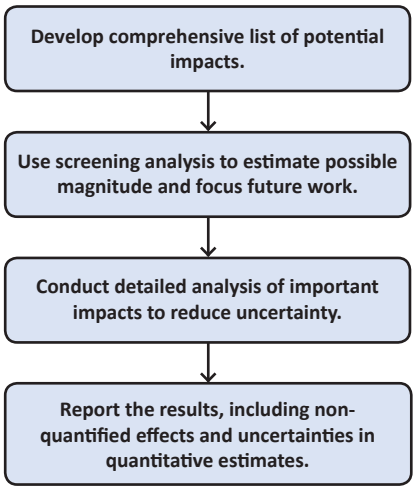
(8) ***Estimate the distribution of impacts:*** While often considered to be outside the BCA framework, the distribution of impacts across a population is frequently important to decision-makers and other stakeholders. At minimum, analysts should provide descriptive information on how both the costs and benefits are likely to be allocated across income and other groups, including the variation in net benefits, benefit-cost ratio, or IRR.

Each of the above components requires appropriate consideration of uncertainty, including non-quantified effects. In summarizing the results, analysts should address the extent to which these uncertainties affect the likelihood that a particular policy yields benefits that exceed costs and the relative ranking of the policy options.

Because analytic resources are limited, the ideal analysis will not assess all policy options nor quantify all impacts with equal precision. In some cases, the cost of analyzing a particular option or quantifying a specific impact will be greater than the likely benefit of assessing it, given its importance for decision-making. In other words, the analysis may not sufficiently improve the basis for decision-making to pass an implicit benefit-cost or value-of-information test. Conversely, options and impacts that are important for decision-making should receive substantial attention.

To implement the BCA framework, analysts should begin by listing all potential costs, benefits, and other impacts, then use screening analysis to identify the impacts most in need of further investigation, as illustrated in Figure S.3. Screening analysis relies on easily-accessible information and simple assumptions to provide preliminary insights into the direction and magnitude of effects. For example, upper-bound estimates of parameter values can be used to determine whether particular impacts may be significant. Screening aids analysts in justifying decisions to exclude impacts from more detailed assessment and in determining where additional research is most needed to reduce uncertainty. It also provides data that can be used to indicate the rough magnitude of impacts that are not assessed in detail.

Figure S.3: Implementation Steps



S.4 Recommendations

In addition to an overview of the analytic framework, these guidelines include specific recommendations in seven areas, focusing on approaches that can be implemented with reasonable ease by analysts working in low- and middle-income countries[4]:

1. Comparing Values Across Countries and Over Time
2. Valuing Mortality Risk Reductions
3. Valuing Nonfatal Health Risk Reductions
4. Valuing Changes in Time Use
5. Assessing the Distribution of Impacts
6. Accounting for Uncertainty and Nonquantifiable Impacts
7. Summarizing and Presenting the Results

Below, we briefly summarize each topic and the recommendations. This summary presumes some familiarity with these concepts and their application on the part of the reader. The main text of the guidelines provides more detailed information on the basis for these recommendations and their application.

The distribution of monetary values over time should be reported along with their net present value, discounted to reflect time preferences.

(1) ***Comparing Values Across Countries and Over Time:*** Assessing policy options often requires translating monetary values across currencies and over time, to support within-country policy choices and allow cross-country comparisons. Three conversions are necessary to meet these objectives: (a) inflation adjustments to account for economy-wide price changes, (b) exchange rates to reflect the relative value of different currencies, and (c) discounting procedures to incorporate time preferences. We focus on defaults that analysts can use either in developing their primary estimates or in sensitivity analysis, to allow comparability with other analyses conducted within and across countries. The rates used in these conversions and their sources should be reported along with the results.

a) **Inflation and Real Changes in Value**

i. Benefits and costs should be converted to real (constant) currency units for a designated currency year using an appropriate inflation index.

ii. Benefits and costs should be adjusted for changes in real value in future years.

