perspective paper

INFECTIOUS DISEASE

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Alternative Perspective on
INFECTIOUS DISEASE, INJURY AND REPRODUCTIVE HEALTH

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1. Introduction

The paper "Infectious Disease, Injury and Reproductive Health" by Dean T. Jamison, Prabhat Jha, Ramanan Laxminarayan and Toby Ord puts forward a case for high cost benefit ratios for a set of targeted health interventions in developing countries. These are tuberculosis treatment, the prevention and treatment of malaria, immunization against childhood diseases, development of a HIV vaccine, surgical treatment of injuries and difficulties in childbirth, and the deworming of children in schools.

My overall view is that the high cost-benefit ratios the authors ascribe to these interventions based on health benefits are warranted, though with a number of caveats. These caveats on measurement of costs and benefits are discussed in detail in Canning (2009) and are reexamined in section 2 below for the six interventions that are recommended in the challenge paper. While I think all of the proposed interventions are individually desirable I particularly welcome the inclusion of deworming of children as a priority health intervention. While the effect of these worm infections on children's mortality is low they can have serious consequences for education and learning and adult productivity. The use of health interventions for benefits not only in health outcomes but in education and worker productivity is an important example of inter-sectoral thinking and is to be encouraged.

While the interventions being recommended have high benefit cost ratios a number of health interventions arguably have even greater effectiveness but did not make the recommended list in the challenge paper. A major change in the recommendations of the challenge paper from the previous rounds of the Copenhagen Consensus (Jamison, Jha et al. (2009)) is a shift from an

emphasis on implementation of existing known interventions that affect risky behaviors and the transmission of infections to prevent the spread of HIV to funding the development of a new vaccine for HIV. While a vaccine is clearly desirable, its development will take many years, and is subject to great risk. Given this it is not at all clear to me that the emphasis on vaccine development over implantation of existing prevention strategies is justified. This issue is considered in more detail in section 3 below.

An additional case as a potential priority health intervention is tobacco control. Evidence from the challenge paper on disease control in the previous round of the Copenhagen consensus (Jamison, Jha et al. (2009) , gives figures for the benefit cost ratios for this intervention that are substantially higher than some of the interventions being recommended in the current challenge paper. It would have been very useful to have discussion in the challenge paper of why this intervention has been dropped from consideration. Is the benefit cost ratio now thought to be lower, or are other considerations in play in the setting health priorities?

Another issue is that many of the interventions recommended are disease specific, and lend themselves to vertical interventions that target these diseases without the need for broad improvements in the overall health system. To some extent this is aimed at overcoming capacity constraints in health systems in developing countries and focusing financial resources where they have the biggest health benefits. An alternative approach would be for a broad expansion of health care resources, coupled with universal health care though public provision or national insurance, to ensure access to a broad range of services. It would be interesting to see what

benefit cost ratio of this more ambitious approach would be, even if it were subsequently rejected as a priority intervention. These alternative interventions are discussed in section 3.

The one major issue that creates a worry about the high cost benefit ratios found for recommended interventions is the lack of any estimate of the effect of saving lives on income levels through population growth. To the extent that the health benefits are about preventing illness and morbidity, which may be particularly true of surgical treatment and deworming, this is not an issue. However to the extent that the health interventions save lives, which is in most cases the key argument for their health benefits, there will be more rapid population growth. This will have economic effects due to effects fixed resource constraints particularly land availability, capital per worker, and the population age structure. The negative effects of population growth on income levels are potentially very large and should not be ignored.

A key issue is the extent to which reductions in mortality, particularly child mortality, affect fertility decisions. If fertility falls in response to lower child mortality, due to a desired family size being achievable with fewer births in a low mortality environment, these negative population growth effects will be reduced or eliminated. However, achieving lower fertility requires the provision of family planning services and it may be that the health benefits outlined in the challenge paper will be undone by population growth unless these services are in place. This is discussed in section 4 below, where I advocate the addition of the provision of family planning services as a necessary complement to the health interventions recommended in the challenge paper.

