

Population Growth and Economic Development *

*A discussion of eight major relationships
that link demographic patterns
and economic processes*

By Samuel H. Preston and Peter Donaldson

Since 1950, population growth rates in developing countries have averaged around 2 per cent per year, enough to double the size of a country's population in 35 years. The calculation is not merely hypothetical; the population of the developing world (Africa, Latin America and Asia, except Japan) has in fact doubled between 1950, when it numbered 1.7 billion, and 1984, when it reached 3.6 billion.

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Although population growth rates have been relatively constant during this period (especially if China, with a hillshaped growth rate pattern, is excluded from the calculation), the demographic combination through which the growth is achieved has changed decisively.

Crude birth rates for developing countries as a whole were 45 per thousand in the period 1950-1955 but only 31 per thousand in 1980-1985. This decline of 14 per thousand in fertility was nearly matched by a decline of 13 per thousand in mortality. The crude death rate was 24 per thousand in 1950-1955 and 11 per thousand in 1980-1985.

Sustained rates of growth of this size for large aggregates are unprecedented in human history. Since the 1940s, they have provoked the concern of scientists and policy-makers who felt that prospects for economic development in poor countries were being impaired by incessant demographic pressures. Many Asian leaders have agreed with this argument. But others have argued that population growth is beneficial for development, and still others, that population growth is largely irrelevant to economic development.

In March 1986, the United States National Academy of Sciences issued a report entitled *Population Growth and Economic Development: Policy Questions*, which reviews these relationships. We decided to frame our report* around a number of specific questions that are enumerated hereinafter.

In preparation for writing the report, we commissioned 17 background papers by experts in the field to help assemble the relevant literature and to draw out important points for discussion. Based on these background papers, on a workshop and on independent research, we proceeded to try to answer what appear to be the major questions in the field.

Conclusions of the report

The report provides no dramatic new analysis of the relationship between population growth and economic development. Nor does it provide an underlying quantitative model that would enable one to determine how much difference a decline of, say, 1 per cent in population growth rates would make

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in various economic indicators. Instead, it provides a detailed discussion of eight of the major relationships that link demographic patterns and economic processes.

One aspect that distinguishes the report from most earlier assessments of those relationships is that it pays more attention to markets and market conditions as mediating variables. It is also more attentive to conditions in the rural sector, where a majority of residents in developing countries continue to live, and correspondingly to some of the excellent empirical work being done by agricultural economists.

The conclusions reached in answering the specific question that was posed about each of the eight relationships are summarized briefly in this paper. In each case, we assume that a country is able to achieve a lower fertility level by means of a government-sponsored programme, and ask what difference lower fertility would make.

1. Will slower population growth increase the growth rate of per capita income by increasing the per capita availability of exhaustible resources?

The report's answer is, basically, "no". The important exhaustible resources are traded on international markets, so this question alone needs to be answered at the international level. The prices set in those markets reflect the extraction costs of the resources and their scarcity value while in the ground. Population growth, along with income growth, will probably make these resources scarcer, thus driving up their price. This should set off a search for substitute materials and for economizing strategies. The dramatic reaction to the rise in the price of oil induced by the Organization of Petroleum Exporting Countries (OPEC) is a clear example of those markets at work.

Slower population growth probably would delay the *time* at which a particular stage of resource-depletion or price increase is reached. But it has no necessary relationship to the number of people who would live during a particular stage of resource depletion - we would just get to that stage somewhat more slowly. Correspondingly, we would postpone the adaptations required by any stage of resource scarcity. But the problem remains; the problem results from the fixity of nature, and not from the existence of too many people. If the human race is to persist, the problem must be dealt with.

In this context, the report's approach would be less sanguine if those resources were more important, especially in developing countries. But the total value of non-fuel mineral resources currently represents only about 1.2 per cent of the total value of world production. With regard to fuel, we are

eventually going to have to rely on sustainable energy sources, especially the sun. This reliance will appear far more practicable when the price of oil and coal is five or ten times its current level.

2. Will slower population growth increase the growth rate of per capita income by increasing per capita availability of renewable resources?

The answer to this question is a qualified “yes”. The report focuses on the most important of the renewable resources, land. We find evidence that larger population size is generally associated with lower labour productivity in agriculture, i.e. the classic situation of diminishing returns. The evidence is drawn from Bangladesh, northern India, Africa and pre-industrial Europe.

That is not to say that faster growth does not often set off adaptive responses such as more irrigation and fertilizer use, perhaps more agricultural research and better infrastructure. There is evidence of these responses occurring. Japan is a striking example.

In 1880, Japan had only 5 per cent as much arable land per worker as the United States, but over the next 100 years it registered the same average growth rate of agricultural production as the United States, i.e. 1.6 per cent per year. The report concludes that even after all adaptive responses are factored in – and they are, of course, not costless – labour productivity in agriculture would be expected to be lower when a population grows faster.

Nor is faster population growth always or usually necessary to induce adaptive responses. A key to success in food production in poor countries is agricultural research, usually government sponsored. Evidence shows that the rate of return on such research is already extremely high, nearly always exceeding 20 per cent per year. Faster population growth, therefore, is not needed to make a valid case for doing more agricultural research.

A related issue is the degradation of renewable resources. This issue is particularly salient in parts of the developing world for common property resources such as forests, land and fisheries. These are resources to which access is not effectively limited. In such cases, people underinvest in resource conservation because they would realize only a tiny fraction of the gain from such investment. They do not own the resource that is being saved or enhanced. Such resources are degraded too rapidly and population growth could be expected to exacerbate the problem.

There is a catch here, however. By making the resource scarcer and hence more valuable, population growth may actually provide incentives for institu-

tions to adapt in ways that better protect the resource in question. It appears from studies of the evolution of property (land) rights in Asia, Africa and pre-industrial Europe that population growth may have played an important role in that process. Institutional adaptation does not occur automatically or inevitably, but the possibility that it will, and the likelihood that it has in the past, provides an important qualification to the “tragedy of the commons” argument that views population growth as an unmitigated environmental disaster.

3. Will slower population growth alleviate pollution and the degradation of the natural environment?

The answer is “probably, yes”, largely because air and water are treated mainly as common property resources. But this is simply not a major economic problem in the less developed countries (LDCs) relative to many other problems that beset them. Moreover, population growth has probably not been as important a contributor to rising levels of pollution and degradation as has economic growth itself. The report does not give much weight to this issue.

4. Will slower population growth lead to more capital per worker, thereby increasing per worker output and consumption?

The argument in this section of the report is somewhat more theoretical than in other sections, and more complicated. The conclusion is a relatively



If slower population growth does not alter the level of saving and investment, workers such as these may be expected to enjoy higher per capita income. (United Nations photograph)

tentative one. By definition, if slower population growth does not alter the rate of savings and investment (savings as a fraction of income), then it will result in more capital per worker and higher per capita income. This is a one-time effect of slower growth in the sense that, eventually, with slower population growth and a fixed savings rate, the capital/labour ratio will stabilize at a higher level. There cannot be perpetual gains from this source.

But it is also possible that the savings and investment rate will change when population growth rates change. Whether or not it does depends on how households, businesses and Governments respond to slower growth. For example, businesses may actually reduce investments because their projected profits are lower when population growth slows. But households may increase savings because the press of immediate consumption demands is reduced. Governments may have less incentive to invest in infrastructure or in schools when the population growth rate slows, but they may have more investible funds.

