

## WELFARE INDICATORS AND HEALTH: THE SELECTION AND USE OF SOCIOECONOMIC INDICATORS FOR MONITORING AND EVALUATION<sup>1</sup>

Philip Musgrove<sup>2</sup>

*PAHO's plan of action for attaining health for all by the year 2000 calls for evaluating improvements in well-being by means of at least eight indicators. This article examines those eight indicators, assesses their worth for making such evaluations, and suggests how the data relating to each indicator could be organized and broken down.*

### Introduction

PAHO's plan of action (for the implementation of regional strategies designed to attain "health for all by the year 2000") sets forth eight tasks to be carried out as part of the monitoring and evaluation process. One of these tasks is "to evaluate the improvement in the levels of well-being in the Region and their relationship to health" (1). Two justifications are offered for this emphasis on general well-being, including its nonhealth components. The first is simply that health "is included within the general framework of well-being," which suggests the desirability of keeping informed as to the evolution of other elements which contribute to welfare. The second is that these other components "are factors that in greater or lesser degree condition the health status, and consequently, ...should be used for the analysis and explanation of the levels of health" (1). This latter is clearly a much more ambitious reason for studying nonhealth components of well-being, implying as it does a commitment to research on causal relations and interactions among health and other elements of human welfare.

Aside from the general contribution such research can make to a wider understanding of health, there are at least two ways in which the findings of such research might be put to practical use. The first way is in helping to design health policies so as to take advantage of (or compensate for) actions and events originating in other sectors of the economy that are likely to affect the health of the population. The second way is by helping to persuade other public agencies to design their own policies in such a manner as to maximize the collateral benefits for health. The object in both cases would be to increase welfare in terms of health without requiring proportionally greater efforts on the part of the health sector.

Almost any change in an economy can have some health consequences, at least for part of the population; and similarly, almost any other component of well-being is likely to show some correlation with health status. Therefore, so as not to be overwhelmed by the number and complexity of such relations, it is essential to choose a small number of indicators to follow. In order to be useful for this purpose, any nonhealth indicator of well-being should be relatively easy to obtain and interpret; should show a clear relation to well-being; and should bear some significant causal relationship to health.

In its strategies for attaining health for all by the year 2000 (2), PAHO proposed a list of mandatory indicators to be included in the

<sup>1</sup>Also appearing in Spanish in the *Boletín de la Oficina Sanitaria Panamericana*, 96(4), 1984.

<sup>2</sup>Regional Adviser in Health Economics, Health Systems Development Unit, Pan American Health Organization, Washington, D.C.

monitoring and evaluation process, while leaving the choice of additional specific indicators open to Member Countries; these mandatory indicators were later included in PAHO's *Plan of Action for the Implementation of Regional Strategies (1)*. This article briefly discusses each of these mandatory indicators, applying the criteria just described. It then reviews several issues common to various indicators, outlines research requirements established by the incorporation of these or other indicators into monitoring and evaluation activities, and briefly discusses some of the methodological issues involved in such research.

### The Proposed Indicators

The eight socioeconomic indicators considered mandatory (1) are as follows:

- demographic information (the population classified according to age, sex, geographic distribution, and socioeconomic status);
- general fertility;
- the per capita availability of calories and proteins;
- literacy;
- the proportion of the population in extreme poverty;
- unemployment;
- the per capita gross domestic product (GDP) and the structure of the gross national product (GNP);
- the proportion of the population that lives in marginal conditions.

It is recognized that demographic information, the first "indicator," is essential to all the others, since each of the latter (except the structure of GNP) is a ratio, with demographic information appearing in the numerator or denominator or both. In fact, demographic data do not directly indicate welfare but instead provide the basis for deriving welfare indicators.

It is also recognized that different indicators measure different aspects of welfare, so that information is lost if they are combined into a single measure. For example, these obligatory

indicators include one component of the "physical quality of life index" (3), namely literacy, and the other two components (infant mortality and young child mortality) may be regarded as part of the basic demographic information. When mortality rates are used this way, they are regarded as direct measures of well-being. However, neither the physical quality of life index nor any other combined index is recommended for use by the plan of action.

### Population Data

The distribution of a population by age, sex, and geographic location (the most basic sort of demographic information collected by a census) requires little discussion. Census data do suffer from certain deficiencies and inaccuracies, but the resulting problems are generally slight, and are outweighed by the nationwide coverage provided as well as by the great expense that would be required to acquire comparable data by other means. What makes this demographic information into an indicator of well-being, however, is the insistence that the population also be classed by socioeconomic status.

