6 Valuation of Health Benefits and Identification of Beneficiary Impact

Benefit Valuation

Although cost-effectiveness analysis is the test normally applied to health projects, there may be occasions when it is necessary to go further and carry out a full cost-benefit analysis. This involves the complex and controversial step of valuing the benefits of health projects. Such an analysis may be required in the appraisal of a multipurpose project (for example, an urban development scheme) with productive as well as health effects where, to complete the analysis, it is desirable to include health benefits. There may also be occasions when additional funds are made available and health projects may be in competition with projects from other sectors for the receipt of these funds. For such cross-sectoral comparisons, estimates of economic returns to projects in competing sectors may inform decision-takers of the consequences of whatever pattern of allocation is chosen. In general, however, we recommend that health benefit valuation be attempted only occasionally, and that such calculations be taken as illustrative of the potential economic impact of health projects rather than as definitive data.

Health projects may generate a diverse set of benefits such as productivity gains due to fewer life years lost to mortality and morbidity, consumption gains due to a higher quality of life and increased life expectancy, and cost savings on curative treatment. In theory, under certain restrictive conditions, the willingness of health beneficiaries to pay for health services will be the appropriate measure of the benefits to society from these services. In practice, however, the most commonly used approach to benefit valuation in the health sector defines benefits solely as the productivity impact of a health project and thus treats only the production, not the consumption, side of health effects. Hence, if the impact of a project can be converted into years of life or into years of healthy life gained, a valuation of this benefit would require an estimate of the net output per year of life saved. A crude approach is to value years of life saved at average earnings per capita for the country concerned. This will be an underestimate of economic benefits, since few would accept the proposition that a year of human life saved is only worth the average income. But it will give a starting point for calculations; and if the project is economically acceptable with this approximate approach, there may be no need for further calculation. This is sometimes termed a human capital approach to valuation of life years. More sophisticated approaches attempt to directly estimate the economic value of the productivity effects of health projects. *Box 8* summarizes the cost-benefit analysis of an onchocerciasis control program using a production function methodology. Appendix 8 illustrates the valuation of benefits by future earnings using data from the Lao Primary Health Care Project.

Estimates of the value of life are largely confined to developed countries and have generally found wide variations in the implied value of reductions in the risk of death. United States data of this nature has occasionally been used in studies in developing countries by adjusting the implied US value of life figure by the ratio of the income per capita in the country concerned to US income per capita. Thus, if the suggested value of life in the USA is $2 million, and the country in which the health project under examination has a per capita income of 20 percent of the US level, a life value of $0.40 million will be implied for the country. This approach, while methodologically unsatisfactory, is also difficult to apply given the wide range of value of life figures derived from various studies. *Table 4* illustrates the range of possible values derived from US studies.

Box 8

Benefit Valuation: Onchocerciasis Control Program

In operation in West Africa since the mid-1970s, the Program eradicates onchocerciasis or river blindness by controlling the black fly that transmits a parasitic worm, the source of the disease. The Program benefits the rural population by removing the threat of blindness and allowing large tracts of land previously unusable due to the risk of contracting onchocerciasis to be brought under cultivation. A study by the World Bank has examined the economic impact of this Project and estimated an economic IRR of 18 to 20 percent. Benefits from the Program are defined as its productive impact and are measured by the increase in agricultural output from subsistence farming. An increase in output occurs because of the additional labor and land made available by the eradication of the disease. The extent of the increase in output is quantified using a production function of the form

$$Q = A * L^{a} * K^{b}$$

where Q is value-added;
A is a constant reflecting productivity level;
L is labor input;
K is land input;
a and b are the elasticities of value-added with respect to labor and land; and
$a + b = 1.0$ so that production is assumed to exhibit constant returns to scale.

Elasticities give the increase in value-added due to a 1 percent increase in labor or land, with either one factor fixed. From other empirical works, the elasticity of labor is taken to be 0.66 (a 1 percent increase in labor input causes a 0.66 percent increase in value-added with land fixed) and of land, 0.34. An estimation of the productive effect of the program requires data on the population at risk, the incidence of river blindness, the productive years gained through control of the disease, the labor force without the Program, the new land freed for use, the land available without the Program, and the value-added in subsistence agriculture in the areas affected. A central assumption is the number of productive years saved per person affected. Following earlier works, it is assumed that on average, persons who are onchocercal blind will live another eight years with the blindness and then die 20 years prematurely. Preventing this blindness, therefore, adds 28 years to the productive capacity of each person affected. This annual increase in the labor force must be expressed as a proportion of the without-project labor force to give the percentage increase in labor supply. When this percentage increase in labor supply is multiplied by the assumed labor elasticity of 0.66, the proportionate change in value-added due to the labor effect of the Program is obtained. Similarly, judgments must be made concerning the land returned to productive use as a result of the Program, and this must be expressed as a proportion of the land available without the Project. This proportionate increase in land use must then be multiplied by the assumed elasticity of 0.34 to give the percentage increase in value-added due to the land effect of the Program. When the sum of these annual percentage increases in agricultural value-added are expressed in real monetary terms, it results in a quantitative measure of the productive benefits from the Health Project, which are compared with its costs in a full cost-benefit calculation.