The scattered evidence on *actual* behaviour is inconclusive and we are left without a strong statement about demographic effects on the savings rate.

This issue is not considered as important as it once was because of demonstrations (by Demison, Abramovitz and others) that capital accumulation in the United States, Japan and Western Europe has played a far smaller role in economic growth than was once thought. But it is not a negligible role, and we would expect some one-time advantage from slower population growth.

5. Do lower population densities lead to lower per capita incomes via a reduced stimulus to technological innovation?

With regard to manufacturing, the report argues that the potentially adverse effect of slowing growth in technical progress is not particularly germane, since most of the technology used in manufacturing by developing countries is imported. For example, there is no reason why each country has to discover independently the sewing machine.

However, with regard to agriculture, there is reason to think that much of the appropriate technology should be locally produced because of variations in agro-climatic conditions as well as in the availability of various factors of production. However, as noted previously, there are already ample incentives for agricultural research; faster population growth does not seem necessary to provide additional stimulus to developing new production techniques (e.g., new seed varieties).

Given any particular advance in technology, the incentives for the former to *adopt* it may well respond positively to population density. Greater popu-

lation density creates larger markets, and the local market is quite important for much agricultural produce because of its high bulk per unit value (and in some cases, its rapid rate of spoilage). Road systems appear to respond positively to population density; roads obviously enable farmers to get their products to market more efficiently, providing greater incentives to expand output. Irrigation systems also require a certain minimum density of users before they become economical. For example, the failure of some systems in Africa has been blamed on low population density.

So here we have a potential economic disadvantage of slower growth, at least in sparsely populated areas. Again, this disadvantage has to be set against the advantage that is posed by diminishing returns.

There is very little evidence about which of these effects would be expected to dominate in most settings. One careful study in northern India showed a dominance of the diminishing returns effect over the technical change effect. Surely for areas that are already very densely populated, such as Bangladesh, Burundi, Java (Indonesia) or Haiti, one would expect little technological gain from additional increases in population density.

The case for a more sparsely populated country is not so clear-cut. There are potential advantages resulting from greater density in sparsely populated agrarian countries with abundant resources. The report often argues that population growth increases incentives to introduce innovations that move such a country in a "modern" direction. But the incentives are irrelevant unless they are translated into practice. This translation will typically occur through markets or wise governmental policies. When neither markets nor wise governmental policies are functioning effectively – and persistently high rates of return to agricultural research imply that in many cases they are not – then the consequences of rapid growth will be more seriously negative. Currently, neither markets nor government policy appear to be functioning very well in many African countries, for example. The most straightforward solution is to fix the institutions; every effort made in this regard would be worthwhile. But it would be naive to believe that success is inevitable or, in many cases, even likely.

6. Will slower population growth increase levels of schooling and health?

The answer to this question is a fairly unambiguous "yes". With smaller families, parents would be expected to have more financial resources to spend per child on such matters as schooling and health. In general, it has been very widely observed that children from larger families have somewhat poorer levels of schooling and health than those from smaller families. At least some

of this negative association seems to reflect the economic consequences of unintended childbearing. However, this association is not invariably found. In parts of Africa, school fees are mainly the responsibility of older, educated siblings rather than of parents, and no association is observed between family size and years of schooling.

However, the report concludes that those relationships are usually negative; they appear to operate primarily at a family level rather than at a societal level. We do not find evidence that the national growth rate of the school-aged population is negatively associated with changes in school enrolment. However, countries with faster growing child populations do appear to spend less on education per enrolled child, suggesting that the quality of education may suffer when growth is higher.

So here we have one of the most clear-cut advantages of slower growth. Better schooling and health among today's children obviously implies a more productive labour force in the future, and studies of the sources of economic growth define a major role for gains in the quality of human capital.

7. Will slower population growth decrease the degree of inequality in the distribution of income?

The answer to this question is "probably, yes" because slower growth should raise the rate of return to labour in the form of wages relative to the rate of return on capital or land. Since those who are primarily dependent for income on wages are generally poorer than those primarily dependent on profits or rents, slower population growth should result in some levelling of the income distribution. This is mostly a theoretical argument, but there is some evidence that the world operates as expected, at least in northern India and pre-industrial England.

This effect could be offset or reversed if the fertility decline were concentrated among high-income families, whose relative advantage could be increased by lower fertility. (Historically, such a pattern of fertility change has predominated in much of Latin America). However, most of the *programmes* to slow population growth would probably have the opposite effect, i.e. they would create larger fertility reductions among the lower-income classes. This pattern would be expected to enhance the income-equalizing tendency of slower population growth resulting from relatively higher wages.

8. Will slower population growth facilitate the absorption of workers into the modern economic sector and alleviate problems of urban growth?



The principal source of urban growth in many developing countries is natural increase.

The report concludes that there is not a close connection between the rate of population growth and the rate of urbanization, i.e. the change in the proportion of people living in urban areas, or in urban unemployment. Urbanization responds primarily to economic growth, not to population growth. Moreover, there is no time series or cross-sectional evidence that would support a linkage between the growth rate of the urban labour force and changes in the rate of unemployment. Very poor people cannot afford to be unemployed; they must find some work. It is in relative *wage* levels that we would expect to find an effect of population growth as well as in the fraction who are employed in modern sector versus informal sector jobs. Because of wage rigidities in the modern sector, one would expect urban labour force growth to be disproportionately absorbed in the informal sector. Several cross-national studies do in fact find evidence of such an effect.

Urban growth is a different matter than urbanization. The principal source of urban growth in developing countries has been natural increase. In addition to labour force issues, urban growth raises matters related to economies of scale and the provision of public service. The report finds that economies of scale tend to be exhausted at a relatively small city size and that population growth plays little if any positive role. It obviously increases congestion in existing public services, while expanding the resource base and sometimes the incentives for creating new services.

Summary

We believe that the cumulation of evidence cited in this paper suggests that conventional indicators of economic progress, such as per capita income

or the per cent living in poverty, will usually improve faster when population growth slows.

Such acceleration would be produced by higher amounts of land/worker, human capital/worker, and physical capital/worker ratios, all of which should result in higher wages per worker. This conclusion seems most secure for poor, densely populated countries such as Bangladesh, and least secure for sparsely populated countries with abundant natural resources such as Zaire.

What the actual reaction will be in any particular country depends as well on how a host Government reacts, how individual households adjust their behaviour, and on the possibilities for trade with other countries. A great deal of research still needs to be done on these matters.

The question of how important the slowing of population growth is relative to pursuing other development strategies is not taken up in the report. This question would require us to consider the *costs* of slowing population growth as well as the benefits, and to compare the balance to that pertaining to other programmes.

It should be obvious to anybody who has thought about it that a population growth strategy by itself is not going to be enough to make a poor country rich. If Bangladesh's population were cut in half and if somehow this were accomplished without inducing any decline in total production, Bangladesh would still be classified by the World Bank as one of the world's poorest countries, i.e. the thirteenth poorest instead of the second poorest.

But it is a matter of cost effectiveness. On the cost side, it is surely relevant that population growth rates can be influenced through programmes that pursue other valuable objectives, and that do not themselves appear to be very expensive.