Censuses usually contain some variables usable for deriving such a classification, such as variables relating to education and occupation; and they sometimes provide an estimate of total household income. However, more detailed or more varied information can only come from household surveys. Such surveys must, of course, cover the whole country; those which merely consider certain population components—such as the urban population or the formal labor force—are useless for this purpose, unless only the health of those limited groups is being assessed.

In this regard, the best single variable by which to measure the well-being of a household or family appears to be total current annual consumption per person (4). Households usually report consumption more accurately than they report income. In addition, consumption is somewhat more stable over time

because transitory variations in income are not fully reflected in consumption. Although both of these circumstances tend to make consumption a better welfare indicator than income, data on income (such as may be provided by a census) are sometimes available when data on consumption are not, and in that case the income data should be used.

Price adjustment of consumption data is obviously necessary in order to remove, so far as possible, the effects of inflation from year to year (or even from month to month if inflation is very rapid). Moreover, it is preferable not to use the same price index for everyone, but rather to calculate separate price indexes for different income levels according to what people at different levels actually buy. This is desirable because different prices change at different rates in times of rapid inflation; food prices may rise much more or less than prices for durable goods, for example, so that the rich and the poor experience different rates of inflation (5). Spatial price adjustments (for different regions) are also desirable if prices differ notably in urban and rural areas or in different areas of a country, although in this case the theory of indexes is less well developed (6). The use of spatial price adjustments is also implicit in the conversion of local currency to a common currency for the purpose of making international comparisons (7).

Besides making price adjustments, it is also necessary to take account of family size, and perhaps also of composition. An income of \$1,000 implies very different welfare levels for a family of two people and a family of 10 people, and may also have different implications depending on the numbers of adults and children present. The simplest adjustment is made by dividing the family's total consumption (or income) by its number of members in order to obtain a per capita welfare indicator. More complex adjustments can take account of the household members' age and sex, but these adjustments are not necessary for the purpose of obtaining a reasonably accurate indicator of well-being.

Making even these basic adjustments for price and family size requires some extra ef-

fort, but such adjustments are essential; for even though they may not alter the population's overall distribution, they will affect which families appear to be poor and how their well-being appears to change over time.

The basic aim of the socioeconomic population indicator is to produce an estimate of what is usually meant by the "distribution of income," or a proxy for it in which the various groups established are sufficiently numerous and are well-defined by income-related variables. Such an estimate could incidentally provide two of the other indicators sought—these being the proportion of the population living in extreme poverty and the proportion living in "marginal conditions," if the latter are defined economically.

This procedure may appear to overemphasize the economic component of "socioeconomic," but in fact many other "social" variables such as education, occupation (or source of income), consumption "style," and so forth, are closely correlated with income. Such variables can and perhaps should be used in acquiring socioeconomic data; the key thing, however, is to acquire data on a multivariate grouping, so that the economic variables are crossed with the purely demographic and social variables. For example, one should know the distribution of families by size in the lowest socioeconomic group, and also the distribution by education of adults in that group.

### *Fertility*

The fertility rate is another basic piece of demographic information. However, when it is taken as an average over a whole population it is not easy to interpret as a measure of well-being, and its connection to maternal or child health is not very strong. What is known is that health tends to deteriorate among women and children if the mother is either very young or old, or if she has many children. Therefore, the average fertility rate should be supplemented by two more disaggregated distributions of births—grouped according to the age of the mother (yielding age-specific birth

rates), and by the number of children still living from previous births (or at least the number of children per mother). Probably no more than three classes are needed for either of these distributions, which would make fertility rates into better measures of well-being and would relate them more closely to both maternal and child health.

#### *Availability of Calories and Proteins*

Data on the average daily availability or consumption of calories and proteins (in grams) per person in the entire population are useless for our purposes. For even though there are countries where these averages are slightly below the estimated minimum biological requirements, this is almost never the case in the Western Hemisphere. So far as averages go, there appears to be enough food everywhere. Thus, even more than in the case of income, it is the *distribution* of food that matters, because a great many people can be malnourished even if the average figures don't show it. Also, people consuming too few calories must metabolize proteins for energy instead of using them to build and maintain body tissue, and so the two kinds of nutrients cannot really be considered independently unless caloric intake is adequate.

