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DISEASES
PERSPECTIVE PAPER

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Diseases

A commentary on "Disease Control" by Dean T. Jamison, Prabhat Jha, and David E. Bloom.

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1. Introduction

The paper "Disease Control" by Jamison, Jha, and Bloom puts forward a case for high cost benefit ratio for a set of health interventions in developing countries. These are tuberculosis treatment, drug treatments to prevent cardiovascular disease, the prevention and treatment of malaria, expanded coverage of immunization against childhood diseases, tobacco taxation, HIV prevention, and an expansion in hospital surgical capacity to treat injuries and diseases and ensure safe childbirth.

There are a number of issues that arise when reviewing this paper. The first is the estimation of benefit numbers where health is involved. After calculating the health benefits of the interventions the authors use estimates of the value of a disability adjusted life year to estimate the welfare benefits of all the health interventions. There is room for doubt of the simple rule of thumb used that in a poor country the value of a life year lived in good health is just over twice average per capita income per year. We will discus some issues around this question – though it is difficult to resolve, and it may be a higher rather than lower figure is appropriate.

One important challenge to the analysis however is the fact that in many developing countries most health care spending is out of pocket. Given that these interventions have such high benefits, and low costs, why are people not already purchasing them? This speaks to a pervasive market failure. While market failures may exist for infectious disease, or where large costs mean households need insurance but insurance markets fail, it is more difficult to make the case for an inherent market failure when the benefits to the intervention are private, and the costs per person treated are low. For preventive measures to control of heart attacks, for example, the payoffs are private and the costs per person covered appear to be very low.

It may be that these market failures exist, but a case has to be made. If no market failure can be found it is difficult to justify the large benefit-cost ratios estimated. Even if

market failures exist, there is an assumption in the paper that the appropriate solution is direct provision of the service. A better approach may be to tackle the market failure directly; for example if the market failure is informational, information campaigns as to the benefits of a health service may solve the problem at much h lower public cost. The authors seem to assume that interventions will be funded through the public sector or international donors, while if the argument is that individual willingness to pay far exceeds the costs, simply devising mechanisms to allow people to spend they own money on the intervention seems a more appropriate policy.

A related issue on the benefits of health interventions is the lengthy discussion in the paper on the economic benefits of improved health, in the form, for example, of higher worker productivity. While much is made of this point in theory, when it comes to estimating the cost benefit ratios of the interventions only the direct health benefits are counted. There is some discussion of financial risk protection as an additional benefit but this is not included in the calculations. This may bias the resulting estimates downwards. More importantly it may lead to overlooking some health interventions that have small health benefits but large economic benefits. Later I will suggest that treatment and prevention of worm diseases and soil born helminthes fall into this category.

In terms of the costs there is some doubt that the estimated costs reflect the actual costs that will be required in practice. Cost studies in health often focus on marginal costs and ignore the overhead and fixed costs that are required when a program is scaled up. Related to this is the issue of the appropriateness of a disease or procedure based intervention strategy versus an emphasis on more broad based care through the provision of the infrastructure for more comprehensive primary and higher level health care. It is unclear if the interventions are thought of as being costed at the margin, given the existence of and working through health care infrastructure, or if they are stand alone programs.

One major challenge to the argument that these health interventions will lead to welfare gains is the fact that by saving lives the health programs envisioned will increase population numbers. This increase in population numbers will put pressure on the limited available resources, reducing income levels for everyone. this negative Malthusian externality may be large in an agricultural setting where a fixed factor, land, is a key resource. It would be interesting to see how much this crowding externality could affect the results.

Wile these issues around estimating the costs and benefits are important, and should be addressed, the very high cost benefit ratios found imply that even if we reduce the money value of life and health substantially, and increase the estimated costs of the interventions, the benefits of the interventions will still dramatically outweigh the costs.

In section 2 I briefly touch on some of the issues around putting money values on health benefits. In section 3 I discuss how including productivity benefits of the health interventions being considered might add to the case for their implementation. In section 4 I discuss the cost side and argue that the interventions may be more expensive than estimated. In section 5 I investigate the market failures that have to form the basis of the argument for intervention. Section 6 looks at the issue of the economic consequences of the population boom that health interventions can engender through mortality reductions. Section 7 ends with an argument that intervention through deworming may be considered a priority area on economic is not health grounds.

2. Money value of health benefits

Cost effectiveness analysis estimates the cost per unit of health benefit gained. 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. There are a number of technical

difficulties with defining disability adjustment to life years and age adjusting life span gains. These are discussed in the paper.