[4] In addition, a companion methods paper discusses valuing the financial risk protection provided by insurance

b) **Currency Conversions**

i. Benefits and costs should be reported in the local currency; when values are transferred across countries, purchasing power parity or market exchange rates should be used as appropriate for currency conversions.

ii. Total benefits and total costs also should be converted from the local currency to internationally-comparable units, such as U.S. or international dollars.

c) **Discounting**

i. The distribution of undiscounted costs and benefits over time should be reported.

ii. A context-specific discount rate should be used to estimate present values in the results highlighted by the authors.

iii. A standardized sensitivity analysis should be presented to test the implications of different discount rates, including a constant annual rate of 3 percent and a constant annual rate equal to twice the projected near-term gross domestic product (GDP) per capita growth rate. Such analysis is particularly important when uncertainty in the discount rate substantially influences the estimates of net benefits or the rankings of the policy options.

Analysts may also wish to test the sensitivity of their results to other rates, and to the effects of declining rates when important policy outcomes do not fully manifest until many years in the future.

(2) ***Valuing Mortality Risk Reductions:*** Many policies aim to improve longevity, decreasing the risk of death in each year. The value of these risk reductions is often expressed as the value per statistical life (VSL); at times a value per statistical life year (VSLY) may be used.[5] The VSL concept is widely misunderstood. It is not the value that the analyst, the government, or the individual places on saving an identified life with certainty. Instead, it reflects individuals' willingness to exchange money for a small change in their own risk, such as a 1 in 10,000 decrease in the chance of dying in a specific year.

The "value per statistical life" (VSL) is often misinterpreted as the value the government or the researcher places on saving a life. In reality, it reflects individuals' willingness to exchange their income for a small change in their own risk, such as a 1 in 10,000 decrease in the chance of dying in a specific year. Individuals often make decisions that demonstrate these preferences; for example, by spending more for a safer product.

[5] The VSLY reflects individuals' willingness to pay for a change in life expectancy, and is often calculated by dividing a VSL estimate by the life years remaining for the average individual included in the study.

This individual willingness to pay (WTP) can be divided by the risk change to estimate VSL. VSL is then multiplied by the expected reduction in the number of deaths each year attributable to the policy to estimate the resulting benefits.[6] While many alternatives to the "VSL" terminology have been proposed to clarify this concept, such as the value per standardized mortality unit (VSMU) or the value of reduced mortality risk (VRMR), they have not been widely accepted or used.

Ideally, the value of mortality risk reductions in low- and middle-income countries would be derived from multiple high-quality studies of the population affected by the policy. These values are likely to vary depending on characteristics of the society, the individuals affected, and the risk. Synthesizing the results from multiple studies relevant to that population is desirable because each will have advantages and limitations. However, extrapolation from studies of other populations will likely be necessary in the near-term, given the paucity of studies conducted in these countries. Standardized sensitivity analysis can be used to address associated uncertainties.

a) **Context-Specific Values**

i. The value of mortality risk reductions featured as the preferred estimate should reflect the decision-making context, taking into account the characteristics of the individuals affected by the policy and of the risk that the policy addresses.

b) **Population-Average Values**

i. The analysis should include a standardized sensitivity analysis to facilitate comparison to other studies and to explore the effects of uncertainties. Such analysis is particularly important when uncertainty in the value of mortality risk reductions substantially influences the estimates of net benefits or the rankings of the policy options. The sensitivity analysis should include alternative population-average VSL estimates for the target country, using research conducted in high-income countries as reference values. It should rely on gross national income (GNI) per capita measured using purchasing power parity to estimate income, and on assumed income elasticities to estimate the change in the VSL associated with

[6] Multiplying VSL by the expected reduction in the number of deaths is a short cut that should approximate the correct result. Conceptually, individuals' values are calculated by multiplying the risk reduction each experiences by their VSL, then summing the results across individuals to calculate the population value. Multiplying an average VSL by the expected reduction in number of deaths produces the same result if VSL and risk reductions are uncorrelated across individuals.

a change in income. The formula is:

$$VSL_{target} = VSL_{reference} * (Income_{target} / Income_{reference})^{elasticity}$$

The sensitivity analysis should use the following three estimates, as illustrated in Figure S.4.

i.a) VSL extrapolated from a U.S. VSL of $9.4 million and U.S. GNI per capita of $57,900 (a VSL-to-GNI per capita ratio of 160), using an income elasticity of 1.5. If this approach yields a target country value of less than 20 times GNI per capita, then 20 times GNI per capita should be used instead.