2. The Cost Benefit Estimates

One of the main issues in the benefit – cost calculation is the money value of health gains. Health gains are measured in disability adjusted life years (DALYs) and these health benefits are then translated in to money units by using estimates of the value of a statistical life and value of disability estimates. A key issue is the assumption that the value of a statistical life and a DALY varies with the level of income. The approach taken in the paper is based on the idea that the value of a year of disability free life is about three times national income per capita. It is argued that this view has empirical support based on the work of Viscusi and Aldy (2003) though they argue that willingness to pay for life year my increase less than proportionately with income.

The rational for different values of life is that the willingness to pay for a life year is lower in poor countries than rich countries. However there is some unease that the life of a person in a poor country in intrinsically worth less than that of a person in a rich country, and most analysis of the health sector has used cost effectiveness analysis, rather than cost benefit analysis, where the benefits are kept in health units (DALYs) rather than converted to money terms at different rates for different people. The difficulty with assuming that lives are equal valuable in all countries is that this would imply high valuations of lives in poor countries, which is not reflected in their willingness to pay.

The challenge paper makes a distinction between projects funded from a developing country's own resources, when a low money value of life based on the willingness to pay for a life year within the country should be used, and projects funded from international sources when a higher value of life, based on the money value of life in developed countries should be used. This seems inconsistent – the value of life should be the same no matter the source of the funds.

In addition once the international funds are in country, and if they can in principle be used for other purposes, would not the optimum now be for a developing country not to undertake the health intervention if the benefit-cost ratio is low from its point of view. This appears to create a time consistency problem if funds for a health intervention from an international source are channeled through national governments.

An alternative approach which I think is more logically consistent is to say that life is intrinsically equally valuable in all countries. However the low willingness to pay money for life in developing countries implies that in these countries money is very valuable (measured in life years). On the other hand in rich countries the high willingness to pay money for life years means that money has low value (measured in life years). This means that the value of life is the same everywhere, but there would be a welfare gain from taking money form the rich, who put little value on it, and giving it to the poor, who valuing it highly.

While I think this is more logically consistent it implies that simple redistribution of money from rich to poor countries will be welfare improving and will have a high benefit cost ratio (measured in life year equivalents). Using money as the measuring rod for welfare, as in benefit cost analysis, means that money is equally valuable for each person, which rules out this kind of redistribution improving welfare. However the implication of this is that poor peoples' lives are less value than rich peoples which is ethically troubling.

The challenge paper takes proper account of the fact that health interventions have spillover effects into educational outcomes, particularly in the inclusion of deworming as a priority.

Recent work Kenya has shown that children who were treated as part of a deworming experiment not only had greater educational attainment but also higher wages when they entered the workforce (Baird, Hicks et al. (2011)). The large returns to health investments in the children in the form of better educational outcomes and eventually worker productivity (Bleakley (2007) , Canning, Razzaque et al. (2011)) could mean that the benefit cost ratios for childhood immunization and malaria prevention and treatment may be larger than those reported in the challenge paper which focus mainly on health benefits. There increasing evidence that these early childhood investments in health and nutrition, in utero and the first few years of life, have large effects on both physical and cognitive development and educational outcomes and eventually income as an adult (Schultz (2005)) mean that there is a strong case for concentrating heath interventions on children to reap these productivity gains as well as the direct health gains .

In addition to the somewhat conceptual issues discussed above there are more practical problems of measuring the benefits and costs of health interventions. However for most of the interventions discussed there is evidence from developing countries of both benefits and costs, which avoids the problem of trying to use data from developed countries to estimate values for developing countries where the setting may be very different. Average costs rather than marginal costs are used in the analysis which seems appropriate given the large scale of the proposed interventions.