Family planning programmes that enable couples better to achieve their reproductive targets through voluntary means appear to be a promising vehicle for social and economic development. They are not promising, of course, if they do not work, if couples have no use for the information and services they provide. However, there is good evidence that they have worked to bring about large fertility declines in some settings: Indonesia, Mexico, Thailand and the Matlab subdistrict of Bangladesh.

There is also evidence that substantial amounts of unwanted childbearing remain throughout the developing world.

Certainly there is nothing in our report that calls into question the long-standing commitment of the countries of the Asia-Pacific region to supporting voluntary family planning programmes.

Mortality and Development in the ESCAP Region: A Review*

*Assessing the contribution of social and economic change to the
mortality decline in selected Asian countries and areas*

By Lado T. Ruzicka and Penelope S. Kane

The influence of economic conditions on health and mortality has long been recognized, although originally the emphasis was probably more on the impact of economic hardships than on the effects of affluence. Irregularities in food supply were well known and reported in ancient records, which describe, for example, the impact of shortages on mortality.

There is a broad consensus on the likelihood of rather narrow differences in mortality among various social strata of European populations before the onset of the demographic transition. This is because of the then prevailing epidemiological climate dominated by infectious and parasitic diseases, the incidence of which transcended social class boundaries.

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The early stages of industrialization widened the gap between the rich and the poor, and socio-economic differences in mortality probably became more pronounced than ever before as the upper classes were in a position to draw more readily upon the possibilities of health protection provided by early technological and medical progress (Hansluwka, 1975: 241-247). It was only at a later stage, from around the mid-nineteenth century, that economic affluence and continuing technological progress on the one hand and socio-political movements on the other resulted in a gradual adoption of social welfare measures. Eventually, these were followed by a narrowing of socio-economic differentials in mortality, though not their disappearance (UN/WHO, 1979).

Developments in medical therapy (the introduction of antiseptic surgery and anaesthesia, the discovery of the X-ray, the great strides made in chemotherapy, in particular the use of sulphadiazine and antibiotics) and in prevention of infectious diseases through immunization and the control of some of the vectors of disease transmission by means of insecticides reduced - in many instances virtually eliminated - mortality (though not morbidity) from most infections.

In low-mortality societies, socio-economic differentials in mortality are now almost exclusively due to differentials in the incidence and prevalence of chronic diseases, many of which are believed to be closely associated with differences in life-style, diet, genetic endowment, and so on.

When the mortality transition started in the high-mortality, economically less developed countries, all the advancements of Western medical science and technology were already more or less readily available. Mass public health programmes were introduced at relatively small cost, often with bilateral or international assistance. Thus, in many instances and in the early stages of the transition, the rapid decline of mortality was largely independent of economic development; the correlation between economic indicators and mortality had been considerably weakened (United Nations, 1973: 152 -155).

Starting in the late 1960s, the view began to be expressed that scientific innovations cannot be fully effective in a social and economic environment which is not prepared to make full use of them. Taylor and Hall (1967) believed that the principal forces accounting for the mortality declines in the developing countries were economic and nutritional improvements, resulting in better and more food, decreased crowding in housing, improved water supplies, and better and more wide-spread education with increased understanding of the importance of personal and environmental hygiene for the protection of health. Others, even if they did not go so far, viewed mortality decline as a result of a complex of interrelated socio-economic and medico-environ-

mental causes (Robinson, 1967; Kusakawa, 1965). Hansluwka (n.d.: 246) suggested that “...a certain take-off into the transformation of society (and the economy) seems still to play an important role in making these [that is, ‘imported’] health activities possible and effective. . . Once this stage is reached the traditional link between socioeconomic circumstances and mortality loosens, and health improvements far outpace socio-economic progress.”

However, there may be a threshold beyond which further improvements in health and declines in mortality once again will depend on social and economic progress. Preventive and curative interventions may be of limited efficacy in societies which have a high prevalence of moderate malnutrition of children, poor sanitation and an inadequate provision of basic needs including education and health care (Ruzicka and Hansluwka, 1982).

The controversy over the relative significance of scientific medical interventions compared with that of social and economic change continues to this day. In this paper we do not expect to resolve the issue, but rather attempt to assess the extent to which social and economic change have contributed to the mortality decline of the last 30 years or so in selected countries of the Asia-Pacific region.

The association between health and mortality and social and economic conditions may be evaluated in several ways:

- At the macro-level of analysis, the relationship between mortality and social and economic development may be assessed :
 - (a) For a range of national populations or subdivisions of the national population (such as states, provinces, districts) relating mortality levels to the social and economic characteristics of the aggregates; and
 - (b) At the community level, using data for population aggregates, such as suburbs in urban areas and individual villages in rural areas. Once again, the social and economic characteristics of these aggregates are correlated with their level of mortality.
- At the micro-level of analysis, two approaches have been followed:
 - (a) The individual couple’s record of child survival or loss is related to the characteristics of the mother, the father, or joint characteristics of the family. The investigations typically combine demographic and biological characteristics (mother’s age, parity, interval since last childbirth, survival of the previous birth/s) with social ones (parents’ religion, education, caste, residence during childhood), and those related to the economic status of the

- family (breadwinner's income, family income, possession of chattels, standard of living, quality of housing and living space); and
- (b) Investigations which give emphasis to behaviour, and to beliefs and taboos which determine behaviour with respect to sickness, appropriate treatment, prevention of sickness and protection of good health. Such investigations also usually collect information on parents' personal characteristics of the type listed in the preceding paragraph.

Economic and social development and mortality

At the macro-level of analysis, the relationship between economic development and mortality has been frequently examined using per capita gross domestic product (GDP) or national income as the measure of development. The level of economic development determines, to a degree, the extent to which public resources may be turned to social welfare programmes, the development of educational facilities, sanitation and environmental protection, and health care. Obviously, this is not the only consideration. The proportion of national product that will be retained by the government, and the priorities to which these resources will be directed depend largely on the political and developmental philosophy of the government. At the risk of over-simplification of a complex and multifaceted situation, one may discern between two groups of developmental strategies at the two extreme points of a continuum. At the one extreme are developmental policies which explicitly have given considerable importance to the radical improvement of social conditions among the masses, in particular with regard to education and health, and to equal access to them. In such a model, improving the educational level and the health status of the population is seen as being not only imperative as a part of the general strategy for the transformation of society, but also as the indispensable component of economic development efforts. The development of human resources (sometimes referred to as the "quality of the population") is given a priority equal to that for increasing productivity and speeding up economic growth.

At the other extreme of the continuum may be placed countries which, although committed to the same goals of improving the living conditions of the people, have acted on the assumption that the best strategy for raising the standards of living (including the educational levels and health status of the population) was investment in economic development as such. On this philosophical premise, economic growth will, quasi-automatically though with a certain time lag, lead to gradual improvements in living conditions as the benefits of economic development percolate through from the upper to the lower strata of the society. For the sake of illustration, it is possible to take the developmental strategies linked with the political philosophies which pre-

vail in China as being close to one of the poles, and those of the Republic of Korea and Japan as tending towards the other. A variety of combinations of developmental goals and strategies may be found between the extremes of these poles.