Because VSL is derived from estimates of individuals' willingness to exchange their own income for small changes in their own mortality risk, these values are likely to be smaller for poorer than for wealthier individuals, given the need to conserve money for purchasing other necessities.

i.b) VSL extrapolated from an OECD VSL-to-GNI per capita ratio of 100 to the target country using an income elasticity of 1.0; i.e., VSL = 100 * GNI per capita in the target country.

i.c) VSL extrapolated from a U.S. VSL-to-GNI per capita ratio of 160 to the target country using an income elasticity of 1.0; i.e., VSL = 160 * GNI per capita in the target country.

Option (i.a) is generally the preferred default, because it addresses concerns about the resources available for spending on mortality risk reductions in low- and middle-income countries. Options (i.b) and (i.c) are designed to align the results with the ranges applied in other research and explore related uncertainties.

ii. These VSL estimates should be adjusted for expected growth in real income over time in the target country.

Figure S.4: Examples of Extrapolated VSL Estimates Using Alternative Approaches

Approach	GNI per Capita (2015 international dollars)					
	$1,000	$5,000	$10,000	$15,000	$20,000	$25,000
a) Reference ratio=160 Elasticity=1.5	$0.021 million (21*GNI per capita)	$0.24 million (48*GNI per capita)	$0.67 million (67*GNI per capita)	$1.2 million (83*GNI per capita)	$1.9 million (95*GNI per capita)	$2.7 million (110*GNI per capita)
b) Reference ratio=100 Elasticity=1.0	$0.10 million (100*GNI per capita)	$0.50 million (100*GNI per capita)	$1.0 million (100*GNI per capita)	$1.5 million (100*GNI per capita)	$2.0 million (100*GNI per capita)	$2.5 million (100*GNI per capita)
c) Reference ratio=160 Elasticity=1.0	$0.16 million (160*GNI per capita)	$0.80 million (160*GNI per capita)	$1.6 million (160*GNI per capita)	$2.4 million (160*GNI per capita)	$3.2 million (160*GNI per capita)	$4.0 million (160*GNI per capita)

c) **Age and Life Expectancy Adjustments**

i. If the policy disproportionately affects the very young or the very old, analysts should conduct sensitivity analyses using VSLY estimates derived from one or more of the above VSL estimates as a rough proxy. This constant VSLY should be calculated by dividing the population-average VSL by undiscounted future life expectancy at the average age of the adult population in that country, relying on the age that is equivalent to one-half of life expectancy at birth to approximate this average age if needed. The VSLY should then be multiplied by the expected life year gain attributable to the policy.[7]

Little is known about how the value of mortality risk reduction varies by age or life expectancy in low- and middle-income countries. A constant VSLY, derived from the VSL, provides a rough proxy for estimating these effects when a policy disproportionately affects the very young or the very old.

ii. If the policy affects deaths around the age of birth, the VSL and VSLY estimates above can be applied. Analysts should also explore the implications of assigning positive values to mortality risk reductions that occur prior to birth.

(3) ***Valuing Nonfatal Health Risk Reductions:*** The conceptual framework and general approach for valuing nonfatal health risk reductions is the same as for valuing mortality risk reductions. The major challenge relates to the wide variety of illnesses and injuries that may be of interest, which differ significantly in severity, duration, and other characteristics. Studies of individual WTP are available for only a subset of these diverse risks, even in high income countries.

When suitable WTP estimates of adequate quality are not available, analysts typically approximate these values using estimates of averted costs (often referred to as the cost of illness, COI) alone or in combination with estimates of the change in QALYs or DALYs valued in monetary terms. We recommend that analysts use estimates of averted costs as a proxy when WTP estimates are not available and explore the sensitivity of their results to the use of monetized QALYs or DALYs.

[7] The use of a constant VSLY leads to total values that decrease as age increases, so that the value of risk reductions that accrue to young children are higher, and the value of risk reductions that accrue to the elderly are lower, than the value of risk reductions that accrue to an adult of average age. This approach is similar to the approach used in CEA, which measures changes in the risk of death as years of life lost (YLLs) (based on life expectancy at the age of death) or gained, typically using QALYs or DALYs.

a) **Willingness to Pay Estimates**

i. The analysis should rely on WTP estimates if suitable estimates of adequate quality are available for the nonfatal health effects of concern.