In general, there appear to be three different ways of obtaining meaningful measures related to calorie and protein intake. The first is by estimating actual consumption within different socioeconomic groups, using either data on expenditures for food or direct measurements of physical consumption. This is the most accurate but also the most difficult and expensive method.

The second way is by estimating consumption indirectly on the basis of measured income or total expenditure, using consumption functions of the sort developed by Reutlinger and Selowsky (8) for caloric intake and protein intake. Very detailed budgetary information on food intake is needed in order to apply such functions initially, but thereafter changes in income can be converted to estimated changes in food consumption without the need to mea-

sure actual food intake again. This procedure is the same in principle as inferring welfare changes from price index changes, when there is new information on prices but not on the quantities or weights in the index.

The third method is to ignore the inputs—that is, the intake of nutrients—altogether, and to monitor only the output or the affected individuals' actual nutritional state. In this case the indicator should be the distribution of malnutrition among the three standard levels, particularly among infants and young children. This information can be obtained by direct surveys—in which case it is not necessary (although it is still advisable) to measure socioeconomic variables (9), and the data can be relatively free of errors. If the surveys are taken in households, rather than in medical establishments, information can also be obtained on several other important determinants of nutritional status including breastfeeding, the principal types of food consumed, and knowledge of food values (10).

Two advantages of measuring outputs rather than inputs (or less directly related determinants) should be emphasized. The first is that total food intake may be adequate for a given family, yet the children may be malnourished. This cannot be checked by household budget surveys, but it becomes apparent when nutritional status is measured directly. (In fact, since the 12 global indicators for measuring progress towards health for all (11) explicitly include minimum standards for birth-weight and for children's weight as a function of age up to five years, it is not clear whether food intake measurements will add any information useful for predicting malnutrition.) The second advantage is that changes in economic conditions can easily produce circumstances in which food availability appears to improve while nutritional status worsens. For example, if a recession raises unemployment or reduces incomes among the poor, then the unemployed or poor will suffer nutritionally, even though the slackening of demand for food may coincide with an increase in supplies or may by itself lead to price reduction. In this regard, it is noteworthy that even

in times of famine when many people die, total food availability usually decreases rather little; people die because prices rise, or their incomes fall, or the distribution system breaks down.

Offsetting these advantages of measuring outputs is the fact that information on food intake is valuable for determining the cause of malnutrition and for deciding upon the proper intervention to correct or prevent it. It must still be stressed, however, that information on inputs is useful only at the level of individuals or small groups; averages over entire populations are of no value.

### *Literacy*

It is generally accepted that education is one of the principal determinants and predictors of income, and thus of a population's general standard of living. It is also accepted that basic literacy is a crucial element, not only for access to jobs but for much broader participation in society (3). Finally, a growing body of research suggests that education has a substantial direct effect on health status, apart from its indirect effect via income, even when no specific health education is included (13).

The clearest connection appears to be between the education of parents and the health of children. That is, better-educated parents are more effective in caring for their children's health at home, make better use of available medical facilities, and in general use resources (both their own and those provided publicly) to better effect.

For all these reasons, literacy rates—particularly maternal literacy rates—belong among the basic indicators of well-being. However, their value as indicators is greatly increased if they are reported not only for the country as a whole but for the various population groups specified by the first indicator—that is, for groups categorized by sex, age, geographic location, and socioeconomic level. Since the data sources that provide these latter breakdowns invariably report on literacy and schooling, no additional effort is required to collect and report literacy information of this

kind. It is also essential, however, to distinguish between functional literacy and the mere ability to write one's name or read a few words.

Of course, literacy is not the only indicator of education; and while it is the simplest, differences among levels of schooling are also important for health, both directly and indirectly via income, even after literacy is attained. For this reason it may be useful to classify adults, especially adult women, by the highest level of schooling reached. The chief problem with such classifications is that they register only the level of schooling attained, making no allowance for repetition of grades or the great differences in quality that characterize education. The simpler distinction between literacy and illiteracy avoids this problem.

With regard to children, it is hard to establish any link between their schooling and either their health status or their families' current income. Therefore, data on the literacy, school achievement, or school attendance of children under 14 or 15 years old are not valuable as indicators of well-being. At most, such data point to future welfare and health status. Here again, data on school attendance in particular are contaminated by students' repetition of grades and by great differences in the quality of instruction.