International comparisons of per capita income and a measure of mortality (usually the expectation of life at birth) have a long history and an interesting variety of outcomes. Stolnitz (1965) found a reasonably close relationship between income per head and age-specific mortality within each of the three categories into which he divided the set of countries he worked with; however, he found little overall correlation. Using a different data set, Davis (1956) concluded that the connection between a country's state of development and level of mortality was a very weak one at best. Demeny (1965:210) concluded that "... any attempt to relate mortality trends to [national income] proves to be largely unsuccessful." Hanada (1982) followed Stolnitz's approach in dividing the countries for which he had adequate data into three groups: 18 low-income countries, 37 middle-income countries and 18 industrialized countries. The correlation between the expectation of life at birth and the level of gross national income (GNI) per head varied from a strongly positive one for the middle-income group ($r = 0.70$) to a weak one for the low-income countries ($r = 0.13$) and industrialized countries ($r = 0.28$). However, for both the low-income and middle-income countries (but not for the industrialized countries) Hanada found a strong, positive correlation between the expecta-



Shoppers in China have a choice of buying produce in government markets or open markets such as the one above. With improved economic growth, people are enjoying better living conditions.

tion of life at birth and, the level of adult literacy and the enrolment ratios of children in primary and secondary schools.

Preston studied the association between economic development and mortality in great detail, originally (1975) using data for the 1930s and 1960s and subsequently (1979) using data for the 1940s and 1970s. In the earlier study, he found a positive correlation between the expectation of life at birth and the logarithm of national income per head in the data from 38 countries around 1930 ($r = 0.885$) and from 57 countries in the 1960s ($r = 0.880$). With the rising level of GNI per head, the expectation of life at birth during both periods rose steeply initially, but almost plateaued at high levels of GNI, thus suggesting diminishing returns to increases in income. In addition, between the two periods, the relationship between the expectation of life and GNI per head moved upwards; a vertical comparison of the two curves suggests, as Preston put it, that “...in order to obtain a particular value of life expectancy between 40 and 60 . . . a nation required an income level approximately 2.6 times higher in the 1930s than in the 1960s.” (Preston, 1975:236).

Preston suggested that factors other than a country's current level of income - for instance, the development and rapid deployment of chemotherapy and, later, of antibiotics; the wide-spread use of insecticides to control disease vectors; and vaccination - probably accounted for between 75 and 90 per cent of the increase in the expectation of life during the period between the 1930s and 1960s. The amount of mortality change attributable to income growth varies, as might be expected, from country to country. For instance, Preston estimated that the larger part of the increase in the expectation of life in Japan was probably due to a rapid growth in income. In the later study (1979), Preston expanded the estimation equation to incorporate the percentage of literates in the adult population and the average per capita daily calorie consumption in addition to national income per head. The periods studied were the 1940s and 1970s. In both periods, literacy and income were highly significant and retained approximately the same magnitude of impact on the expectation of life. The effect of calorie intake was statistically insignificant, but it is possible that these data suffered from greater measurement errors than the other two terms.

Taking 11 developing countries of the Asia-Pacific region for which estimates of life expectation (LE) at birth (males) and gross national product (GNP) per head of population were published by the World Bank (1984) for the early 1980s, it is possible to show a positive association between the two measures:

$$LE(\text{males}) = 49.4164 * Y^{0.0889}$$

where LE is expectation of life at birth and Y is national product per head in

U.S. dollars. The coefficient or correlation is $r = 0.600$ and 36 per cent of the variation in LE(males) among the countries appears to be explained by the variation in per capita GNP.

If the two cities, Hong Kong and Singapore, are added to the equation along with the three high-income industrialized countries, Australia, Japan and New Zealand, the equation becomes :

$$LE(\text{males}) = 49.7614 * Y^{0.0843}$$

and the fit improves considerably: $r = 0.821$ and 67.3 per cent of the variation in the expectation of life among the countries is now explained.

One aspect of this estimation is of particular interest. If it is assumed that the model adequately reflects the relationship between economic development (measured by domestic product per head of population) and the health status of the population (as measured by the level of expectation of life at birth), two situations call for closer examination: a marked failure to achieve the level of health that could be expected on the basis of the given level of economic development and, in contrast, a considerably better performance in health protection than could be anticipated from the given state of the economy.

Table 1. Estimated and predicted expectation of life at birth around 1980

Country	Expectation of life at birth (average, males + females)		
	Actual	Predicted from model	
		(1)	(2)
Bangladesh	48	50.9	51.2
China	65	54.6	54.7
India	55	53.8	53.9
Indonesia	52	57.8	57.7
Malaysia	65	64.1	63.7
Pakistan	51	55.6	55.7
Papua New Guinea	53	59.6	59.4
Philippines	62	59.6	59.4
Republic of Korea	64	64.2	63.8
Sri Lanka	67	54.8	54.9
Thailand	61	59.3	59.2

On the basis of this crude assessment, in five of the eleven countries – India, Malaysia, the Philippines, the Republic of Korea and Thailand – the level of mortality appears to be in close correspondence with the state of national economic development. In Indonesia, Pakistan, Papua New Guinea, and, probably, also in Bangladesh, the state of the economy would lead one to expect lower levels of mortality than actually prevail (at least according to the available estimates). In China and Sri Lanka, it appears that expectation of life at birth is considerably above what one would expect if the state of economic development were the only determinant of the level of mortality. (The circumstances and factors which may be the cause of these deviations will be explored later in this paper).

Considerable differences in the level of mortality exist within each country. In what follows we shall take the two most populous countries in the region, China and India, as examples. In India during the early 1970s, the distribution of the 15 major States by the level of expectation of life at birth for males differed depending upon which set of estimates of expectation of life is used (Hansluwka, 1986: 370); according to the estimates of the Expert Committee on Population Projections, four of India's fifteen largest States, which contain 43 per cent of the population, had mortality levels which resulted in an average expectation of life at birth for males of less than 50 years; Dyson's estimates put 10 States and 72 per cent of the population into that situation.

Table 2. Distribution of India's 15 most populous States by the estimated level of expectation of life at birth in the early 1970s

Expectation of life at birth (males, the early 1970s)	Number of States		Percentage of population	
	Expert committee	Dyson	Expert Committee	Dyson
Under 45	1	4	17	31
45 to under 50	3	6	26	41
50 to under 55	8	2	45	20
55 to under 60	2	3	8	8
60 and more	1	0	4	0

Table 3 shows the distribution of the 25 provinces of China for which 1981 life tables were available (Liu Zheng, 1986) and the population size exposed to a given level of mortality was known. (The aggregated population

of the four provinces for which such information is still missing is also shown in this table). Six provinces with 20.6 per cent of China's population had levels of mortality giving rise to an average expectation of life at birth (jointly for males and females) of less than 65 years; about the same proportion (22.8 per cent) of the population in another seven provinces would enjoy 70 or more years of life. This distribution is not likely to be severely distorted if the four provinces for which such data are not yet available are taken into consideration. The most populous of the four provinces, as of 1982 census, are Henan with 75.2 million and Guangdong with 59.87 million. It is likely that moderate levels of mortality, corresponding to a life expectation of more than 65 years, exist in those two provinces. The remaining two provinces, Tibet and Ningxia, are likely to have comparatively high mortality and, hence, would be in the first category. However their populations are only 1.9 million and 3.9 million, respectively, and thus their addition to the first category would increase the proportion by less than one percentage point.