Source: Kim, A. and B. Benton. 1995. *Cost-Benefit Analysis of the Onchocerciasis Control Program*. World Bank Technical Paper, Number 282. Washington DC: World Bank.

Table 4
Implied Values of Life from Expenditures or Regulations that Reduce Risk of Death

Basis for Calculation	**Value of Life** (1987 $)
• Desire for prompt coronary care	66,000
• Automobile air bag purchase	360,000
• Smoke detector purchase	373,000
• EPA requirements for sulphur scrubbers	500,000
• Seat belt usage	541,000
• Wage premiums for dangerous police work	850,000
• EPA regulation of radium content in water	2,500,000
• Wage premiums for dangerous factory jobs	3,200,000
• OSHA rules for workplace safety	3,500,000
• Premium for tire usage	3,600,000
• Desire for safer airline travel	11,800,000

Source: Folland, S., A. Goodman and M. Stano. 1997. *The Economics of Health and Health Care*. New Jersey: Prentice Hall.

Willingness-to-pay studies on health in the context of developing countries are relatively rare and attempts to apply this approach may have to rely on very simple approximations. *Guidelines 1997* puts forward a simple method for estimating willingness to pay in any sector with marketed output. This involves identifying two combinations of price and demand: price and demand without a project; and price and demand with a project. Provided certain simplifying assumptions hold—principally that the demand-price relationship is linear—the willingness-to-pay for additional project output is taken from the average of the price with and without the project multiplied by the increase in output generated by the project. Provided one knows the initial price-demand point without the project and what price the project will charge, then with an assumed price elasticity of demand, the final piece of information—demand with the project—can be derived (see *Guidelines 1997* Appendix 4). The approach can even be applied to freely available services, such as access to a free health clinic, provided alternative sources of supply are available, for which a price is charged or for which a cost can be imputed. *Box 9* gives a health project illustration taken from *Guidelines 1997*.

At some point in the future, it may be possible to value health benefits more accurately. At present however, most practical estimates of health benefits are either underestimates since they focus on production rather than on the full range of health effects, or controversial since they are based on individuals' perceptions of their own

Box 9

Estimating Willingness to Pay for Services of a Health Clinic

In this illustration, a primary health care project providing free care to a poor village is to be established. At present, the only available treatment is from a private clinic in a nearby town and for which a fee is charged. Costs to individual villagers are the fee plus cost of transport and time in getting there. For simplicity, it is assumed that without the Project, the private clinic would be fully utilized so that the supply from the new village clinic is wholly incremental. As incremental output, the services of the village clinic should be valued at willingness to pay. The figure below illustrates the situation providing a surrogate (as opposed to an actual) demand line. The situation without the Project is that the charge to villagers is P_{wo}. However, as no incremental services are available at this price, quantity supplied without the Project is zero. In the with-Project situation, the services of the clinic will be free; so the with-Project price P_w is zero. At this price, the needs of all villagers are met to give quantity of service of Q_w. The incremental output supplied by the Project is (Q_w - Q_{wo}) and the willingness to pay for this output is given by the shaded area (P_{wo} * Q_{wo} * Q_w). As there is a linear demand line, this shaded area is taken from the average of prices with and without the Project (P_{wo} + P_w)/2 multiplied by the incremental output of the Project (Q_w - Q_{wo}). Hence, willingness to pay (WTP) is

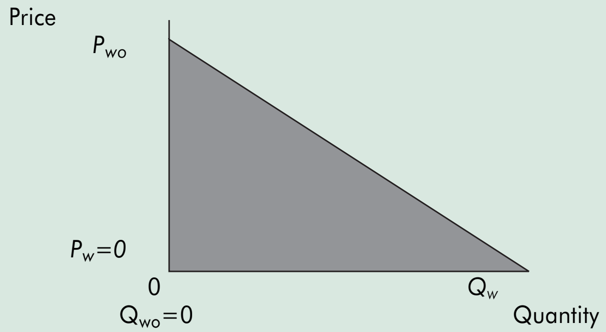
$$\mathbf{WTP = ([P_{wo} + P_w]/2) * (Q_w - Q_{wo}).}$$

In this case P_w = 0 and Q_{wo} = 0, so that WTP reduces to

$$\mathbf{WTP = (P_{wo}/2) * Q_w.}$$

The result means that based on individuals' willingness to pay, the benefit from the health clinic is derived by multiplying output of the Project by half the price charged in the without-Project case. The argument is simplified, particularly since no single service that should be valued at the unit price of $P_{wo}/2$ is identified; but it indicates a general procedure that can be applied to health projects. The analysis only changes slightly if the new project charges a fee. All that will happen is that WTP will no longer reduce to WTP = (P_{wo}/2) * Q_w and incremental output valued at the average of P_{wo} and P_w. Q_w will also be lower if charges are imposed.