### *Prevalences of Extreme Poverty and Marginal Living Conditions*

These two indicators are considered together because, depending on what is meant by "marginal conditions," they may coincide. Accordingly, it is necessary to define "marginal conditions." Such conditions may be defined economically and thus correspond to poverty; or they may be defined geographically, in the sense of physical isolation, thereby referring to the "dispersed" part of the rural population; or they may be defined socioculturally, encompassing such ideas as lack of participation in the nation's social and political life, subjection to ignorance or superstition, and so forth. These latter sociocultural definitions are those that separate "marginal

conditions" most clearly from the other proposed indicators, and they may also involve factors having an important bearing on health. However, an effective sociocultural definition of "marginal conditions" is clearly the hardest to attain, even in one country, and comparisons between countries are likely to be meaningless. Therefore, unless a clear and consistent definition can be given to sociocultural marginality, it is probably preferable to use an economic definition, so that the concept comes to mean the same thing as poverty and there is one less indicator to collect.

Problems also exist in defining "extreme poverty," but they are less severe. There is general agreement that a poverty line should be defined that relates to the cost of a minimum adequate diet, making that line a function of prices and of household composition. The treatment of nonfood needs is necessarily somewhat arbitrary, the usual procedure being simply to multiply the minimum food budget by a factor close to 2.0; a line of "indigence" or extreme poverty can then be defined by the minimum adequate food budget alone (14).

Of course, poverty can also be studied in relative terms; but then the "poverty line" becomes totally arbitrary, and what is measured is not deprivation but inequality. And while inequality itself may be considered undesirable, it has no bearing on health except when it means that some people are experiencing low absolute levels of well-being. Moreover, a given degree of inequality is more or less tolerable in terms of absolute well-being, as average well-being is higher or lower. These matters have been thoroughly explored by Fields (15).

As was remarked earlier, the procedure used to determine the population's distribution among various socioeconomic groups can also be made to include the poor and the extremely poor as particular groups within that classification.

Both the welfare implications of poverty and its relation to health are fairly clear. The chief flaw in the proposed indicator is that it only counts the number or proportion of the

poor, saying nothing about how poor they are on the average or how much they differ among themselves. Particularly when the poor population is large, it should not be assumed that its members are all equally poor. Sen (16) has developed an index that considers the proportions of poor people at different levels of poverty, how far below the poverty line they are on the average, and how much they differ in welfare, so as to measure both the extent and severity of poverty. A number of such indicators that have been derived axiomatically are discussed by Kakwani (17). Overall, it seems clear that some such index should be used, instead of a simple head-count of those below the poverty line, because it is possible for the prevalence of poverty to fall while its severity increases, and vice versa (5).

### *Unemployment*

It is widely recognized that poverty is largely a consequence of lack of opportunity for productive employment, and that a general improvement of welfare and a reduction of inequality will depend on creation of employment (18). It might appear from this that the rate of unemployment (the ratio of those without jobs and seeking work to the total labor force of both employed and unemployed) is a good indicator of deprivation. Unfortunately, there are many ways in which unemployment rates, while measuring economic hardship in some degree, are still seriously deficient indicators, even on those rare occasions when they can be accurately estimated for the entire population. Among their drawbacks:

- 1) They measure only overt unemployment, not the "disguised" unemployment of unproductive jobs.

- 2) Unemployment is affordable only by people who have other means of support, usually from their families. For short intervals, at least in some countries, public unemployment insurance is available to some workers but almost never to rural workers. Thus, unemployment is actually rare among the very poor and among heads of families, being more common among secondary wage-earners (19) and those newly entering the labor force.

3) "Discouraged" workers may stop looking for work and cease to be counted among the unemployed, and so the unemployment rate tends to underestimate real deprivation.

4) The duration of unemployment is usually not measured, but long periods of unemployment concentrated among a few people have a much more serious impact on well-being than short layoffs spread over the entire labor force.

5) Because the demand for farm labor is seasonal and rural workers often hold other employment during the year, measuring rural unemployment is extremely difficult and subject to large errors (20).

These deficiencies mean that simple unemployment rates should not be used as indicators of well-being, and that if used they should be supplemented by indicators measuring the duration of unemployment periods and the extent of underemployment. Also, as with several of the other kinds of indicators listed, it is advisable to collect and report unemployment information for the various specific groups defined by age, sex, geographic location, and socioeconomic status. Unless some such procedure is followed, the general unemployment rate by itself will add little or nothing to the information provided on income (or consumption) and poverty, and it may give a misleading picture in places where there is extensive deprivation.

