Perspective Paper

The Challenge of Communicable Diseases

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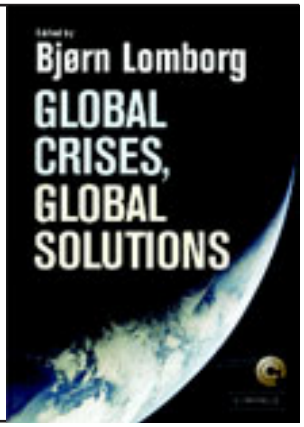

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Comments on the Challenge Paper on Communicable Diseases

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Introduction

Cost-benefit analysis, as it has long been used in the sectors of the economy traditionally considered to be productive, can be characterized as having the objective of seeking to maximize the present value of a stream of consumption changes resulting from a decision to use resources (Ray 1984). Some types of social concerns have been incorporated from time to time, including giving greater weight to investment than consumption resulting from a project to allow for distortions in the capital market, or to introduce weights on the consumption benefits depending on who receives them, thereby incorporating equity concerns. This traditional approach has been applied extensively to health investments, and is related to the literature classified by Mills and Shillcutt (M&S) as the microeconomic impact of the disease and the macroeconomic approach to estimating costs and benefits.

At the same time, perhaps influenced by environmental economics, there is a strand of the literature which broadens the definition of welfare to incorporate the intrinsic value people place on health and on preventing death. This is clearly not totally separable from the consumption possibilities resulting from good health or a long life, but even if the net effect of improving health on consumption is non-positive (perhaps health care for the aged is an example), the investment in health could still lead to increases in welfare assuming that health is an argument in a social welfare function. This literature values health improvements in terms of the money value of the gain in welfare based either on willingness to pay (WTP) (e.g. Weaver et al. 1996; Klose 1999; Onwujekwe et al. 2002**)**. This approach is the essence of the cost-effectiveness evidence presented by M&S and categorized as the microeconomic approach.

It should be noted at the outset that the two approaches have different maximands, and the numbers produced relate, therefore, to different concepts. Estimates of the impact of health investments on GDP should be smaller than those based on the money value of averting a DALY. Using the first method to value health benefits will show very low or zero economic benefits for some health interventions, but the same intervention could look attractive using the second.

This is important when it comes to comparing the results reported by M&S with the cost-benefit analyses of various other types of interventions. Investments in the environment, and sometimes in water and sanitation, are commonly evaluated in terms of WTP (Alberini & Krupnick 2000, Bowland & Beghin 2001). Some environmental investments may well have non-positive impacts on economic growth, like some health investments. To compare the numbers produced by studies reported under the macroeconomic approach for malaria with those from the microeconomic (cost-effectiveness) approach for HIV/AIDS is not appropriate. To compare the numbers produced by the macroeconomic studies reported by M&S with the results from a benefit-cost analysis of environmental health interventions based on WTP is also not appropriate.

From the perspective of someone working with health policy-makers, an additional concern is that the current global focus on the economic impact of health has been

interpreted largely as the impact of health investments on GDP rather than on welfare (Commission on Macroeconomics and Health 2001). This makes health practitioners assume that if it is not possible to show that a particular intervention improves GDP, it is not worth doing from an economic perspective. It also encourages donors to fund yet more cost-of-illness studies.

I argue in the rest of this paper that the numbers summarized by M&S under the rubric of microeconomic impact and the macroeconomic approach to measuring benefits are not very reliable, partly because of questions about their quality and partly because they produce conflicting results. The information based on the microeconomic (cost-effectiveness) approach is more reliable and addresses some of the most important questions for policy-makers in the health sector. I conclude with some suggestions on how to make the analysis even more useful to policy-makers.

The Microeconomic Impact of Malaria and HIV/AIDS

This literature is based on the cost-of-illness (COI) methodology that separates costs into those linked to obtaining care, including the costs of treatment, transport, special foods, etc. (called direct costs) and the lost income associated with illness (called indirect costs). An industry of COI studies has developed over the last decades, and many of the weaknesses are well established (Dummond 1992; Maynard 1997; Koopmanschap 19987; Bloom et al. 2001). At the household level, direct costs represent the resources that could have been used for other types of consumption or investment had the disease or illness not occurred, although the impact on the present value of future consumption depends partly on whether the costs are funded from current consumption or savings.

