ASSESSMENTS OF MALARIA ERADICATION

COSTS AND BENEFITS

Edwin J. Cohn
AID/Washington
August 10, 1971

BEST AVAILABLE COPY

Introduction: Why Assessment?

In the case of a malaria eradication program, as with most types of program or project, assessment of the expected costs and benefits can be a useful tool in arriving at an informed and rational decision as to whether a proposed program should be adopted and in choosing between variants of that program. It is important that the approach be systematic and comprehensive -- what is often referred to as a systems approach -- and that no major inputs or outputs be overlooked. Quantification, costing, and time-phasing of all inputs and outputs is, of course, highly desirable and should be undertaken wherever possible; without this data the benefit-cost ratio cannot be calculated. Many of the estimates, especially on the output side, will, of necessity be highly tentative but the exercise of making them should make for clearer thinking through the consequences of the proposed program. Even if quantification and costing of some elements is impossible, precision in identifying these inputs and outputs should still be attempted.

Prospective vs. Retrospective Assessment

A distinction should be made between prospective and retrospective assessment. The former should provide information useful to those who must make the decision as to whether to proceed with a proposed program, modify it, or reject it. The latter, although interesting from an academic point of view, is of little value for decision-making except insofar as it provides experience and insights, including methodological advances, which can be drawn upon by those making prospective assessments elsewhere. Even then the question arises whether different country situations are sufficiently similar so that the findings in one are transferable to

BEST AVAILABLE COPY

another. It should be noted, however, that retrospective assessment would be greatly facilitated by the collection of good base-line data; without such data, which can most effectively be assembled in connection with a prospective assessment, sound retrospective assessment is virtually impossible.

Assessment of Inputs: Discounting

One of the major deficiencies in economic assessments that came to my attention during my participation in the In Depth Evaluation of the Indian National Malaria Eradication program last year (my only association with malaria studies and the experience on which I therefore draw heavily in this presentation) and which I would therefore like to stress here is the fallacious practice of assuming that costs (and benefits) today and at different points in the future are of equal value. This issue arose in India in connection with the comparison of the costs of control and eradication programs but is relevant for all types of comparison. One of the arguments which has been advanced in favor of eradication, along with the technical ones, is that although it is initially more costly it is cheaper in the long run because it is completed in a finite period of time (seven to ten years) whereas control goes on forever. It is, however, inadmissible to compare these two sets of outlays by simply adding up the projected annual costs of the two programs over their expected lives; it is essential that the two expenditure flows be reduced to a common base to take into account the fact that, viewed from today, money next year is of lower value than money today -- and that money five or ten years hence is of still lower value. This principle, known as discounting for present

BEST AVAILABLE COPY

value, is conceptually the reverse of compound interest. Discounting makes it possible to compare expenditure (or income flows) with different time-phasing; without discounting, no such comparison is possible. The determination of an appropriate discount rate for any particular situation requires consideration of the country conditions, especially the scarcity of capital. It is safe to say, however, that for most developing countries -- which are also the countries likely to be engaged in anti-malaria programs -- the discount rate would not be less than 10% and might be considerably higher. Such discounting to take account of the different time-phasing of costs (and benefits) implicit in alternative programs is standard practice in cost-benefit analysis. Apparently it has not been applied, however, in comparing alternative anti-malaria programs.

The significance of discounting can be illustrated from the Indian experience for which the relevant expenditure estimates are at hand. In 1957 the Government of India was facing the choice between continuing the control program which had been underway since 1953 and switching to eradication. It was calculated that eradication would cost a total of about 80 crores of rupees (roughly $100 million at today's exchange rate) over ten years. The control program was then costing between six and seven crores of rupees annually and could be expected to continue at this level indefinitely, rising slowly as population grew. Without discounting expenditure flows it would appear that a break-even point between eradication and control was reached if one looked only three or four years beyond the ten years of the eradication program and that in any longer perspective eradication, being thereafter free, was significantly cheaper.