#### *Gross Domestic (and National) Product*

The level of the per capita gross domestic product (GDP) or gross national product (GNP) is the most widely used measure of a country's "income" or its level of "development." It is not, however, a very satisfactory indicator of well-being or of factors causing good health. Regarding well-being, this depends on the distribution of income, and not simply upon average income—a point already covered in the discussions of poverty and of demographic information grouped according to socioeconomic status. In fact, if these demographic and poverty indicators could be obtained often enough and accurately enough, there would be no reason to use per capita GDP or GNP as an additional indicator. It is only useful because it is estimated

every year on a uniform basis, and because sharp changes in per capita income do indicate changes in well-being for at least some of the population. These changes in well-being will, of course, be influenced by income distribution and by the extent and severity of poverty.

Regarding health, per capita income is not very strongly related to health; also, the relationship is complex and is very different in the short run than in the long (17). (This observation is not contradicted by the fact that per capita income is very strongly related to spending on health care (22), because such expenditure is only weakly related to health status.) Again, it is the distribution that matters. It should also be noted that changes in per capita GDP or GNP may foreshadow shifts in health status, especially when such changes affect people living in precarious economic circumstances so that their diets and health may be strongly affected by relatively small changes in income.

The rather weak justifications for using per capita GDP or GNP as an indicator do not extend to treating the *structure* of GNP as any sort of indicator, and this should be dropped from the list. It is true that there are some systematic relationships between the structure and the level of national income, but these relationships tend to differ considerably according to the demography, resources, history, and recent economic policies of the particular country involved (23). The economic structure—that is, the shares of GNP accounted for by different sectors such as agriculture, industry, services, etc.—also tends to change quite slowly, except when large changes originate in a country's foreign trade. Thus, no welfare connotation can be accorded to the shares as such, and their connection with health, if any, is best observed through other indicators, particularly the socioeconomic classification of the population.

An example may make this clearer. Suppose that the price of a leading agricultural export rises, so that agriculture's share of GNP increases. This is in one sense a step "backward," because as a rule the agricultural

share systematically falls as a country develops; but it is nonetheless a clear income gain for the country. Who benefits from it, however, depends on how the extra income is divided among landowners, agricultural laborers, the commercial sector, and the government. It is even possible that poverty and health status will worsen, because a higher price for food must be paid by poor domestic consumers. This opposition of interests between food producers and consumers is at the heart of price, trade, and investment policies in many countries; and in such cases sectoral shares give no information about the net welfare effect.

### Distributional Considerations

It is evident from the preceding discussion that the chief reason for studying measures of well-being, so far as the health sector is concerned, is to identify people or groups whose welfare is in some clear sense inadequate, because this inadequacy is likely to involve health problems. In every case, what is wanted is information about the distribution of well-being, not simply about average levels of well-being.

This does not mean, however, that relative inequality has any particularly important health implications. Rather, it is the distribution of well-being with respect to absolute levels that matters. This is very evident in the case of protein and calorie consumption, where insufficient consumption leads to malnutrition and ill health, while excess consumption leads to obesity and cardiovascular disease. It does not matter that some people eat more than others; it matters that some do not satisfy their biological needs while others oversatisfy them.

The same is true of poverty, which must be defined in relation to an absolute subsistence standard, even though this standard includes some socially defined "necessities" and must be somewhat arbitrary. Income inequality as such can be of great political and social importance, but so far as health is concerned it is the extent and severity of absolute poverty that

counts. This emphasis on the low end of the absolute distribution of well-being extends even to such indicators as unemployment rates, which may indicate the likelihood of poverty, and to fertility rates, which have different health consequences depending on the distribution of births among women of different ages, income levels, and parity.

PAHO's plan of action explicitly emphasizes distributional information where indicators of health status are concerned, noting that evaluation of progress in health should refer not only to "achievements in the national averages... but also the degree of reduction of the differences" among population groups, particularly the marginal or least advantaged groups (1). This same emphasis should be applied to all the different welfare measures. Another reason for an explicitly distributional approach is that while health status is related to many socioeconomic variables, the relation is invariably nonlinear. That is, over a considerable range of a particular variable there may be no effect at all on health, while at other levels of the variable small changes can produce large health effects. Depending on the variable studied, of course, the low-welfare range can coincide with low values (income) or with high values (family size). In the case of a few variables (such as food consumption), health problems may be associated with values at both ends of the scale. For non-biological variables, however, it is usually only one end of the scale that matters.