Indirect costs of survivors are typically measured as an estimate of time loss multiplied by a wage rate, and are added to the discounted future earnings of people who have died estimated in the same way - years lost multiplied by annual per capita income. For example, the studies summarised in Shepard et al. (1991) and used by M&S assumed that the self-reported duration of a malaria episode in adults equated with lost work time, and that one adult would lose 30% of the duration of disease in children due to their caring functions. This loss was multiplied by an imputed daily wage rate that was apparently constant over the year. The discounted future earnings of children who died because of malaria was estimated as described above.

Agricultural communities, where much of malaria occurs, have developed various methods of coping with disease, some of which are described in M&S. The agricultural cycle means that there is great flexibility in the timing of labour inputs at some times of the year (e.g. weeding), less so at other times (e.g. planting or harvesting). Most COI studies in developing countries, including some of those reported by M&S, have ignored this and assumed that a day sick is a day of lost work (e.g. Shepard et al. 1991; for a critical review of studies related to malaria, see Chima et al. 2003). The appropriate method would be to compare the days worked by the sick person and their family compared to the counter-factual of what would have happened in the absence of the illness. Only a few studies have tried to assess this by comparing activity patterns of people with illness to those of people in the same community, with the same

characteristics, without illness (Mills Nepal; Ramaiah et al. 2000), but this is rare and most of the studies reported by M&S for malaria and HIV/AIDS do not use this approach. The case-control approach suggests that the actual time lost due to illness is considerably lower than suggested by the crude method.

On the other hand, many of the most important potential effects on households are not measured at all in COI studies. Few have measured the impact of ill health on productivity (output per unit of time input), likely to be lower for people with chronic conditions (Ramu et al. 1996), or the impact on long term production through reductions in savings, changes in activity patterns, reduced educational investment etc (e.g. Kochar 2004). The end result is that most COI studies produce estimates of indirect costs that probably have little to do with the impact of illness on the discounted present value of household consumption, to the extent that even the direction of the bias is unclear. The data on direct costs is potentially more useful in the sense of showing the immediate impact on a household's budget, although again the quality of the costing assumptions made in such studies leaves a lot to be desired (Adam et al. 2003).

It is important to health policy-makers to understand the impact, economic and social, of disease and ill health on households. COI studies are an imperfect estimate of the economic burden on households. They are even more misleading when they are aggregated across households and the results interpreted as a loss of GDP. Even in industrial countries this does not hold. In Europe, relatively high levels of unemployment and imperfect labour markets mean that multiplying days lost by the wage rate for each person suffering illness, then aggregating across individuals, overestimates the impact of that time loss on GDP (Koopmanschap & van Ineveld 1992; Hutubessy et al. 1999). This is even more important in developing countries with large agricultural and informal sectors.

Assuming that the sum of direct costs is a loss of GDP is also incorrect as the health sector is included in national accounts and contributes to GDP. The impact of direct costs on GDP would be through a drawdown of savings or similar mechanisms. This type of link is explored in some of the macroeconomic models discussed in the next section, but for the moment the conclusion is that many of the COI studies reported in the paper do not show the impact of illness on the discounted present value of household consumption, and the aggregation of the costs across households bears an unknown relationship to the impact of malaria and HIV/AIDS on GDP.

That being said, the impact of malaria and HIV/AIDS on households is undoubtedly substantial and important for policy purposes. Health financing systems in the parts of the world where these diseases are most endemic rely relatively heavily on direct out-of-pocket payments by households, these payments are high for the two diseases but particularly for HIV/AIDS, and can push households into poverty or deepen the poverty of households that are already poor (Xu et al. 2003, Wagstaff & van Doorslaer 2003). The impact on lifetime consumption is less clear for malaria but is high for HIV/AIDS because it affects adults of working age while malaria deaths occur predominantly in children. In addition, as M&S state, the impact of HIV/AIDS can lead to the

disintegration of households and family structures in countries where it is most endemic, and a generation of children is being raised without traditional social support mechanisms (Moatti et al. 2003; WHO 2004). Indeed, Friere (2003) argues that by focusing on the families directly touched by AIDS, the way other households have been forced to adapt and modify their economic activities as a result has been ignored. She claims that these effects can be substantial. This type of effect is difficult to quantify in money terms without relatively costly studies that trace households over time, but the destruction of households and the social fabric of societies is real, and of a different nature and order of magnitude of the types of estimates emerging from the COI studies (Moatti et al. 2003; WHO 2004).