There are two issues concerning translating health improvements into money values that may however have a bearing on the results found in the paper. The first is how the value of a statistical life varies with the level of income. The approach taken in the paper is to assume that the willingness to pay for a statistical life is unit elastic in income. this means that the value of health improvements is taken to be directly proportional to a country's income level. However Viscusi and Aldy (2003) report results from 60 value of life studies and 40 studies of injury risk premiums. They find an income elasticity of willingness to pay for life and health of about 0.5. A low elasticity means that in poor countries people are willing to pay a higher fraction of their income to avoid the risk of death and disability than in rich countries. This result may not be correct but it needs discussion together with a more detailed argument for accepting unit elasticity in the willingness to pay and the actual multiple of average income people are willing to pay for a statistical life year.

A second issue is that in cost benefit studies we usually add up the money value of the benefits to those who receive the intervention. In the health approach we add up the health benefits, weighted equally across people with different income levels and willingness to pay. Jamison, Jha, and Bloom then translate the health benefits to money units using average income in the countries in question to put a money value on life. This approach seems reasonable if the health gains are equally distributed over income groups. However, there is strong reasons to suspect that the heath gains will be concentrated in among the poor, (in poor countries and the poor in richer countries) who typically have a much high disease burden than the rich (as is indeed pointed out in the paper). The poor will typically have a lower willingness to pay for health than the average person, making the reported benefit-cost cost ratios too high.

The approach used by cost effectiveness analysis is egalitarian; all gains to health within a country are weighted equally. This egalitarian flavor in maintained in the paper where all health gains are translated to money units at the same rate. However in benefit cost calculations the key issue is efficiency. A low benefit-cost ratio implies the person would rather have the money than the intervention. The poor are less willing to pay for life, which is another way of saying they have a high value of money. For the poorest people in the poorest countries, who have the worst health, and the most to gain in health terms from the interventions being proposed, the value of money is high and the benefit-cost ratio may be much lower than is being reported.

3. Productivity Benefits

There is a comprehensive review of the literature in the paper on the idea that health interventions have economic as well as health benefits. However, when it comes to estimating the benefit-cost ratio for the health interventions only health gains are included. Adding these economic benefits would give a clearer view of the overall gains from health interventions. To some extent this omission may be due to lack of data on the economic benefits of the interventions being assessed. However there is certainly evidence, at least for some of the interventions, and including this information might change the ranking of the interventions considered, and might raise other interventions above those currently being considered.

I focus on malaria. The loss of productive work time due to a bout of malaria has been estimated by 5.8 working days per bout of malaria in Zambia (Utzingerg, Tozan et al. 2002). Other studies indicate that 4.03 days per bout are lost in Sri Lanka (Attanayake, Fox-Rushby et al. 2000), and 10 days per bout in rural Colombia (Bonilla and Rodriguez 1993). Snow et al. (1999), estimate that in malaria endemic areas (where natural immunity is common) adults on average suffer 0.4 bouts per year, though children aged 0-4 suffers on average one bout of Malaria per year.

The working days lost due to malaria fever are substantial but not enormous. A number of studies use national efforts to eradicate malaria in the 1950s and 1960s using DDT spraying to estimate the long term gains to children from avoiding early childhood exposure to malaria. Early childhood exposure to malaria can retard physical and cognitive development in children, leading to poor outcomes in school and worse health, and low productivity, as an adult. Cutler, Fung et al. (2007) find that the malaria eradication in India lead to significant gains in literacy in the areas in which malaria was initially endemic. Lucas (2005) finds malaria had a substantial adverse effect of on female literacy in Paraguay, Sri Lanka, and Trinidad and Tobago. Bleakley (2006), in an analysis of malaria eradication program in the USA, Mexico, Columbia and Brazil shows that childhood exposure to malaria substantially depresses labor productivity in later life, lowering adult wages by as much as 50%.

These long term economic effects of malaria on children are likely to dominate the cost of the working days lost due to malaria by adults. These economic gains have to be discounted since they come in adulthood, long after the health investment in reducing childhood exposure to malaria has been made, but even with discounting the economic benefits of malaria control may be a significant addition to the health benefits. In the paper the financial risk protection that comes from malaria control is rated as low, which presumably means that the cost of treatment and earnings forgone by adults when ill is not very substantial. however, The potential addition of the long term economic consequences of childhood exposure might change these assessment.

Immunization against childhood disease has large effects on childhood mortality. These disease, may like malaria, have a large morbidity burden in children affecting, in particular, their cognitive development. Bloom, Canning, and Weston (2005) estimate that the health gains that flow from childhood immunization will have a productivity benefit when these children becomes adult and that despite discounting the return on

immunization as a purely economic investment (ignoring the direst health gains) is substantial and is comparable with investments in primary education.

