POLICY BRIEFS ON

ECONOMIC IMPACT OF HIV

13.

ASSESSING COST-EFFECTIVENESS ACROSS HIV & HEALTH INTERVENTIONS

Health Economics and Epidemiology Research Office
HE²RO
Wits Health Consortium
University of the Witwatersrand

WITS UNIVERSITY

BOSTON UNIVERSITY

UCL

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KEY POINTS

- **While other criteria may also be taken into account, decision support on choices between health interventions typically focuses on cost-effectiveness in terms of health gains per monetary unit spent.**
- **Comparisons between HIV interventions and other health-related interventions require common measures of health gains. The most common are the disability-adjusted life year (DALY) and the quality-adjusted life year (QALY).**
- **Socio-economic considerations often come in only indirectly, e.g., in the form of cost-effectiveness thresholds derived from an economic valuation of health gains or reflecting a country's fiscal context.**

Investments in the HIV response involve choices. Decisions regarding the distribution of funding between HIV and other development challenges (Brief #10) consider a range of desired health and other development outcomes, the contributions of the HIV programme to attaining these objectives, and the contributions of alternative investments in health or other sectors.

Decisions between spending on HIV and other health objectives also involve comparisons between outcomes. Planners typically use some measure of life years gained per monetary unit spent as a benchmark for identifying the most cost-effective interventions. The most common criteria are the loss of life years as a consequence of a disease (or gain as a result of an intervention), and the health impairment caused by the disease. These criteria are often summarised in the form of disability-adjusted life years (DALYs) or quality-adjusted life years (QALYs).

Social and economic considerations are often only implied in decision support within the health sector, to the extent that the magnitude of the health outcomes offers sufficient statistical basis for a ranking according to economic or social criteria. But more explicit approaches are available (see Brief #10, or discussion of benefit-cost analysis in Brief #2), and economic and fiscal criteria may enter in the form of thresholds informed by economic valuations of health gains or fiscal constraints.

Measuring outcomes across health interventions

Numerous aspects of the consequences of disease are relevant for decision-makers, including the impacts on mortality, impairment of capabilities and loss in well-being, the age profile of the population affected, and the distribution across the population according to regional or socio-economic criteria. However, assessments and comparisons of the effectiveness and cost-effectiveness of interventions targeting different diseases typically apply

standardisation to summarise the consequences of an intervention. The most common summary measures of health states or losses are the QALY and the DALY. Both combine estimates of life years lost and of the change in health while alive.

QALYs assign weights to distinct health states (of experiencing a disease, possibly differentiated by severity or stage of progression), drawing on patient or population preferences elicited through large-scale surveys (see Drummond et al., 2005, for a discussion on measurement). QALYs are the measure used most commonly in health cost-effectiveness analysis, especially in high-income countries. They account for over 90 percent of published academic studies reporting either QALYs or DALYs (Neumann et al., 2018), and have been endorsed as a standard by the U.S. Panels on Cost-Effectiveness Analysis in Health and Medicine (Neumann et al., 2016; Feeny et al., 2017).

The DALY was developed in connection with the World Health Organization's (WHO) Global Burden of Disease estimates (Murray, 1994) and is the most commonly used measure in global health. The DALY measures losses in healthy life compared to an ideal state of health. The DALY distinguishes between years of life lost (YLLs) due to premature death and years lived with disease (YLDs). The latter adds up the losses of quality of life attributed to living with disease(s), compared to perfect health, over the projected duration of life. Unlike the preference-based QALY estimates, the disability weights included in DALYs were originally based on expert assessments, but they are now generated using a more empirical and survey-based approach (Salomon et al., 2015).

Economic gains are often only implied in cost-effectiveness analyses (to the extent that better health gains result in higher economic gains). For comparing health interventions, though, it is often sufficient to compare the health outcomes and costs, because of the decision situation or because adding a valuation to health gains would not affect the ranking of interventions. If economic returns matter additionally, there are a number of methods for capturing those, depending on purpose. Feeding the health outcomes into a macroeconomic model of economic growth provides insights on how health interventions contribute to economic activity and may help stabilise the economy during a health crisis. (Covid-19 comes to mind, but it stands out since the economic consequences primarily result directly from disease-control policies, rather than from the actual health impacts.) However, current economic growth yields an incomplete picture of economic gains in case of longer survival, the economic benefits of which accrue over the life cycle. Such lifetime gains are often estimated under the "human capital" approach. A third economic interpretation of health gains is benefit-cost analysis, based on the amount of money an individual would exchange for an improvement in his or her own health (Robinson et al., 2019; Robinson & Hammitt, 2018; also see Brief #2).