The nonlinearity of these relationships and the consequent importance of distributional rather than average measures also helps to explain why there may seem to be no relationship between health and average welfare variables over time. For example, if the shape of the income distribution curve stays the same while income grows, at most, a few per cent a year, then the only change that is relevant for health is the movement of a small part of the population out of poverty. Such a small step forward can easily be reversed by cyclical economic movements or by a slight worsening of income inequality. The same sort of relationship is likely to hold for food consumption,

with the averages changing only very slowly and having little impact upon health, while small distributional shifts may be of major importance.

Two additional conclusions follow from the nature of these relationships between welfare indicators and health. One is that the attention of the health sector should be focused on distributional improvements—partly because the desirability of increasing average income, literacy, and other welfare variables is widely accepted and does not need to be restated. The other is that we should expect health progress to be much more rapid than growth in average welfare levels, as indeed it must be if the goal of health for all is to be achieved. (This relatively rapid progress must come about mainly through direct health and sanitation interventions, and partly through exploitation of the favorable health effects and interactions of other welfare components.) Waiting for improvements in average welfare levels to raise levels of health will simply take too long, especially in the case of the very poor.

### Research and Use of Data

PAHO's plan of action cites a need to use data on nonhealth components for the purpose of analyzing and explaining health levels. In effect, this amounts to a commitment to undertake research on the connections between those nonhealth components and health. The need to undertake methodologic research—i.e., to learn and apply new analytical techniques—as a part of the evaluation process is also explicitly recognized. However, no specific commitments are made regarding who is to bear responsibility for such research, or regarding the type and amount of research to be undertaken. The following are suggestions concerning the manner in which this commitment should be interpreted and carried out.

First, no socioeconomic information should be reported by the health sector unless it is already being generated by other sectors, because the health sector's resources should not be diverted into data-gathering except where the data specifically describe the health of the

population or the operation of the health sector. Thus, for example, it is essential for the health sector to estimate needs and demands for health care, but it does not make sense for it to try independently to estimate the extent of poverty. On the other hand, whether surveys undertaken to gather health status data should also obtain other information, and what agency should conduct such surveys, are still open questions. In general, the health sector should make its needs for data and analyses better known to statistical and other agencies that decide what data to collect and publish.

Second, there is no reason to expand the list of socioeconomic indicators beyond those already described as "mandatory." (On the contrary, at least one of those indicators, the structure of GNP, should be omitted from the list.) It is trivially easy to imagine many other indicators such as highway density, arable or cultivated land per person, or average numbers of people per room (24); but such indicators add no relevant information; instead they merely increase the burden of gathering and interpreting the data.

Third, if any indicators are to be added, they should bear a clear relationship to health. The incidences of alcohol and tobacco consumption are good examples; unfortunately, these are mentioned in the plan only as "optional" indicators. To the extent that much of people's health depends on their behavior rather than upon the external economic environment, data on behavior related to particular health risks should be regarded as just as valuable as overall indicators of well-being.

Fourth, given the emphasis on distribution and on the classification of the population into demographic and socioeconomic groups, any research undertaken should be microanalytic. Enough is already known about the evolution of macroscopic indicators of well-being and the relationships among them (25), and further macroscopic research of that sort is unlikely to reveal anything relevant to health. What are needed instead are careful and detailed studies relating health outcomes to specific socioeconomic variables such as education (13), or to the interaction of such variables

with direct interventions like the provision of safe drinking water (26). Where the appropriate focus is a larger unit than the individual or household, it is likely to be the community in which people live, where specific health and sanitation services are present or absent (27). The country as a whole is too large a unit for this purpose, and it provides only averages rather than distributional information.

Fifth, the kind of research likely to be most valuable is also analytically the most demanding. It is correct to state, as the plan of action does, that "logical and conceptual criteria must always take precedence over mathematical or statistical considerations" (1). That, however, is true of any good research, and it does not reduce the need for high-quality statistical work if anything of value is to be learned. This means that such research must be contracted out, or that PAHO must assign adequate resources to the task, or that capable people must be found in the Member Countries who can undertake this work. It will also be necessary to take due account of the defi-

ciencies of socioeconomic data, which often contain substantial errors—especially when one attempts to measure changes over time (28). The object is to detect and interpret changes which are significant for welfare, without being distracted by irrelevant fluctuations.