A similar analysis could be applied to the other health interventions proposed. In particular those that target morbidity, rather than mortality, such as the surgical treatment of injuries, are likely to have substantial benefits in terms of worker productivity. In addition, interventions that affect childhood health, such as immunization, that have effects on their long term physical and cognitive development are likely to have economic benefits once these children reach adulthood.

It may be that, due to uncertainty in the estimates of these economic benefits, the authors may be uncomfortable including them in the calculations. However, it would still be useful to report estimates of the magnitude of the economic payoffs even if they are not ultimately used in the calculation of benefit-cost ratios.

4. Costs

The paper discusses the issue of strengthening the health system as part of the intervention strategy. In addition to the financial constraints they are real resource constraint in terms of health sector infrastructure and personnel that may make scaling up of interventions difficult. The vertical disease specific approach does leave the question of how the overall health system will function in parallel. While attention is paid to this issue and its importance is underlined it is unclear how the vertical programs will be integrated with he health system in practice.

A related issue is the costing of the interventions. A recurrent problem in the health area is costing of interventions at marginal cost, assuming the existing of health infrastructure, and sometimes even health workers. these costs can be wild underestimates. It is recognized in the paper that these disease specific interventions should go hand in hand

with general increases in physical and human resources for the health sector. It is postulated that this will increase costs by a factor of 2 or 3 but this appears speculative. A better approach would be to distinguish costs from small scale interventions to those found when scaling up interventions. There is the problem that many health interventions are joint products of a single health system, but more detailed evidence of actual costs of large scale interventions would be very helpful in making the case for these health initiatives.

5. Market Failure

The usual rational for intervention in economics is some form of market failure. In a perfectly competitive market the price should be equal both to the marginal social cost of producing the good, and to the marginal welfare benefit to the consumer. This implies that for market goods, under perfect competition, we should have benefit-cost ratios of exactly one. The cost- benefit ratios given for the suggested interventions are very high, ranging from 10 to 1 up to 30 to 1. This speaks to widespread market failures in the provision of these health services. However there is no real discussion in the paper of what market failures are present or how they might be overcome.

For infectious disease the externality caused by infecting others gives a clear market failure that can justify intervention. This argument applied to the prevention of HIV/AIDS, the prevention and treatment of tuberculosis, immunization against the childhood diseases, and the prevention and treatment of malaria. Even in these cases, however, the private gain from prevention and treatment may be large relative to the social spillover.

For example, in the case of the use of bed nets against malaria, and the treatment of malaria, the estimates given in the paper are of a benefit-cost ratio of 20 to 1. The major beneficiaries to the use of bed nets and the treatment of malaria are those who

directly avoid infection and receive treatment. There are spillover effects through reduction in the malaria burden on others (Hii et al. 2001) but the vast majority of the benefits accrue to the household using the net and getting the treatment. However, despite having welfare gains whose money value is estimated to far outstrips the cost, households exhibit very low willingness to pay for bed nets, both in their observed purchases and stated contingent valuations (e.g. Guyatt et al. 2002 find low willingness to pay for bed nets in Kenya).

How are we to reconcile a household's failure to purchase a bed net with the fact that he benefits are around 20 times the cost? There are of course possible explanations. They may be too poor – as pointed out above the benefit-cost ratios are calculated for an average person in the country, and the ratio for poor people may be lower. There may be information problems, people may not know or understand the health benefits. They may be capital market problems, so that the expenditures while small exceeds current cash reserves and a load is required, but not available. There are a host of possible explanations – but these explanations need to be made. The explanation also affects the nature of the intervention. If poverty is the problem redistribution is required. If it is information an advertising campaign may be better than direct provision. If it is credit market imperfections this will affect many aspects of people's lives and the priority intervention may be micro-credit institutions rather than the direct provision of bed nets.

Surgical interventions give essentially private benefits, there is no spillover as with infectious disease. In this case if the costs per person are high the issue may be the lack of health insurance. Presumably the high, but uncertain, cost of surgery is the reason that in Table 7 its provision is assessed to give a high payoff in terms of alleviating financial risk. However, if lack of insurance is the key reason for the market failure in surgery provision this raises the issue of why the right intervention is not the provision of health insurance rather than direct provision of surgery.

The high benefit-cost ratio for the acute management of heart attacks with low cost drugs is perhaps the most difficult to explain since the gains are private while the costs per capita are very low and should be affordable. This may be an information problem and the correct response is therefore to get the appropriate information to doctors and patients.