Cost-effectiveness of HIV and other health interventions in context

There are two broad approaches to deploying cost-effectiveness analysis for decision support:

- Direct comparisons of cost-effectiveness between two or more interventions, or
- Assessments of cost-effectiveness against some threshold, below which interventions are considered for implementation.

In practice, these two approaches are complementary and related. Of two methods of delivering the same intervention, only the more cost-effective would normally be funded, even if the cost-effectiveness of both is below the threshold. And if some interventions are selected for funding in the order of their cost-effectiveness until the available budget is exhausted (similar to the example described in Brief #11, Figure 11.3), and others are not, then the cost-effectiveness of the least effective intervention selected for funding defines a threshold.

The most comprehensive recent effort to rank health interventions across diseases is the Disease Control Priorities (DCP) project, illustrated in Table 13.1, which lists a number of interventions for HIV or cardiovascular disease (a small selection from the range of diseases covered by DCP3 (the third edition of the DCP, 2018; see Horton, 2018). Such "league tables" can be used, among other criteria, to identify priorities for public policy and define health-benefit packages, depending on the resources available. Indeed, DCP3 uses the rankings to identify a) interventions which cost less than US$ 200 per DALY averted, which it proposes "could be considered for publicly funded health care in low-income countries"; b) interventions costing US$ 200-500 per DALY averted, which "could be considered for lower-middle-income countries"; and c) interventions costing more than US$ 500 per DALY averted, which are "potentially appropriate for consideration in upper-middle-income countries."

Table 13.1: Cost-effectiveness of selected interventions (Disease Control Priorities, 3rd Edition)

Intervention	Cost-effectiveness (US$/DALY)
Blood pressure management, upper-middle-income countries	Cost-saving
Polypill for high-absolute-risk cardiovascular disease, upper-middle-income countries	Cost-saving
Giving female condom to sex workers, South Africa	Cost-saving
Salt reduction policy in food	Cost-saving to 45
Voluntary male circumcision	10
Prevention of mother-to-child transmission of HIV Option B versus no treatment, Africa	26
ACE inhibitor versus no medication, heart failure, no access to treatment	28
Scale up HIV antiretroviral therapy to all with a T-cell count <350, or all infected, South Africa	188–256
Beta-blocker and ACE inhibitor vs no med, heart failure, no access to treatment	274
Primary prevention of cardiovascular disease with four drugs, middle-income countries	1070–3207
Pre-exposure prophylaxis with HIV antiretrovirals for non-infected partner in serodiscordant couples	Cost-saving to 6468

Source: Horton, 2018.
Note: US$ are at 2012 prices. Table shows selection from interventions covered by DCP3, focusing on HIV and cardiovascular diseases.

However, Table 13.1 also reflects several challenges associated with the use of "league tables" in priority-setting. First, economic capacities and costs differ widely according to economic circumstances, even within country income categories. GDP per capita differs by a factor of about 4 among low-income countries, by 4 among lower-middle-income countries, and by 3 among upper-middle-income countries. Second, DCP estimates of cost-effectiveness for many interventions are based on evidence from a few countries only. These estimates might not be representative, and might be misleading when applied to specific countries. Third, some of the estimates (e.g., on male circumcision for HIV prevention) depend on the epidemiological context. For instance, cost-effectiveness of some HIV prevention interventions is closely linked to HIV incidence and/or prevalence and the risk of contracting HIV, so that the cost-effectiveness of such interventions differs steeply depending on context.

Thresholds

The use of thresholds can facilitate decision support by allowing comparison of the cost-effectiveness of an intervention with just one benchmark rather than a string of estimates (where appropriate; for different means of serving the same purpose, direct comparison is required). Such thresholds can be derived from economic criteria – do the health and economic gains expected from the proposed intervention outweigh the costs? – or from the budget context – is there a threshold that divides interventions which are typically funded and those which are not?