Table 3. Percentage distribution of China's 1982 population by estimated level of mortality

Mean expectation of life at birth (males and females) 1981	Number of provinces	Percentage of China's 1982 population
60 to under 65	6	20.6
65 to under 67.5	5	17.3
67.5 to under 70	7	25.4
70 and more	7	22.8
Not available	4	13.9

Substantial regional differences in mortality (whether expressed in terms of age-adjusted crude death rates, infant mortality rates, or expectation of life at birth) have been reported from other countries as well (WHO, 1982; Ruzicka in ESCAP, 1984: 87-93).

In the Philippines during the early 1970s, the extreme values for expectation of life at birth for females differed by as much as 23 years. Most of the benefits of lower mortality went to about 50 per cent of the population concentrated on 22 per cent of the country's land area. Of the low-mortality provinces, six were clustered around Metro Manila, and the others contained important urban centres: Cebu City in Cebu province and Laoag in Ilocos Norte province.

In Nepal, according to World Fertility Survey data (Gubhaju, 1984: 93) the probability of infant death during the period 1962-1966 ranged from 153 to 203 and 206 per thousand live births in the hills, mountains and the plains (terai), respectively; comparative data for infants born during the period 1967-1971 were 147,180 and 168.

In Indonesia, infant mortality (estimated by an indirect method from 1980 census data) varied between provinces, with the lowest value of 62 per thousand in Yogyakarta and the highest, 187 per thousand, in West Nusa Tenggara. The two provinces also appear at the extremes of the infant mortality distribution in 1983 with levels estimated at 47 per thousand and 170 per thousand, respectively. The distribution of provinces with respect to their level of infant mortality is clearly bi-modal, with a flat peak at levels of 70-89 per thousand and another lower peak at 100-119 per thousand. The average infant mortality rate for the country as a whole was estimated at 92 per thousand; accordingly, 15 provinces and almost two thirds of all births would be exposed to lower mortality, and 11 provinces with just over one third of all births would be exposed to higher mortality than the national average.

Table 4. Distribution of provinces by the level of infant mortality and the percentage of births at risk: Indonesia, the late 1970s

Infant deaths per 1,000 live births	Number of provinces	Percentage of live births
47	1	1.3
60 - 69	2	6.5
70 - 79	6	29.3
80 - 89	6	27.2
90 - 99	3	4.5
100 - 109	4	24.6
110 - 119	3	4.4
170	1	2.2

Source: Based on data from Dasvarma (1984) and Utomo and Iskandar (1986).

In Thailand, the probability of survival from birth to one year of age (estimated from a 20 per cent sample of the 1980 census) was highest in the central region, where infant mortality dropped from about 39 per thousand around 1965 to 26 per thousand during the period 1976-1978. Infant mortality rates were only slightly higher in the southern region (40 per thousand

and 30-32 per thousand, respectively). The two high-mortality areas were the northern and north-eastern regions; in the former, infant mortality was about 70 per thousand around 1965 and dropped to 44 per thousand by 1978, while in the latter the corresponding values were 67 per thousand and 39 per thousand. Hence, it appears that the variation in infant mortality between various parts of Thailand was remarkably moderate. Moreover, such regional variation as there was has probably been reduced further during the last decade or so (IPSR, 1985).

In most instances, the intra-country variation in economic development provides a partial explanation of the regional differences in mortality. In China, for instance, 31 per cent of inter-provincial differentials in survival (measured in terms of expectation of life at birth) could be explained by the combined effects of the variations in provincial output per head and level of urbanization of the provinces. In this example, the expectation of life at birth was calculated from 1981 mortality data, the economic data were for 1980, and the percentage of urban population was as of the 1981 census.

$$LE(\text{males+females}) = 65.05 + 0.14 Y + 0.03 U$$

Where Y is the average output per head in hundreds of *renminbi* (Rmb); and U is the percentage of provincial population residing in urban areas. In this case, $r = 0.56$ and $r^2 = 0.31$. An increase of output per head by Rmb100 increases LE at birth by 0.14 of a year; about the same increment in LE would require an increase in the proportion of the urban population by almost five percentage points.

A stronger association than that of the level of urbanization is that between provincial expectation of life at birth and the level of illiteracy among the population aged 12 years and over. In this instance, the estimation equation is :

$$LE(\text{males+females}) = 71.37 + 0.09 Y - 0.16 IL$$

Where IL is a percentage of population aged 12 and over, illiterate or semi-literate. The association accounts for 45 per cent of the variation in longevity among the provinces ($r = 0.67$). These findings confirm those of a more detailed study of the variation in mortality among China's provinces based on the 1973-1975 set of life tables. Hansluwka (1986: 368) examined the correlation between the expectation of life at birth (for males) and the level of illiteracy (population aged 12 and over), income per head, hospital-bed/population ratio, and health care provider/population ratio. The inter-provincial variation in the level of illiteracy turned out to be the most important predictor, accounting for 52 per cent of the differences. This was followed by average income which added another 7 per cent to the explained variance. In con-

trast, neither of the two health care related indicators contributed significantly to the total explained variation in the inter-provincial levels of expectation of life at birth.

Independent variable	Multiple R ²	Change in R ²	B
Illiteracy rate	0.52070	0.52070	- 0.13632
Income per head	0.59147	0.07076	0.01313
Hospital-bed/population	0.60070	0.00923	- 0.96819
Health care provider/population	0.60589	0.00519	0.33168

By comparison, a multivariate analysis of Indian data (Hansluwka, 1986: 370-371) suggested that the inter-state variation in the expenditure per head on health was a major factor accounting for about 60 per cent of the difference in expectation of life among the States; the variation in the level of illiteracy accounted for another 10 per cent of the disparities. Lack of access to adequate data prevented the authors from using a similar conceptual model as in the analysis of the Chinese data. Yet it may be argued that the level of health expenditure used in this analysis is a proxy for the level of economic development expressed in terms of income per head in the above analysis of China's provincial data.

The variation in infant mortality among the 26 provinces of Indonesia, however, cannot be adequately accounted for by inter-provincial differences in estimated levels of GDP (per head of population) or in the differential incidence of poverty. In the former instance, regression analysis leads to :

$$\text{IMR} = 218.744 * X^{-0.1389}$$

where IMR is infant mortality (measured as the probability of dying between birth and exactly at age one) and X is GDP per head in thousands of *rupiah*. The relationship accounted only for 10 per cent of the inter-provincial variation in the estimated level of infant mortality ($r = 0.3169$). There were two provinces in which comparatively high GDP was associated with high levels of infant mortality: Irian Jaya with a GDP per head of *Rupiah* 555 and Maluku with *Rupiah* 239. These provinces had infant mortality rates of 106 and 124 per thousand live births, respectively. If these two provinces are left out, the estimation equation becomes:

$$\text{IMR} = 293.704 * X^{-0.1987}$$

with almost 16 per cent of the inter-provincial variation in IMR accounted for by the relationship between GDP per head and IMR ($r = 0.3969$). Obviously, there are other important factors which affect the levels of infant mortality



Nutritious food provided for young children at a day care centre in West Sumatra, Indonesia, is among the types of factors that affect the level of infant and child mortality. (UNICEF photo by Maggie Black)

in individual provinces, such as the level of fertility, availability and utilization of prenatal care and of trained attendance at delivery, efficiency of the immunization programme, and so on.