The issue of tobacco control has some special problems as already noted in the paper. More could be made of the issue of second hand smoke and bans of smoking in public places. The paper takes the view that there is an information problem which justifies intervention. I would give more weight to hyperbolic discounting and time inconsistency that leads people to start and continue smoking despite knowledge that in the long term the cost of the health risks outweigh the current benefits of smoking. This lack of rationality on the part of consumers can justify a paternalistic policy.

6. Mortality Reduction and Population Growth

Mortality reduction that result from health interventions will lead to an increase in population numbers. While each individual who has a health improvement may see a welfare gain, in the aggregate population crowding can exert a negative externality through resource shortages. Acemoglu and Johnson (2006) suggest that this population pressure may explain why countries that undergo rapid improvements in health do not see improvements in income per capita at the same time.

In its most extreme Malthusian form this argument requires the existence of fixed resources, such as land, that becomes scarce as population expands. In a manufacturing economy the physical capital stock can adjust to match an increased population, but this adjustment may take time leading to low capital-labor ratios during periods of rapid population growth.

Ashraf et al. (2007) undertake a simulation model of the Zambia economy and examine the economic effects of malaria eradication. This eradication lowers infant mortality setting in progress a population boom. They assume a Cobb Douglas production function and that rent on land amounts to 10% of national income. The importance of land, the slow adjustment of physical capital, and the delay in children reaching working age means that over a 20 year horizon income per capita falls after eradication. In the very long run the productivity gains from improved health may increase income per capita above the initial baseline.

An import issue in thinking about the population response to health improvements is how reducing in infant mortality affects fertility decisions. Given that families care about the number of surviving children, reductions in infant mortality can reduce the desired number of births. Provided family planning is available to achieve these lower fertility goals, the population boom due to lower infant mortality may be offset by a reduction in fertility. Indeed fertility may fall more than one for one with infant mortality. Understanding the magnitude of this fertility response is therefore central to the question of the size of the crowding externality.

7. Deworming as an Additional Intervention

the parasitic infections, soil–transmitted helminths and schistosomiasis have very high prevalence rates in developing countries. It is estimated that world wide 2 billion people, almost one third of the world's population, and infected with these diseases. Despite the high prevalence these diseases a have a low ranking in global estimates of the burden of disease and are not a high priority on health grounds. The explanation of the low burden, given the high prevalence of these diseases, is the low mortality burden of these diseases and the low disability weight given to these infection and their sequelae in the burden of disease estimates. King, Dickman, and Tisch (2005) focus on the 0.005 disability weight for schistosomiasis (where normal functioning has a weight of 0 and 1 corresponds to death) set by a panel of experts and used in Global Burden of Disease

estimates. They argue that shistosomisis infection produces a large disease burden in terms of anemia, diarrhea, low weight for height, and reduced physical fitness and that a more accurate disability weight would be between 0.02 and 0.15, increasing the global DALY burden by a factor between 4 and 30. These "hidden" morbidities, which are difficult to ascribe to a disease at the individual level, but evident in population studies, are also likely to be present in other parasitic diseases.

The treatment of high prevalence tropical diseases by mass chemotherapy, with general or school based populations is highly cost effective. There exist cheap (or even free) drugs that can be administered safely to populations that have a large impact, curing the disease in the patient and interrupting transmission of the disease, for example, Benzimidazole anthelmintics, and albendazole for soil transmitted helminths and Praziquantel for schistosomiasis. The high prevalence rates means that it makes sense to avoid the costs of diagnosis and to treat everyone in the population at risk. However, when prevalence rates fall to very low levels after a successful population level of intervention, it is eventually more cost effective to carry out treatment only when the disease is diagnosed in primary health care clinic. Estimates of the cost of treatment per person range from $0.05 per drug to around $0.25 for combined therapy. Deworming needs to be repeated periodically since re-infection is common.

While the health benefits of this intervention may be substantial, the largest effect is likely to bee seen in terms of economic gains. Iron deficiency anemia, which can result from the parasitic diseases, has more insidious effects lowering energy levels, worker productivity and wages (Thomas, Frankenberg et al (2004)). The parasitic worm diseases are most common in children where they have effects on school attendance, literacy and physical development (Bleakley (2003) , Miguel and Kremer (2004), though the potential for effects on cognitive development are less clear (Dickson et al. (2000)). he combination of very low costs of treatment and large potential economic benefits mean that deworming should be considered as an additional priority health intervention

on economic grounds if not on health grounds alone (Molyneux, Hotez and Fenwick, 2005).

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