The most influential such thresholds derived from general economic criteria have been the income-based thresholds associated with the Generalised Cost-effectiveness Analysis framework developed by the WHO (Hutubessy et al., 2003). Interventions that cost less than 1x per capita income per DALY averted were considered "very cost-effective", as income gains owing to longer survival are considered to outweigh the costs. Interventions costing less than 3x per capita income per DALY averted were considered cost-effective. This latter benchmark draws on economic valuations of health gains around the value of statistical life (see Brief #2) – for interventions costing less, the welfare gains from improved health were thought to exceed the costs.

This approach has been used extensively in the academic literature and in advocacy for increased investments in health, including the report of the Commission on Macroeconomics and Health (2003), the UNAIDS HIV Investment Case (Schwartländer et al., 2011), or the report by the Lancet Commission on Investing in Health (Jamison et al., 2013), highlighting the economic value of the health gains which can be achieved and comparing it with investments in other sectors (see Brief #10). These thresholds, however, have not been effective in identifying those interventions which should receive funding (Marseille et al., 2014). According to Griffiths et al. (2016), over 90 percent of academic studies on new or additional interventions in low- and middle-income countries concluded that they "would be highly cost-effective or cost-effective" according to these thresholds. These income-based categories therefore offer little guidance on prioritisation, especially in low- and middle-income countries (Robinson et al., 2017).

For effective decision support, it is instead necessary to interpret findings regarding cost-effectiveness in light of the country-specific economic, fiscal, political and health context (Marseille et al., 2014; Leech et al., 2018), a point also now recognised by WHO staff (Bertram et al., 2016). One response to this challenge is the estimation of thresholds which reflect actual budget allocations, identifying the least cost-effective interventions which are typically supported by a health programme or estimating the marginal return (in terms of health outcomes) of health spending.

Using regional difference in spending and health outcomes, the marginal return to health spending has been estimated at about one-half of GDP per capita per QALY (Claxton et al., 2015) in the UK. The only study available so far applying these methods in a low- or middle-income country estimates a threshold of 53 percent of GDP, based on the provincial variation in health outcomes and health spending in South Africa (Edoka & Stacey, 2020). Under a fixed budget, these estimates can be interpreted as an opportunity cost – introducing a new intervention would crowd out some other health services and impose a health loss at least equal to the marginal return. This approach, however, is demanding on data as it requires sufficient sub-national data on variations in spending and health outcomes, and extrapolating from the scant evidence in the UK or South Africa does not yield reliable benchmarks for decision support (Woods, 2016).

The other source of evidence on thresholds is budget prioritisation exercises. One survey finds that HIV services are included in health-benefit packages (i.e., the "list of priority/essential services to be delivered through the wider health system") in most of 26 countries where such a plan was operating (Regan et al., 2021). The design of a health-benefits package of the Health Sector Strategic Plan 2017-2022 for Malawi (Government of the Republic of Malawi, 2017) implied a threshold (based on the least effective interventions included under the plan) of US$ 61 (18 percent of GDP per capita) per DALY averted. Based on South Africa's HIV investment case, Meyer-Rath et al. (2017) report a threshold of between US$ 547 per life-year saved (for the least effective intervention included in the programme) and US$ 872 per life-year saved (for the most cost-effective intervention not included), corresponding to between 10 percent and 15 percent of GDP. These estimates suggest that at least in middle-income countries the cost-effectiveness of the most common HIV interventions is typically within the range of interventions funded by the public health sector. The large scale of HIV in countries where it is concentrated, though, means that HIV interventions are not necessarily affordable from domestic sources alone, even if cost-effectiveness is below observed thresholds. This is so because financing them would exhaust much of the health budget – which is one reason for the relatively large role of donors in supporting HIV programmes.

Concluding notes

The use of cost-effectiveness analysis in decision support is evolving. The principles are well established and used to good effect by initiatives like the Disease Control Priorities project to highlight interventions which contribute to improved health outcomes in low- and middle-income countries at lowest costs. However, there are few examples in which cost-effectiveness analysis has been used in comprehensive budget-allocation exercises, reflecting lack of country-level evidence on costs (intervention-specific estimates in DCP3 are typically based on observations from a few countries only), and little work that casts thresholds in terms of opportunity costs and the fiscal context.

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