Macroeconomic Studies

The macroeconomic studies reviewed by M&S for malaria differ to those reviewed for HIV/AIDS. The former rely on two studies using cross-country regressions that are not really production functions. Gallup and Sachs (2001), for example, explained the growth of per capita GDP as a function of initial GDP per capita, initial levels of health and education, and a variety of other country descriptive variables such as the proportion of the land area in the tropics, quality of public institutions and a malaria index. The specification did not explicitly account for reverse causation, or changes in capital and labour. McCarthy et al. (2000) did account for reverse causation and suggest that the negative impact of malaria on growth was robust to many different specifications. The estimated impact of malaria on GDP per capita is far greater than would be estimated if the effect was limited to the impact on the size of the labour force (Gallup & Sachs 2001).

The most important health impact of malaria is on child mortality, which poses a dilemma. Bloom and Williamson (1997) have suggested, using similar cross country regressions (although with a different set of countries), that the decrease of the dependency ratio linked to low fertility rates was a key to the success story of the East Asian countries. Reducing malaria would initially increase the dependency ratio which might be expected to reduce growth rates. Indeed the mechanisms through which malaria might have retarded economic growth in Africa that were suggested by Gallup and Sachs have not, to my knowledge, been tested in any way - e.g. the suggested relationship between malaria severity and foreign investment flows.

The impact of HIV/AIDS on the quantity of labour is now very substantial - the gains in life expectancy made through most of the 20th century in sub-Saharan Africa started to be reversed in the mid-1990s when life expectancy began to decline. Life expectancy at birth was 43 years in Southern Africa in 2002 and would have been 56 years in the absence of the disease (WHR2004). The macroeconomic approaches to assessing the impact of HIV/AIDS on GDP reported by M&S incorporate the reduced size of the labour force into computerized general equilibrium models that also try to account for the impact of the disease through other mechanisms such as reduced labour productivity and savings. However, as M&S show, the results are confusing with changes in assumptions showing a range of outcomes varying from increases in GDP per capita to economic catastrophe.

In any case, a general equilibrium model cannot capture the full impact of HIV/AIDS on a society or economy. Annual deaths from AIDS among nurses has represented around 40% of the recent output of nursing schools in some countries and similar trends are observed in other sectors such as education (WHO 2004). When this is added to shortages caused by migration, natural attrition, and absenteeism due to illness, the health and education systems in the most heavily endemic countries simply cannot function. They certainly cannot function to the extent necessary to support the recent scale-up in funds available for HIV/AIDS and malaria, something to which I return.

The Microeconomic Approach (Cost-Effectiveness)

Most estimates of health effects used in cost-effectiveness studies are based on observing what happens with the introduction of an intervention compared to settings in which the intervention is not introduced. This is in contrast to the modelling necessary to estimate the counterfactual in the general equilibrium models of the previous section. The set of interventions described by M&S for malaria reflect the currently available technologies and approaches, and the studies from which the estimates were taken generally use appropriate methods and assumptions. A few small technical questions can be raised. The analysis of the decision to switch from one antimalarial to a new type of combination therapy was based on a time horizon of only 13 years. This does not allow for consideration of the risk that a new antimalarial will not be available by the time resistance to the combination therapy reduces its clinical effectiveness, something that has happened to all antimalarials to date. This consideration is surely important in any decision to switch. The second problem concerns the assumption that the costs and benefits of the interventions undertaken singly can be simply added to obtain the costs and benefits of the package. Preventive interventions such as ITNs reduce incidence, thereby reducing the need for, and the cost of, the curative interventions. The number of people that M&S assume would be protected by nets would not change, nor would the cost. However, the number of people needing to be treated would be lower and so would the total costs and the benefits of treatment (though not necessarily the cost-effectiveness ratio). However, the net benefits reported by M&S should not change drastically.