Sixth, the value of research for health policy will depend greatly upon how the results are presented to and interpreted by policymakers. Therefore, the need for analytically difficult investigation must not prevent clear presentation of relevant findings; and neither must the need for relatively simple answers lead to examination of the wrong questions or to the pursuit of inadequate research efforts.

Finally, this whole matter of evaluation should be considered of value to the design of health policy and to the effort by health planners and administrators to influence policy in other sectors. It cannot help in the short-term management of the health sector, but it is of potentially great value for longer-term health planning and assessment.

### ACKNOWLEDGMENTS

The helpful comments of Antonio Solis, John Elac, Jorge Peña, Renate Plaut, James Robey, Mark Crowley, and Alberto Gónima are gratefully acknowledged.

### SUMMARY

PAHO's plan of action for attaining the goal of health for all by the year 2000 calls for evaluating improvements in well-being—partly because health "is included within the general framework of well-being" and partly because nonhealth factors conditioning health status should be used to assess and explain health levels. Accordingly, the plan sets forth eight indicators that, together with other appropriate indicators, can be used for such evaluations. These eight indicators include demographic information (the population classified according to age, sex, geographic distribution, and socioeconomic status); general fertility; illiteracy; unemployment; poverty; the availability of calories and proteins; per capita gross domestic product and the

structure of gross national product; and the proportion of the population living in marginal conditions.

The purpose of this article is to examine each of these indicators, assess its value, and suggest how the data relating to it should be organized and broken down. Among other things, the author stresses the need to obtain demographic data of a socioeconomic nature; the importance of breaking down the information obtained in terms of population subgroups—by age, sex, geographic location, and socioeconomic status; and the need to go beyond average values, which tell little about overall welfare problems, so as to develop values for appropriate subgroups, which can tell quite a lot. Other points noted include the need to group fertili-

ty data according to the mother's age and number of children; the ability of data on malnutrition to serve as an indication of available calories and proteins; the possibility of equating two indicators (extreme poverty and marginal living conditions); the need to supplement data on unemployment rates with information about the duration of unemployment and the extent of underemployment; and the marginal utility of per capita gross domestic (or national) product information for the purpose of assessing deficiencies in public welfare.

The piece also makes various points relating to research on the connections between health and

nonhealth components of well-being. Specifically, it notes that socioeconomic information unrelated to health should not be reported by the health sector; that the "mandatory" socioeconomic indicators listed are sufficient for the purposes envisaged; that any indicators added to those on the plan's list should bear a close relationship to health; that any research undertaken should be "micro" rather than "macro" in nature; that such research requires high-quality statistical work; and that the value of this research for health policies will depend largely upon how the results are presented to and interpreted by policymakers.