ii. Estimates of averted costs not otherwise included in the analysis should be added to these WTP estimates, especially if they are expected to be significant. These additional costs include medical costs paid by third parties as well as the opportunity costs of caregiving provided by family or friends. Costs borne by the individual may be included in the WTP estimate, in which case they should not be added.

b) **Proxy Measures**

i. When WTP estimates are not available, averted costs should be used as a proxy measure, recognizing that this measure is expected to understate the value of the risk reduction. These costs should include those incurred by the individual, household and family members, and third parties.

ii. Sensitivity analysis should be conducted that uses monetized estimates of the change in QALYs or DALYs to replace the estimates of costs incurred by the individual, especially if including these values is likely to significantly affect the analytic conclusions. This sensitivity analysis should involve estimating the change in QALYs or DALYs attributable to nonfatal risk reductions and valuing them using constant VSLY estimates, calculated as described in the discussion of valuing mortality risk reductions.

(4) ***Valuing Changes in Time Use:*** How individuals use their time, regardless of whether it involves paid or unpaid work or leisure, is often affected by policies that aim to improve health and development in low- and middle-income countries. Such changes may be categorized as either a cost or a benefit, depending on whether the change contributes to implementation of a policy (a cost) or is among its outcomes (a benefit).

Ideally, the value of changes in time use would be estimated using data that address the specific population and activities affected by the policy. For market work time, compensation for similar individuals in similar occupations generally provides a reasonable estimate of these values. For nonmarket work and leisure, data from nonmarket valuation studies are typically needed. In the absence of studies relevant to the policy context, previous work provides a range of values that can be applied to estimate these values.

a) **Market Work Time**

i. Changes in market work time should be valued based on compensation data for the population of concern. When the costs to employers include taxes, expenditures on fringe benefits, or other costs in addition to the compensation received by the employee, these additional costs should be included in the estimates.

b) **Nonmarket Work and Leisure Time**

i. Changes in nonmarket work and leisure time should be valued using WTP estimates, if suitable estimates of adequate quality are available.

ii. If WTP estimates are not available, 50 percent of after-tax wages should be used as a central estimate, with sensitivity analysis using 25 percent and 75 percent of after-tax wages.

(5) ***Assessing the Distribution of the Impacts:*** Conventionally, BCA focuses economic efficiency, comparing a policy's costs and benefits to estimate its net effects. There is widespread agreement, however, that information on on how the impacts are distributed across individuals is also needed to support sound decisions. Distributional considerations should be an integral part of the analytic process and include the following.

To support sound decision-making, the analysis should consider the distribution of both costs and benefits throughout the population. Focusing solely on a subset of impacts (health benefits but not costs) or a subgroup of the population (the very poor rather than the full income distribution) does not provide adequate information to support policy evaluation, design, and implementation.

a) **Individuals and Impacts of Concern**

i. In consultation with decision-makers and other stakeholders, analysts should identify the characteristics of individuals and impacts of concern. At minimum, the distributional analysis should address the effects of the policy on the health, longevity, and income of members of different income groups, including the distribution of both costs and benefits.

ii. The effort devoted to the distributional analysis, including its level of detail and degree of quantification, should be proportionate to its importance for decision-making. "Importance" may depend on the likely magnitude of the distributional impacts and concerns about associated inequities; it may also depend on the need to respond to questions likely to be raised by decision-makers and others.

b) **Distributional Metrics**

i. For each policy option, the analysis should describe the distribution

of both benefits and costs across members of different population groups. These results should be reported as monetary values and in physical terms to the extent possible; e.g., as net benefits and as the expected number of individuals who accrue net costs and/or benefits. Measures of inequality, such as the Gini coefficient, may also be used; the advantages and limitations of the selected measure(s) should be discussed along with the results.

(6) ***Accounting for Uncertainty and Nonquantifiable Impacts:***

All analytic results are uncertain to some degree, due to the characteristics of the available data and models and the difficulties of quantifying some potentially important effects. To ensure that decision-makers and other stakeholders appropriately account for these uncertainties, analysts should disclose all data sources and methods used and discuss their advantages and limitations.

Any analysis involves uncertainties, including difficulties related to quantifying some potentially important effects. The challenge for the analyst is to determine how to best convey these uncertainties to support decision-making. The goal is to ensure that decision-makers and other stakeholders comprehend the extent to which key uncertainties – in the data, models, and assumptions – affect the main analytic conclusions.