One of the factors deemed to be associated with the national level of mortality has been the distribution of the national income among various strata of a society. It is obvious that the average GNI per head has a different meaning where there is relatively little inequality in its distribution compared with societies where the economic benefits of development are reaped by a minority. Inequality of income is likely to be associated with inequality in access to a range of social amenities such as education or health care facilities, as well as with inequality in social status and other aspects of life related, directly or indirectly, to health and mortality. Rodgers (1979) introduced income distribution into the GNP-mortality models using Gird's coefficient and, as an alternative, quintile distribution of average income as measures of the degree of inequality. He experimented with three measures of mortality: expectation of life at birth and at age five, and infant mortality. The income distribution variables returned consistently significant results for expectation of life as a measure of mortality: for instance, the difference in expectation of life at birth between a relatively egalitarian and nonegalitarian country at the same level of GNI per head was between five and ten years (Rodgers, 1979: 350). In contrast, in the case of infant mortality, once the data set was reduced to the developing countries, not only did the level

of expectation fall dramatically (R^2 declining from 0.54 to 0.33) but the effect of the inequality of income measure also became statistically insignificant.

Very little information is available on income distribution in the less developed countries of the Asia-Pacific region, and what there is, is often of rather limited reliability. It appears from the estimates shown in table 5 that Indonesia and Thailand had a rather inequitable income distribution in the mid-1970s. Yet the distribution seems to have been considerably better than in Malaysia, Nepal and the Philippines, for instance. According to these data, the least inequalities in income distribution appear to have prevailed in Bangladesh, the Republic of Korea and Sri Lanka. Even a cursory examination of the data indicates a lack of a systematic relationship between those measures of inequality and the levels of mortality in the group of countries considered here.

Table 5. Income distribution: Percentage share of household income by percentile groups of households

Country (Year)	Lowest 20 per cent	Second quintile	Third quintile	Fourth quintile	Highest 20 per cent	Highest 10 per cent
Bangladesh (1973-1974)	6.9	11.3	16.1	23.5	42.2	27.4
India (1975-1976)	7.0	9.2	13.9	20.5	49.4	33.6
Indonesia (1976)	6.6	7.8	12.6	23.6	49.4	34.0
Malaysia (1973)	3.5	7.7	12.4	20.3	56.1	39.8
(Nepal) (1976-1977)	4.6	8.0	11.7	16.5	59.2	46.5
Philippines (1970-1971)	5.2	9.0	12.8	19.0	54.0	38.5
Republic of Korea (1976)	5.7	11.2	15.4	22.4	45.3	27.5
Sri Lanka (1969-1970)	7.5	11.7	15.7	21.7	43.4	28.2
Thailand (1975-1976)	5.6	9.6	13.9	21.1	49.8	34.1

Source: World Bank, *World Development Report, 1984*.

To the extent that the national level of mortality is associated with the level of economic development – and most of the preceding evidence suggests a significant, positive relationship between national income and the level of expectation of life at birth – the continuing growth of the national economy may be a condition facilitating a sustained mortality decline over time. Undoubtedly, economic growth is not the only decisive factor; yet the allocating of adequate funds to sanitation, water supply and health care infrastructure, to the expansion and improvement of the quality of educational facilities, to road and rail transport and communications, and to other public amenities and social welfare programmes which contribute directly or indirectly to improving living standards and the health of the people is certainly easier in times of economic growth and expansion than in depression. In this respect, it is not merely coincidental that some of the strongly growing economies in the Asia-Pacific region also have recorded considerable improvements in mortality in the 1970s.

Table 6. Growth of production and of longevity in selected countries of the Asia-Pacific region

Country or area	GDP average annual growth (%)		Expectation of life at birth (females)			
	1960-1970	1970-1982	1960	1982	Increment	Annual growth (%)
Bangladesh	3.7	4.1	42	49	1	1.4
Burma	2.6	5.0	45	56	11	2.0
China	5.2	5.6	41	69	28	5.7
Hong Kong	10.0	9.9	69	78	9	1.1
India	3.4	3.6	42	54	12	2.4
Indonesia	3.9	7.7	42	55	13	2.6
Malaysia	6.5	1.7	56	69	13	1.9
Nepal	2.5	2.7	38	45	1	1.5
Pakistan	6.7	5.0	42	49	7	1.4
Papua New Guinea	6.7	2.0	40	53	13	2.7
Philippines	5.1	6.0	54	66	12	1.9
Republic of Korea	8.6	8.6	56	71	15	2.2
Singapore	8.8	8.5	66	75	9	1.2
Sri Lanka	4.6	4.5	62	71	9	1.2
Thailand	8.4	1.1	55	65	10	1.5

Source: World Bank, *World Development Report, 1984*.

In this assessment, however, the level of survivorship (expectation of life) at the start, that is in or around 1960, has to be taken into consideration.

It is generally accepted that greater relative gains in expectation of life may be achieved over the same period of time if, at the start, mortality is high than if it has been already reduced to moderate or low levels. The data set out in **table 6** also provide support for Preston's previously cited conclusions that economic growth was not the main factor in mortality decline during the 1960-1980 period, although it undoubtedly played an important role: the paths of mortality decline in China, Sri Lanka and the Indian State of Kerala have often been referred to as examples of successful control over excessive mortality under conditions of considerable economic stress.

Individual and family standard of living and mortality

The association between levels of mortality (and, hence, health status) and economic conditions obtains a different meaning and dimension when we move from the national or other aggregated data to the characteristics of individuals.

Many of the individual characteristics such as income or education now relate to health and mortality through the effect they have on individuals' living standards and on their behaviour in general, and in relation to illness in particular. Other factors such as the quality of housing, access to and utilisation of various social amenities are at least partly dependent upon what families can afford to avail themselves of, i.e. basically on income, and on how they set their priorities when deciding on the uses to be made of their income. Income utilization in this context is dependent, to some extent at least, on education.

In the study of the variation of expectation of life at birth among China's provinces, economic output may not be the best indicator of whether individual families in one province are comparatively better off than in another. If we are looking for an indicator of family, well-being, possession of selected chattels may be an acceptable proxy. We used the rank order of each province by the proportion of families which own a bicycle, sewing machine, radio, clock or watch, as an index of material well-being, and correlated this with the provincial expectation of life at birth. Spearman's rank correlation coefficient of $r = 0.820$ suggests that individual and family prosperity may have been a very relevant factor in regional variations in mortality in China during the early 1980s.

Most studies which have used data on individuals and families in the context of mortality analysis have been confined to the study of infant and child mortality. This is largely because of the paucity of data on the mortality of adults; in most developing countries, registration of deaths is either nonexistent or defective. In addition, a study of differential mortality calls



Gathering information on the population of the Philippines. (POPCOM photograph)

for linking of socio-economic information about the deceased (collected from the death certificates) with data on the distribution of the population by the same characteristics obtained in the census. This poses considerable methodological problems even in countries which have had a long history of regular censuses and complete registration of vital events (United Nations/WHO, 1979; United Nations, 1984). Methodologies for the indirect estimation of infant and child mortality have become available since the late 1960s (McDonald, in WHO, 1982). Thereafter, data from demographic surveys, in particular the World Fertility Survey, provided a rich source for the examination of the demographic, social and economic determinants of infant and child mortality in a variety of social and economic settings.