A recurring issue with such high benefit-cost ratios is why if the benefits are so large relative to costs do people not finance these interventions themselves. Even in poor countries an action that produces a benefit that is 10 times larger than a cost should be very attractive. The answer for

tuberculosis treatment, the prevention and treatment of malaria, immunization against childhood diseases, HIV prevention, and the deworming of children in schools, is that these all attack infectious disease. With infectious disease there is a large negative externality when one person infects another. The social benefits to these interventions may be much larger that the private benefit to the individual who receives a vaccine or treatment. This produces a clear case for governments or international agencies to intervene.

The case for surgical interventions is quite different. The benefits from essential surgery accrue directly to patient with no infectious disease agent to cause an externality. If surgery has such a high private benefit cost ratio should it not be financed by individuals affected themselves? Here the case is really the failure of health care markets, health insurance markets, or finance markets for borrowing, which mean that poor people cannot fiancé even highly beneficial health care. Rather than improve access just to essential surgery there is a case for a broader intervention that improves access to a broad range of health care services that may be highly beneficial to poor people. This is addressed in the next section when I discuss universal access to health care.

3. Alternative Cost Effective Health Interventions

The Challenge paper makes a strong case for six interventions. However there are other health interventions that might be ranked even higher than these. One is in the area of HIV prevention. I agree with the view that while treatment with antiretroviral therapy is probably cost effective, particularly in light of the high labor productivity and earnings of those in treatment (Thirumurthy, Graff-Zivin et al. (2005)) its benefit cost ratio is not exceptionally high. On the other hand prevention efforts, particularly interventions aimed at behavioral change in high risk populations and that reduce the likelihood of virus transmission, are highly cost effective (Canning (2006)). The benefit cost ratio of these behavioral preventive intervention has been estimated at 12 to 1 (Jamison, Jha et al. (2009)).

However the challenge paper instead highlights investment in the development of a new vaccine to prevent HIV as the priority in this area. This development activity is very risky; it is difficult to know what effect the spending will have on time to development of the vaccine. Also the benefits are well in the future, perhaps twenty years, which means we must apply a discount rate over a long period of time. We also have the issue of whether we should use a low value of life based on the low willingness to pay for a life year in the mainly poor countries affected by HIV/AIDS or a higher valuation of life based on willingness to pay in rich countries, since the funding will be from international sources. Different assumptions about the effect on vaccine development, discounting and the value of life in Table 6 of the challenge paper produce a range of benefit cost estimates from 4:1 to 72:1. They assume an expected ratio of 11:1 to justify making this research funding as a priority health intervention.

It is difficult to justify putting vaccine development, with a 11:1 benefit cost ratio, ahead of implementing existing prevention strategies at a 12: 1 ratio, especially given the very wide uncertainty about the effect of funding on the chances of vaccine development. An argument given in the challenge paper is that a decision for funding for development of a HIV vaccine would signal the importance of the issue to other players in the development arena. However, it could equally well be argued that such a decision would signal a lack of emphasis on implementing prevention strategies based on changing behaviors and preventing transmission using existing technologies. Given the risks associated with development of an HIV vaccine, and the high benefit cost ratios of existing prevention interventions, I think is it very difficult to justify HIV vaccine development as a higher priority. To do this would I think require an additional justification based on prevention using existing methods not being feasible, but the evidence appears to be that it is, if carried out in a systematic way (Piot, Bartos et al. (2008)).

In addition to HIV prevention there are two other health interventions that deserve attention. One is tobacco control through high taxation. This has a very high benefit cost ratio and would have large effects on the adult health in developing countries. Smoking has large effects on cancer and heart disease and reducing smoking rates would substantially reduce illness and mortality from these diseases.