The package M&S have chosen to report for the HIV/AIDS interventions does not include care, i.e. treatment using antiretrovirals, something that is now dominating resource allocation decisions internationally. WHO has estimated that almost $1 billion has been pledged, largely by the international community, for care in the 40 most endemic countries over the last year, and the question of the return to this investment is important to consider. WHO argues that in addition to keeping people at work and allowing systems such as health and education to function better than they do currently, the provision of care will also encourage people to present voluntarily for testing and counselling, thereby reducing transmission (WHO 2004).

The economic analysis of the package reported by W&S, unlike the malaria package, includes interactions between interventions in terms of effectiveness. In some cases it is difficult to understand the source of estimates of effectiveness - for example, the interventions used for the estimates of the effectiveness of something described as

voluntary counselling and testing included some focusing on female sex workers, some on their clients, some on serodiscordant couples, some on pregnant women and some on people with sexually transmitted infections. Many included condom distribution and health education, also evaluated separately as part of the package. However, reanalysis of some of this work suggests results of a similar order of magnitude (WHO 2002).

In my opinion, therefore, the studies reported under the microeconomic approach provide a reasonable assessment of the health effects and costs of key interventions against malaria and HIV/AIDS, with the exception of care. When the DALYs averted are multiplied by a monetary value of the health benefit, the result is, at least in theory, more akin to valuing outcomes in terms of the broader welfare gain than the narrower effect on GDP - as discussed earlier. The question is what value to place on a DALY averted. Viscusi and Aldy recently concluded that estimates of the value of a statistical life, based on workers' willingness to accept a greater risk of death in return for higher salaries, ranged from 100-200 times GDP per capita. This was based on studies from 10 countries (Viscusi & Aldy 2003; Bloom et al. 2004). Even though this type of measure does not incorporate the impact of improved health on welfare, it suggests the value of GNI per capita used by M&S as the value of averting a DALY is too low. If there are 70 years to the average life, and years are undiscounted, the value of a year would be between 1.4 and 2.8 times GDP per capita. However, if the present value of a life is worth 29 discounted years (at 3%), each year would be worth approximately 3.4-6.9 times GDP per capita.

The important question, however, is to be consistent in this valuation across interventions and challenges, an issue considered again briefly in the conclusions. In any case, as shown by M&S, the benefits exceed the costs of the interventions by a considerable margin, even using the low value of a DALY averted. In addition, the discounted net benefits of a package focusing on HIV/AIDS are substantially greater than that for malaria given the nature of the HIV/AIDS epidemic. It should also be remembered that this way of valuing outcomes does not include the impact of interventions on maintaining family structures and the social fabric, nor the inability of the health, education and other sectors to function.

Strengthening Basic Health Services

M&S use two methods to examine the costs and benefits of strengthening health services. The first is based on cross-country regressions, where they show that some studies report higher levels of government spending on health are associated with health outcomes, while others show no effect. Nevertheless, they feel that more recent studies find a positive impact and use the most recent - Gupta et al. (2001) - as the basis for their valuation of the benefits of strengthening the health infrastructure. However, a more recent study, from the IMF like that of Gupta et al., again finds no significant impact of government expenditure on health (but a significant impact on health of expenditure on education) (Baldacci et al. 2002). This study used a MIMIC model so does not have the same problem of finding a single indicator to define health associated with the studies reported by M&S.

In any case, the specifications are wrong (except perhaps for the MIMIC model). Health services involve a complex interaction between government and non-government sectors in most countries, and the assumption that only government expenditure is important, or that the impact of government expenditure can be determined from regressions which omit private expenditure, is not appropriate. This literature is, at best, inconclusive.

The second approach was to base the estimates on the costs and effectiveness of a package of interventions reported in 1993 (Jamison et al. 1993). That study combined information on the costs and effects of interventions evaluated in different countries without trying to adjust for differences in epidemiology or costs. The individual studies also used different methods. Moreover the epidemiology of diseases, effectiveness of interventions and costs have changed since then. While the approach might be appropriate, the numbers are not very relevant today. Unfortunately, it remains the only attempts to compare a wide variety of interventions in terms of the costs and DALY gains, which is the reason why there are two current international activities designed to update and improve the evidence base (the WHO-CHOICE project - see Tan-Torres Edejer et al. 2003; and the Disease Control Priorities Project 2004).