BEST AVAILABLE COPY

Discounting places the comparison in an entirely different light; at a 14% discount rate the 80 crores or rupees for the eradication program shrinks to a present value of 54 crores, which happens to be equal to the cost over 30 years of continuing the control program at the 1957 level of 6.8 crores of rupees, also discounted by 14%. (Costs beyond 30 years can be ignored because at a discount rate of this magnitude they are negligible.) In other words, at a 14% discount rate there is no difference in cost between eradication and control; at any higher discount rate, control would be cheaper.

It should be noted that in the above comparison population growth has been taken into account but the cost of the maintenance program required to follow the eradication has not. This regretable omission was necessitated by the lack of data on maintenance costs. Clearly inclusion of such costs would have made control cheaper than eradication at a discount rate below 14%. Expenditures for the maintenance phase are an essential element in the cost structure of the eradication program. Their omission distorts the analysis and constitutes an example of the danger of overlookin a major input (or output) which was stressed above.

Assessing the Outputs

There are three direct outputs of malaria eradication program: 1) reduc morbidity, 2) reduced mortality, and 3) increased fertility. Each of these has a number of economic and social consequences. The reduction in morbidity and debility and the production gains associated with a healthier population are probably the aspect that has received the most attention. Conceptually those production gains are of three types. The first, and

BEST AVAILABLE COPY

easiest to assess, are those resulting from the opening up to cultivation of potentially productive areas which had previously been so infested with malaria that they were virtually uninhabitable. Once malaria was brought under control the way was opened for people to settle there, for agriculture to develop, and for processing and service industries to make their appearance. Examples are the Terai in northern India and the Awash Valley in Ethiopia. It should be noted, however, that the containment of malaria is a necessary but not sufficient condition for the economic development of such regions; resources which have alternative uses must be applied to the clearance of land, the construction of transportation and communications systems, the development of irrigation works, the building and equipping of houses, schools, public buildings, and commercial and industrial structures etc. Resources used for such purposes (with some exceptions) are not free; they must be valued at their most productive alternative use, or opportunity cost. In other words, the production gains realized in such reclaimed regions cannot be attributed in their entirety to malaria eradication; the share assignable to the malaria program is calculated as a residual after these other inputs have been taken into account at their opportunity cost.

The second effect of reduced morbidity on production occurs in regions which had previously been inhabited and cultivated but where the heavy incidence of malaria exerted a depressing effect on human activity and therefore on output. A healthy population is doubtless capable of higher productivity than one which is intermittently racked by fever and chills and the debilitating after effects of malaria. The approach of

BEST AVAILABLE COPY

estimating the number of man-days "lost" through fever and multiplying this by a coefficient representing a hypothetical wage or output, however, is unsatisfactory because it rests on the dubious assumption that time lost to fever would have been productively employed. Such an assumption, which would be plausible in developed countries with full employment, is untenable in low income countries with heavy, and for the most part rapidly increasing, unemployment and underemployment in both rural and urban areas. Most malarious countries are characterized by surplus labor, especially in the rural areas where the incidence of malaria is especially high.

Even with surplus labor during most of the year, however, there may be a labor constraint during peak periods of agricultural activity, such as planting and harvesting. Moreover, the existence in a region of surplus labor in the aggregate does not necessarily mean that the surplus will flow to where it is needed; because of institutional constraints, including kinship and communal ties, there may be no arrangement which makes it possible for the fields of the man who falls ill to be harvested by a neighbor even if that neighbor is grossly underemployed. These circumstances make quantification of the production gains brought about by improved health a very tricky matter. Proper analysis requires that fairly detailed knowledge of seasonal variations in the demand for labor and of the institutional arrangements governing the deployment of labor.

A third possible consequence of improved health is encouragement of the cultivation of higher value crops which, however, must be planted and/or

BEST AVAILABLE COPY

harvested within narrow time limits. Relieved of the anxiety that they may be incapacitated by malaria at these crucial times and the risk that their crops may therefore be a total loss cultivators can afford to switch from products yielding a low financial return but involving little or no risk (such as manioc) to more demanding but more profitable products such as seasonal vegetables. This lack of responsiveness to prices has been reported in Northeast Brazil (although not specifically in connection with malaria) and seems plausible.