## REFERENCES

- (1) Pan American Health Organization. *Health for All by the Year 2000: Plan of Action for the Implementation of Regional Strategies*. PAHO Official Document 179. Washington, D.C., 1982.
- (2) Pan American Health Organization. *Health for All by the Year 2000: Strategies*. PAHO Official Document 173. Washington, D.C., 1980.
- (3) Morris, M. D. *Measuring the Condition of the World's Poor: The Physical Quality of Life Index*. Pergamon, New York, 1979.
- (4) Deaton, A. *Measurement of Welfare: Theory and Practical Guidelines*. Working Paper No. 7, Living Standards Measurement Study. World Bank, Washington, D.C., 1980.
- (5) Musgrove, P. The oil price increase and the alleviation of poverty. *Journal of Development Economics* 9:229-250, 1981.
- (6) Thomas, V. Spatial differences in the cost of living. *Journal of Urban Economics*. 8:108-122, 1980.
- (7) Kravis, I. B., A. W. Heston, and R. Summers. Real GDP per capita for more than one hundred countries. *Economic Journal* 88:215-242, 1978.
- (8) Reutlinger, S., and M. Selowsky. *Malnutrition and Poverty: Magnitude and Policy Options*. World Bank Staff Occasional Paper No. 23. Johns Hopkins University Press, Baltimore, 1976.
- (9) Martorell, R. Nutrition and Health Status Indicators: Suggestions for Surveys of the Standard of Living in Developing Countries. Working Paper No. 13, Living Standards Measurement Study. World Bank, Washington, D.C., 1982.
- (10) Berg, A. *The Nutrition Factor: Its Role in National Development*. Brookings Institution, Washington, D.C., 1973.
- (11) World Health Organization. *Development of Indicators for Monitoring Progress towards Health for All by the Year 2000*. "Health for All" Series, No. 4, Geneva, 1981.
- (12) Musgrove, P. *Consumer Behavior in Latin America*. Brookings Institution, Washington, D.C., 1978.
- (13) Cochrane, S., D. O'Hara, and J. Leslie. The Effects of Education on Health. World Bank Staff Working Paper No. 405. Washington, D.C., 1980.
- (14) Altimir, O., and J. Sourrouille. *Measuring Levels of Living in Latin America: An Overview of Main Problems*. Working Paper No. 3, Living Standards Measurement Study. World Bank, Washington, D.C., 1980.
- (15) Fields, G. S. *Poverty, Inequality and Development*. Cambridge University Press, Cambridge, 1980.
- (16) Sen, A. K. Poverty: An ordinal approach to measurement. *Econometrica* 44:219-231, 1976.
- (17) Kakwani, N. C. *Income Inequality and Poverty: Methods of Estimation and Policy Applications*. Oxford University Press, New York, 1980.
- (18) International Labour Office. *Employment, Growth and Basic Needs: A One-World Problem*. Praeger, New York, 1977.
- (19) Berry, R. A. Open unemployment as a social problem in urban Colombia: myth and reality. *Economic Development and Cultural Change*. 23:276-291, 1975.
- (20) Figueroa, A. *La economía campesina de la sierra del Perú*. Universidad Católica del Perú, Lima, 1981.
- (21) Fuchs, V. Economics, health and post-industrial society. *Milbank Mem Fund Q* 57:153-182, 1979.
- (22) Musgrove, P. Family health care spending in Latin America. *J Health Econ* 2:245-257, 1983.
- (23) Chenery, H., and M. Syrquin. *Patterns of Development, 1950-1970*. Oxford University Press, New York, 1975.

(24) Barrenechea, J. J. Esquema de evaluación y monitoría del proceso SPT/2000. PAHO Working Document. Pan American Health Organization, Washington, D.C., 1982.

(25) Morawetz, D. *Twenty-five Years of Economic Development*. Johns Hopkins University Press, Baltimore, 1977.

(26) Merrick, T. The Impact of Access to Piped Water on Infant Mortality in Urban Brazil, 1969 to 1976. Discussion Paper No. 81-52. Population and

Human Resources Division, World Bank, Washington, D.C., 1981.

(27) Rosenzweig, Mark R., and T. Paul Schultz. Child mortality and fertility in Colombia: Individual and community effects. *Health Policy and Education*, July 1981.

(28) Morgenstern, O. *On the Accuracy of Economic Observations*. Princeton University Press, Princeton, New Jersey, 1963.

#### LOW ANTIBODY RESPONSES TO RABIES VACCINE

Following a case of human rabies in a U.S. Peace Corps volunteer in Kenya in August 1983, the United States Centers for Disease Control, in cooperation with the Office of Medical Services, U.S. Peace Corps, conducted serosurveys of 333 volunteers to assess the adequacy of rabies preexposure prophylaxis. Initial results indicated a lower than expected antibody response at different intervals following primary immunization.

All the volunteers had been immunized outside the United States between 1979 and 1983 using a three-dose regimen (administered on days 0, 7, and 28) of 0.1 ml intradermal doses of human diploid cell rabies vaccine purchased from the same producer. Serum specimens were collected by either CDC or Peace Corps medical staff members, and the rapid fluorescent focus inhibition test for rabies-neutralizing antibody was performed on all specimens at the CDC. The time from the initial immunization to sera collection ranged from 42 days to two years.

The data obtained from these tests indicate that human diploid cell rabies vaccine administered intradermally to volunteers in many countries has not resulted in antibody titers as high as those demonstrated in vaccine trials conducted in the United States and Europe between 1978 and 1982. Investigation of this matter is continuing.

*Editorial note:* The World Health Organization recommends that governments and institutions using human diploid cell culture rabies vaccine should have samples tested for potency. This can now be arranged, free of charge, through WHO. For further information, those interested should contact the Unit of Veterinary Public Health, Division of Communicable Diseases, World Health Organization, 1211 Geneva 27, Switzerland.

*Sources:* U.S. Centers for Disease Control, *Morbidity and Mortality* 32(46), 1983; and World Health Organization, *Weekly Epidemiological Record* 59(4):23-25, 1984.