I do believe, however, that the potential gains from the increases in expenditure described earlier for AIDS care, considerably higher if all recent funds allocated to HIV/AIDS, tuberculosis and malaria are considered, will not be fully realised without an intense effort to improve health systems. It requires not only building health centres and distribution networks, and providing drugs, testing facilities, community services and a set of key interventions, but it also requires developing new ways of interaction between the government and non-government sectors, and probably new ways of organizing and delivering services. It requires identifying any binding short run constraints to scale-up - the availability of human resources is one such constraint in many African countries where there are strong fears that it might not be possible to train enough skilled staff to fill the demand created by the additional funds for health. Strengthening of the health system is a fundamental requirement if the challenge set by HIV/AIDS and malaria are to be met.

Conclusions

Communicable diseases continue to be the major cause of death and illness in poor countries. With the advent of HIV/AIDS, the gains in health and life-expectancy experienced throughout the 20th century are being eroded in much of sub-Saharan Africa. The burden that HIV/AIDS, malaria and other communicable diseases such as TB imposes on households is substantial, partly because a substantial proportion of health payments in poor countries are met out-of-pocket. Households are pushed into poverty, or their poverty deepened, as a result - something only partially captured by COI studies. The impact of HIV/AIDS is even more dramatic, destroying family structures and long established mechanisms of caring for the sick and sharing the financial burden of doing so. The impact of these diseases on GDP per capita has yet to be demonstrated conclusively, but there is certainly reason to believe that many African countries are being fundamentally changed because of HIV/AIDS in ways that are only beginning to

be understood. Similar changes could emerge in parts of South and East-Asia without immediate action.

Effective, low cost methods for preventing both diseases exist - they are among the most cost-effective interventions possible (WHO 2002). Treatment for malaria is still relatively low cost, although the cost is rising because of the way the parasite develops resistance to new pharmacological products relatively rapidly. The cost of care for HIV/AIDS has declined rapidly in recent months and can be expected to decline further. There are also strong grounds for believing that the availability of treatment will encourage people with the infection to present for treatment and counselling and will then decide to protect their sexual partners from infection.

The increase in funding recently is a good sign but much more is needed. There remains a funding gap of between $3.4 and $4 billion if only a half of the estimated number of people requiring treatment for HIV/AIDS are to receive treatment before the end of 2005, and much more is needed if the associated problem of TB is to be tackled effectively, and if a basic package of interventions for malaria is to be made widely available. The numbers do not include the needs for strengthening health systems, without which the current investments in health will not achieve their full potential. I agree with van der Gaag (2004) that much more could have been done by now, and much more needs to be done quickly, to meet these challenges.

The final question concerns the way in which health benefits are valued in money terms. Valuations based on willingness to accept risk or willingness to pay assume rational decisions and markets that work. Health economists almost universally accept that market failures in health are so great that governments must intervene, though the extent of this intervention is not necessarily agreed. One of the most important market failures is that of information, where the asymmetry between the information held by the provider and the patient means that the patient is not able to make their own rational decisions and must trust the provider to act as their agent. The use of WTP and willingness to accept valuations is troubling in that the assumption is that the same people can make informed decisions about accepting risks, or paying for interventions that would reduce their risks of ill health and death.

Moreover, the use of these measures for setting international priorities has fundamental ethical problems. M&S, by basing their valuation on GNI per capita, assign a lower value to saving life in the poorest parts of the world than in the less poor. Other studies have also shown that WTP and the value of a statistical life based on willingness to accept, not surprisingly, vary by such factors as country, race and age (Krupnick 2000; Bowland & Beghin 2001; Viscusi 2003). To set international priorities based on a value of life saved, or of a DALY averted, that is some multiple of national product, will give priority to diseases that are currently found predominantly in the richer countries, and in the rich in poor countries. On those grounds, it may well be that cardiovascular disease interventions would show higher money benefits than investments to control HIV/AIDS as the highest burden of CVD is in rich countries, and in poor countries it currently affects predominantly the rich. Although it has been shown that people have an altruistic

willingness to pay for some health interventions (Onwujekwe et al.2002), something more is needed to resolve this dilemma. One possibility is to postulate the existence of a global welfare function, in which case there is a global WTP for saving life and improving health which can be applied across all interventions and societies for global decision-making.

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