To turn from agriculture to other branches of economic activity such as mining, construction, forestry, plantation agriculture and other types of activity carried on by organizations, the benefits brought by malaria eradication may be less to increase output than to reduce costs, although both can occur. Such cost reduction is made possible because employers are relieved of the necessity of retaining extra workers to take the place of those who fall ill.

Another category of economic benefit brought by the decline in the incidence of malaria is reduction in expenditures for its treatment; medical personnel and facilities become available for other health purposes.

Another possible benefit, but an extremely difficult one to get at, is the increase in mental energy among a population liberated from malaria, and its ramifications for education and innovation. It has been widely noted that malaria causes apathy. This does not necessarily mean, however, that its eradication will, by itself, bring about a sharp increase in mental vigor and innovativeness. Apathy and the fatalism and past orientation associated with it are generally a joint product of disease,

BEST AVAILABLE COPY

malnutrition, lack of opportunity, and poverty. Such attitudes and world-outlook are a realistic adaptation to a world over which men have little control. Moreover, they are sanctioned and supported by culture. It may therefore be unrealistic to expect rapid increases in future orientation, sense of efficacy, and innovativeness to follow the eradication of malaria. This is an area which it would be most interesting to know more about.

Demographic Consequences: Reduced Mortality and Increased Fertility

The two other outputs of malaria eradication programs are reduced mortality and increased fertility. Both of these contribute, in some cases significantly, to the increase in the rate of population growth. For instance, in India, on the basis of the available data, which is not very reliable, the malaria control and subsequent eradication programs appear to have reduced the crude death rate between 1952 and 1970 by about four points per thousand of population. The total decline in the crude death rate over this period was between six and nine points.* If one accepts the estimates of death due to malaria prior to 1953, which may or may not be correct and cannot be verified, the virtual elimination of death from malaria therefore appears to have accounted for between one half and two thirds of the decline in the crude death rate since 1952.

At the same time fertility is raised in two significant ways. First, a number of people who escape death from malaria produce children who would not otherwise have been born. Second, the miscarriage rate is reduced;

---

*A better estimate of the current death rate awaits analysis of the 1971 Census of India.

BEST AVAILABLE COPY

pregnant women who carry malaria parasites in their blood are known to have an uncommonly high (but unquantified) propensity to spontaneous abortion. In the Indian study it was not possible to quantify increases in fertility attributable to either of these factors.

The kind of radical demographic transformation brought about by the simultaneous decrease in crude death rates and increase in fertility has significant adverse effects for economic development which need to be taken into account in any appraisal of the costs and benefits of malaria eradication. Rapid population growth exerts a retarding effect on economic development. This effect is especially pronounced when the increments to population are dependents who consume but do not produce. In the case of increased fertility all of these increments are obviously among the very young and in the case of reduced mortality they are largely in this category. The effect of an increase in the dependency ratio (the ratio of those younger and older than the labor force to total population) is to raise marginal consumption and depress marginal savings and investment rates. It also effects the composition of investment unfavorably in that the demand for housing, schools, health facilities and other types of less directly productive investment rises with the result that fewer resources become available for more directly productive investment.

Models for relating increases in population to other economic parameters and thus quantifying the retarding effect on economic development of a given increase in the rate of population growth have been worked out, notably the TEMPO model produced by Stephen Enke and his associates.

BEST AVAILABLE COPY

From an economic point of view, then, the acceleration of population growth effect of malaria eradication tends to offset the increased production effect except in previously uninhabited regions such as the Terai or the Awash Valley. As a result, the economic case for malaria eradication may not be very strong. (It will vary, of course, from situation to situation depending on the outcome of the analysis of the factors outlined above). At the same time, however, the improved health and longevity may be regarded as valuable gains in bettering the conditions of human life, which is a central goal of the development effort.

The demographic consequences of malaria eradication and their economic implications are so far-reaching and significant that it is essential that analysis of them be incorporated into assessment of malaria programs. Only then can the responsible authorities make informed decisions knowing the implications for population growth and the needs thus created for efforts to reduce fertility.

BEST AVAILABLE COPY