Of the various social and economic characteristics of families and of individuals, parental education appears to be producing a consistent, significant, negative association with child mortality (Caldwell, 1979; Caldwell and McDonald, 1981). Nine countries in the Asian-Pacific region were included in a recent comparative analysis of infant and child mortality in 28 countries for which World Fertility survey data were available. Where selected socio-economic factors such as parents' education, occupation and family's place of residence were introduced into multivariate models, mother's education emerged as an especially important factor in almost all countries with regard to either mortality after the first month of life (i.e. during the post-neonatal period), or during early childhood. The effect of mother's education on the mortality of young children rather than on infants was more often found in countries where breast-feeding is commonly continued beyond 12 months. In many of these societies, the general level of women's education is very low as well (Hobcraft *et al.*, 1984).

Table 7. Mortality of children under five years of age in selected countries of the Asia-Pacific region

Socio-economic indicator	Bangladesh (1975/76)	Indonesia (1976)	Malaysia (1974/75)	Nepal (1976)	Pakistan (1975)	Philippines (1978)	Republic of Korea (1974)	Sri Lanka (1975)	Thailand (1975)
Number of deaths before age five per 1,000 live births									
Total	215	180	61	259	202	90	83	84	116
Mother's education (years)									
None	222	193	67	261	208	130	107	104	145
1-3	198	194	64	(204)	(143)	118	94	97	105
4-6	186	143	56	(157)	(138)	94	74	80	110
7+	(122)	77	18	(136)	(112)	53	56	55	(38)
Mother's work status									
None	213	167	52	250	200	94	69	71	(71)
Family	224	183	71	256	212	92	91	85	116
Other	228	189	61	305	201	82	76	111	136

Husband's occupation										
Agriculture	216	182	72	258	197	106	95	102	128	
Skilled and unskilled	236	201	59	330	211	82	73	75	102	
Sales and services	208	190	48	(198)	205	64	77	71	83	
Professional and clerical	152	100	40	(214)	188	46	70	52	(55)	
Husband's education (years)										
None	230	199	88	270	215	118	102	122	151	
1-3	221	205	59	(216)	(172)	122	(134)	98	(162)	
4-6	191	165	60	(234)	208	96	90	93	109	
7+	176	99	40	167	155	62	67	51	83	
Place of residence										
Metropolitan	(180)	143	42		143	57	63	71	(57)	
Other										
Urban	188	137	46	(145)	174	71	87	74	(83)	
Rural	218	188	68	262	216	98	90	87	122	

Note: Data refer to mortality of children reported born between five and fifteen years before the survey.

Source: Hobcraft *et al.* (1984).



In Sri Lanka husbands' education is a significant factor in infant and child mortality unlike in many other developing countries. (Sri Lankan Ministry of Information photograph)

The effect of the husband's education appears less often as a significant factor in infant and child mortality. However, for a group of Asian and Pacific countries (table 7), it was significant in Bangladesh, Indonesia, the Philippines and Sri Lanka. As with occupation, the husband's level of education is probably an indicator of social status, and the effect on mortality is mediated largely through income and living standards, although some direct effect of a husband's education on child care practices is also quite likely. For instance, the effect may be observed when decisions are made regarding when an ill child should be seen by a health care provider, and whether the child should be taken to a hospital or local health centre, or to a traditional healer.

Another example of the contrasting of mortality experience among various social strata of a given society comes from the Philippines. An analysis of the returns of the 1973 National Demographic Survey revealed that . . . women with professional careers or occupying high administrative positions had an average life expectancy of some 67 years, while women in white-collar jobs could look forward to only 58 years, and farm women to even less than that, 55 years" (Flieger in WHO, 1982: 249).

In making a comparative analysis, a question arises concerning the extent to which socio-economic differences account for variations in mortality between countries. Hobcraft *et al.*, in the previously mentioned study, illustrated this point by estimating neonatal, post-neonatal and child mortality among what they called “traditional rural families” (both husband and wife illiterate, residing in a rural area, the husband working in agriculture and the wife in family work) and “metropolitan elites” (husband and wife with more than seven years of education, residing in a metropolitan area, the husband a professional, the wife working for a salary outside the home or family). The differences are shown in **table 8**.

Table 8. Estimated levels of mortality for traditional rural families and metropolitan elites

Country	Traditional rural families			Metropolitan elites		
	NN M	PN M	Ch M	NN M	PN M	Ch M
Bangladesh	80	64	88	65	64	(5)
Indonesia	55	60	88	29	17	15
Malaysia	13	36	25	8	10	(2)
Nepal	82	38	38	72	90	60
Pakistan	96	63	47	29	63	24
Philippines	22	55	75	16	18	9
Republic of Korea	35	36	42	22	28	16
Sri Lanka	39	21	38	39	19	11
Thailand	51	51	56	37	24	(3)

Notes: NN M= neonatal mortality (age 0-27 days); PN M = post-neonatal mortality (age 28-365/6 days); and Ch M = child mortality (age 1-4 years).

Source: Hobcraft *et al.* (1984).

There is not only a wide gap between the two extreme social groups in each country, but also a huge variability in levels for the same group between countries. (In a few instances, the small number of households of “urban elites” in the sample resulted in suspiciously low child mortality). Whereas it is accepted that the social and economic situation of the family affects the children’s chances of survival, there is no simple explanation for the wide inter-country variations among socio-economic sub-groups with similar attributes.

The analysis suggests, however, that there is a relatively greater homo-

geneity of experience among metropolitan elites than the rural traditional social groups. It is likely that the rural environment and living conditions differ widely between countries in many respects: for instance, in the structure of endemic diseases and disease incidence and prevalence; in provisions for adequate medical care and access to such services, not only in terms of distance but also in economic and social terms. In addition, traditions and practices of child care are likely to vary to a greater extent among the more rural societies than among the more "modern" urban groups. Last but not least, the rural groups, as they were defined for the purpose of this illustrative analysis, comprise a wider assortment of economic conditions than the metropolitan elites. The rural families probably exclude those of rich landlords; however, even then, they range from self-sufficient households providing adequate shelter and food for their members to those of landless agricultural labour. The information available from the World Fertility Survey was, unfortunately, not quite adequate for differentiating in greater detail between the socio-economic conditions of the rural families.

Micro-level studies have only recently started to collect information about amenities available to all families in the same community - the "community variables" - in addition to that on individual and family characteristics. One recent study (Jam, 1984) using data from a large sample survey in India (Registrar General, 1981), demonstrated that the availability of some community facilities, such as health care centres or arrangements for the delivery of immunization to children, operates on the reduction of infant and child mortality largely through the strongly positive correlation with selected characteristics of individuals, in particular, the mother's education. The mechanism of operation of such community variables is clearly indicated: the better-educated mothers are more likely to utilise such health care services as exist within reach, both for the treatment of ill children and for the protection of their health.