One argument against tobacco control is that aside from the externality of second hand smoke, smoking is a voluntary decision and that people should be expected to take into account the health costs of smoking in their decision making. This does not allow for the established prevalence of short term decision making, or hyperbolic discounting, by consumers where they

discount more heavily than rational future benefits relative to current benefits. The addictive nature of smoking means there is a public welfare benefit from preventing initiation of smoking and encouraging cessation. That a majority of current smokers support tobacco tax increases if the proceeds are used to help smokers quit (Wilson, Weerasekera et al. (2010)) suggests that there is a serious self control problem in smoking. Despite its voluntary nature there may still be a large welfare benefit from measures to reduce tobacco use given that the behavior of smokers is non-rational.

The disease specific nature of most of the interventions in the challenge paper is somewhat troubling given that the delivery of the interventions will largely be through a common health system infrastructure. Rather than focus on particular interventions, an alternative approach would be to emphasize the provision of health care, particularly preventive care, and cost effective treatments, using a system based on universal access. One striking feature of the last decade in Africa is a move away from user fees when accessing health care (Yates (2009)) to public provision or national health insurance. India has increased access to health care through its National Rural Health Mission while China has developed the New Cooperative Medical Scheme to provide health insurance to the rural poor (Yip and Mahal (2008)). These changes to the health system are aimed at providing greater access to a broad range of essential health care services to the poor. I am unaware of any benefit cost figures for these type of reforms, but it would be useful to examine the benefits and costs of this type of policy aimed extending access to a broad range of services. While foreign donors may emphasize highly cost effective vertical health interventions targeted as specific diseases, the developing countries themselves seem to be placing greater emphasis on creating universal access to a broad range of health care services.

4. Population Growth and Access to Family Planning Services

A serious potential problem with large scale health interventions is that the result will be larger population numbers. In the simplest sense this is exactly the health benefit we want, it is the survival of greater number of people that provides the bulk of the welfare gain from the health interventions. However, the survival of a greater number of people may have negative effects on income per capita due to the effects of population growth on land and capital per capita.

Acemoglu and Johnson (2007) find that improvements in health tend to lead to reductions in income per capita in a cross country study, and argue that the mechanism is that while better health may mean improved worker productivity, the larger population numbers may put pressure on scarce resources and reduce income per capita. Ashraf, Lester et al. (2008) use a simulation model to show that the effect of improvements of child health through a malaria intervention may lower GDP per capita for three decades due to increased child survival and population pressure, before the productivity benefits occur as the healthier children enter the workforce. Similarly Young (2005) argues that HIV/AIDS has raised income per capita in many African countries due to a high death rate and lower population growth.

The population growth that results from mortality reductions is not inevitable. One of the major determinants of fertility is child mortality. When child mortality rates fall women can achieve their desired family size with fewer births. A reduction in child mortality usually sets of a decline in fertility, leading to a demographic transition (Dyson (2010)). Without this accompanying decline in fertility the population pressure associated with health improvements may have a negative effect on human welfare.

An important factor allowing women to achieve their desired level of fertility is the provision of family palling services. A reproductive health, child health, and family planning intervention in Matlab, Bangladesh, in the 1980s, and a similar intervention in Navrongo, Ghana, in the 1990s, both led to a reduction in total fertility rates of about one child per woman in the treatment areas compared to the control areas (Debpuur, Phillips et al. (2002) , Joshi and Schultz (2007)).

The lower fertility allowed by family planning programs plays a central role in preventing a Malthusian trap occurring when child mortality declines. Improvements in reproductive health and access to family planning can have also have health benefits. The challenge paper highlights surgical interventions for complications in pregnancy. Other forms of ante-natal and post-natal care can improve the health of both mothers and children. Access to family planning can not only lead to lower total fertility but can also reduce high risk births for very young women, and for women at high parities. It can also lead to improved birth spacing. This improved timing of childbirth can again improve the health of mothers and children, reducing maternal and child mortality (Cleland, Conde-Agudelo et al. (2012) . Fewer children also allow increased parental investment per child in health, nutrition and education (Joshi and Schultz (2007)).

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