Related recommendations include the following.

a) **Uncertainty in Quantified Effects**

i. The impacts of the policy options should be quantified to the greatest extent practical; sensitivity analysis and/or probabilistic analysis should be used to illustrate the implications of uncertainties. Uncertainties should also be discussed qualitatively, including both those that can and cannot be quantified. Screening analysis should be used to tailor the analytic approach to the magnitude of the impacts and their importance for decision-making.

b) **Nonquantified Effects**

i. At minimum, the analysis should list significant nonquantified effects and discuss them qualitatively. To the extent possible, the effects should be categorized or ranked in terms of their importance within the decision-making context, including their likely direction (e.g., whether they increase or decrease net benefits) and magnitude, and the implications for selecting among policy options. Where some data exist, but are not sufficient to reasonably quantify the effect, analysts should consider whether breakeven or bounding analysis will provide useful insights. Intermediate measures, such as the number of individuals affected, should be reported where available.

(7) ***Summarizing and Presenting the Results:*** Clear and comprehensive documentation of the analysis is essential both to inform the decision-making process and to allow comparison of the results to the results of other analyses. These guidelines are intended to aid analysts in conducting work that is both useful and used, by clarifying the conceptual framework and recommending approaches for application. However, if the approach and results are not well-documented, the analysis will not fulfill its intended purpose regardless of its underlying quality.

a) **Categorizing Impacts as Costs or Benefits**

i. Impacts categorized as "costs" should relate to the implementation of the policy; impacts categorized as "benefits" should relate to its consequences. Costs include the required inputs or investments needed to implement and operate the policy – including real resource expenditures such as labor and materials, regardless of whether these are incurred by government, private or nonprofit organizations, or individuals. Benefits include the outputs or outcomes of the policy; i.e., changes in welfare such as reduced risk of death, illness, or injury.

ii. Counterbalancing effects should be assigned to the same category as the impact they offset. For example, "costs" might include expenditures on improved technology as well as any cost-savings that result from its use; "benefits" might include the reduction in disease incidence as well as any offsetting risks, such as adverse reactions to medications or post-surgical infections.

b) **Summary Measures**

i. The summary measure highlighted in presenting the analytic results should reflect the decision-making context. These summary measures may include net benefits (benefits minus costs), the ratio of benefits to costs (benefits divided by costs), and/or the IRR (the discount rate at which the net present value is zero).

ii. Regardless of whether a benefit-cost ratio or IRR is featured, it is generally valuable to also report estimates of net benefits to indicate the magnitude of the welfare gains, along with information on the distribution of the impacts.

c) **Documenting the Approach and the Results**

i. The analysis should be clearly and comprehensively documented. The documentation must describe the problem the policy is designed to address, the options considered, the analytic approach, and the results, as well as the implications of uncertainties.

ii. To inform decision-making, the documentation should be written

so that members of the lay public can understand the analysis and conclusions. It should also provide enough detail for expert review; ideally, competent analysts should be able to reconstruct the analysis or at minimum explore the implications of changing key assumptions.

Ultimately, these guidelines are intended to aid analysts, decision-makers, and other stakeholders in understanding the implications of different methodological choices, in developing high quality analyses that are consistent and comparable, and in clearly communicating the results and their implications. One theme throughout these recommendations is that we know relatively little about the values held by the populations of low- and middle-income countries. In the near-term, the implications of related uncertainties should be explored through sensitivity analysis and clearly communicated; in the longer term, more primary research is needed.

To meet the goal of encouraging evidence-based decision-making, the BCA must be clearly documented in a way that allows the general public to understand the implications. It should also provide enough detail for others to explore the effects of changing key assumptions.

Please visit https://sites.sph.harvard.edu/bcaguidelines to download the full guidelines document and read about these recommendations in more detail.

From left to right: Brad Wong, Dale Whittington, Patrick Hoang-Vu Eozenou, Anil B. Deolalikar, James K. Hammitt, Lisa A. Robinson, David de Ferranti, Maureen Cropper, Dean T. Jamison, Lucy O'Keeffe, Michele Cecchini.
Not pictured: Kalipso Chalkidou, Karl Claxton, Frederico Guanais, Soonman Kwon, Jeremy A. Lauer, Damian Walker, Thomas Wilkinson, and David Wilson.

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