Health Service provision Without Charge



Gross Economic Benefits valued through Q_w * P_{wo}/2
Economic Price valued through P_{wo}/2

Source: Asian Development Bank. 1997. *Guidelines for the Economic Analysis of Projects*. Appendix 11. Project Economic Evaluation Division, Economics and Development Resource Center. Manila, Philippines.

benefits from health effects, or subject to wide margins of error. Hence, it is preferable to use cost-effectiveness analysis as the main criterion for health projects while, where possible and relevant, attempting to establish a picture of a project's economic impact that might be used to complement the choice between alternatives based on costs alone.

Health Beneficiaries and Poverty Impact

Even if full social cost-benefit analysis of the conventional type is rare in the health sector, it is nonetheless important to establish who the beneficiaries of health projects are. ADB's priorities for the health sector are the poor, women, and indigenous peoples; and as much as possible, the expected impact of projects on these groups should be estimated as part of project economic evaluation. For example, if a project's health impact is expressed in YLG, HYLG or DALYs, the proportion going to different target groups could be estimated. Even if this formal analysis is not possible, it is also useful to have simpler indicators, as in the number of poor people served by a project and its impact on measures like their life expectancy or number of days of ill health. Where projects can be targeted directly at the poor, they will form 100 percent of project beneficiaries.

Ways of reaching the poor include: establishing health centers in poor and relatively inaccessible regions and having health workers travel to visit the poor; focusing on health problems that disproportionately afflict the poor such as TB, malaria, and diarrhea; and concentrating subsidies on facilities used by the poor such as health clinics rather than hospitals where the better-off are likely to be a much higher proportion of beneficiaries. Women's access to health facilities can be improved in various ways, but a central part of a gender-oriented strategy will be a focus of priorities on health projects that have a disproportionate impact on women. These include provision of user-friendly family planning methods, tetanus toxoid immunization, measures to control reproductive tract infections, and improvements to maternal health services. Measures to reach indigenous people may include development of a better database on their health status, establishment of more health centers in areas where they are concentrated, training of ethnic minority health workers who can provide services to their communities, and development of community-based schemes that encourage beneficial traditional medical practices alongside modern health services.

The methodology for assessing the poverty impact of any ADB project remains to be established definitively. In the case of health projects, it is well known that improved health has not only medical effects that improve welfare but also directly productive ones that raise the capacity of individuals to work. Assessing the full impact of a health project on poverty would require incorporating both direct and indirect dimensions. In the absence of a comprehensive approach, it is nonetheless helpful to first establish the likely impacts, at least qualitatively. One framework is presented in ADB's Poverty Impact Assessment Matrix for program loans. It provides different channels for potential impacts on the poor and relates these to a series of impacts (direct, indirect, macroeconomic, and impacts on the non-poor). The discussion is expected to be qualitative in that only the direction of a poverty impact (either positive or negative) is shown. The approach is useful primarily for encouraging those designing the program loan to think about its range of possible consequences for the poor and, if necessary, to design mitigating features (for example, exemptions or subsidies for certain groups to offset user charges). *Box 10* illustrates this approach.

Box 10

Poverty Impact Assessment Matrix

Channel	Direct	Indirect	Impacts Macro	Non-Poor
Labor Market		+	–	–
Prices			–	
Access for Poor	+			
Transfers	+			

The matrix is supplemented by information on gender impact, mitigating measures planned, and assumptions concerning factors like price elasticity or levels of transfer. Here, macro refers to any macroeconomic or fiscal consequences of a program or project, and non-poor to possible effects on this group.

To illustrate the general approach, the matrix shows entries for a primary health care program that extends services to the rural poor (a positive direct impact) and raises long-run productivity (a positive indirect effect through higher wages). TheProject is assumed to avoid user charges (introducing a positive impact through transfers). This, however, will have negative macro consequences due to the demands on the government budget which, in turn, will impact negatively on the non-poor through higher taxes and, indirectly as well as negatively, on the poor themselves through inflation. The overall net effect will depend on the balance between these factors.

Source: ADB. 1997. *Guidelines on Operational Procedures*. GP6: Program Lending.

When individual projects are evaluated, it is desirable to complement this type of qualitative analysis with some more quantitative measures. At the project level, this can include a headcount indicator of the number of the poor (or other target groups) reached by the project. In addition, it may be possible to identify how their health status is affected by a project (for example, in terms of average life expectancy or annual days free from illness). Further, if household surveys are conducted among the poor, it may be possible to estimate the monetary cost to households (measured by a combination of medical expenditures, working time lost, and travel time incurred) of ill health. Improvements in health status can thus be expressed as equivalent to an income gain in monetary terms to the households concerned. This may be incomplete as a measure of the full benefits from a health project, but it should nonetheless allow judgments about its short-term impact on incomes of the poor.