The other type of investigations of mortality determinants at the micro-level of analysis concentrates on individuals' behaviour related to health protection and care in illness. It has only recently been developed in demographic research, although its methodology has a much longer history and tradition in social, and in particular medical, anthropology. It has been observed that, in many developing countries, the available health care facilities are often under-utilised for reasons which appear to be dissociated from economic constraints or the physical distance of such facilities. In particular, such under-utilisation appears more often among the more traditional, illiterate, rural families than among families in urban areas.

The micro-demographic approach has the potential for shedding light on the reasons for such under-utilization, taking a step further the findings



A behavioural approach to the study of health protection may provide valuable clues to the social acceptability of such methods as vaccination, for example.

of the more traditional approaches to the study of socio-economic differentials in mortality.

The behavioural approach to the study of health protection may thus assist our understanding of the mortality transition and the circumstances under which it starts and spreads. However, there is a considerable additional benefit from such studies (although it is currently rather under-utilised) in providing clues to the social acceptability of modern methods of health protection, such as vaccination of children or pregnant women, and positive health promotion, such as emphasis on personal and environmental hygiene. The findings of such studies have greater value for devising socially acceptable strategies than in designing the content of national health policy.

Conclusions

The mechanisms which lead to and underlie changes in mortality over time as well as differentials among countries and among various social groups within a given country have many facets, some of which are difficult or impossible to capture in the form of statistical measures and indicators. Many of these facets are inter-related in their impact on health and mortality: education and occupation; income and standard of living; education and income; education, occupation, income and place of residence are just a few well-known examples of interactive effects encountered almost inevitably not only in the analysis of mortality differentials, but also in the assessment and evaluation of the impact of health care and other interventions. Any intervention sets into motion a complex process of direct and indirect, short-term and long-term effects on the level and pattern of mortality in the population.

There are limitations to the ability of statistical methodologies of multivariate analysis to deal adequately with the complexity of those effects on mortality. Even greater difficulties arise from the lack of dependable information about the dimensions of the factors involved. The past 30 years or so have seen failures in attempts to quantify the contribution of each of the identifiable factors which have had an influence on the mortality transition in the less developed countries. This observation does not include other factors, the contribution of which has been claimed or suspected on philosophical or ideological grounds but which could not be demonstrated because of difficulties of quantification.

There are valid reasons for such failures and it is difficult to find a better summary of them than the one put forward by Myrdal (1968:16-18) almost 20 years ago:

“From the planning point of view the effect of any particular policy measure in the health field depends on all other policy measures and is by itself indeterminate. This means that it is impossible to impute to any single measure or set of measures a definite return in terms of improved health conditions.”

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Planning for Service Delivery at Health Centres: An Experiment *

The institutionalisation of an internal planning system could improve India's delivery of maternal and child health, and family planning services

By G. Giridhar and J.K. Satia

India's primary health care and family planning programme has been receiving increasing attention owing to the country's commitment to achieving "health for all" and to reaching the national goal of a net reproduction rate of unity by the year 2000. These time-bound twin objectives call for substantial improvements in the performance of the programme at all levels and particularly at the operating level where direct interface with clients occurs.

The Government has taken many steps to achieve the higher level of performance implied in the national goals. Some of these are expanding the

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network of service centres; integrating complementary services, particularly maternal and child health (MCH) and family planning at the point of delivery; introducing changes in the delivery system; improving the supply of medicines, vaccines and contraceptives; and generating community participation.

The need for strengthening in-service training programmes to improve workers' skills for providing health and family planning services and to stimulate demand for their use has also been recognized by the programme managers.

Some progress towards these objectives has been made. However, insufficient planning for the systematic provision of services continues to affect adversely the delivery of services.

An experiment was conducted by the authors in 1983-1984 in a district of Rajasthan State to verify the feasibility of developing and institutionalising a planning system at the primary health centre (PHC) level as a means of improving the performance of MCH and family planning service delivery. This paper highlights aspects of the experiment.^{1/}

Programme structure

Rural health services in India were developed on the basis of the recommendations of the Committee on Health Services and Development set up in 1946, which is popularly known as the Bhore Committee.^{2/} The Committee proposed an extensive network of primary health centres and subcentres to deliver health and family welfare services. It was suggested that the primary units should be supported by a series of "appropriate organizations in an ascending scale of technical efficiency", so that the necessary range of health services could be provided.

Each PHC covers 80,000-100,000 people living in eight to ten subcentre areas. Each subcentre is staffed by a team of one male and one female paramedic who deliver primary health services. In each PHC, three medical officers are posted along with the team of paramedics. For many years, these staff members were working as single-purpose workers because various health and family planning programmes were designed to run vertically and independently, each having its own separate staff. However, in 1974 a multi-purpose mode

^{1/} The findings of this experiment were reported to the Government in G. Giridhar and J.K. Satia, "An Experiment in Planning for Service Delivery at the Primary Health Center". (Indian Institute of Management, June 1984).

^{2/} Government of India, *Report of the Health Services and Development Committee*. (New Delhi, 1946).

of service delivery was adopted in which the range of services provided by each worker increased but the area of coverage for each decreased.^{3/} The logic was that complementary services are better provided as a package. In addition, for a population of 1,000 at the village level, one trained village health guide (VHG), a voluntary worker chosen by the community, was posted.^{4/}

Two important categories of staff at the PHC level are supervisors and block extension educators. Their roles in ensuring the systematic delivery of services in adequate quantity and quality and in carrying out information, education and communication (IEC) activities are crucial to the success of the programme. They also provide important links in the system of monitoring the progress of work at the field level. For this purpose, monthly meetings are held between the medical officers and all the staff of the health centres.

Considerable emphasis is placed on achieving annual targets set for the provision of specific services. These targets are determined at the national level based on overall programme goals and are allotted sequentially to each lower level, i.e. State, district, PHC and subcentre workers, largely based on population size but with some adjustment for past performance.

Experience indicates that such heavy target orientation is not very conducive for systematic programme operations. Moreover, the cycle of programme operations is such that the last quarter of the programme year accounts for over 50 per cent of the annual performance in family planning. The reason for this pattern is related to climatic conditions. The summer months are too hot for travel and the ensuing monsoon rains cut off certain areas from access and make travel very difficult. During the last quarter of the year, however, a large number of service campaigns are organised, incentives are announced, monitoring is improved and a sense of competition is nurtured with the aim of reaching the targets. During this period of hectic action, the emphasis is generally on reaching sterilization targets. The monitoring of programme performance is based on the proportion of a target achieved by workers.

Evolved over 10 years ago, this system of functioning has many weak-

3/ Government of India, *Report of the Committee on Multipurpose Workers*. (New Delhi, Ministry of Health and Family Planning, 1973).

4/ The pattern of rural health infrastructure before the fifth five-year plan (i.e. before 1979) consisted of a subcentre covering 10,000 people; a primary health centre covering 80,000 to 100,000 people and a community health centre covering 400,000 people. However, the pattern was to undergo some change during the sixth five-year plan (i.e. from 1980). According to the new plan, a village health guide (VHG) would be posted at the village level for a population of 1,000. One subcentre was to cover a population of 5,000 and a primary health centre was to cover a population of 30,000. This expansion in infrastructure is being carried out in phases and is not yet completely operational.

nesses. First, it reflects the limited nature of the supply-oriented strategies without systematic demand-creation efforts. Second, it implies a rigid and almost uniform pattern of inputs and activities in the implementation strategy without regard to special conditions that may exist in different areas. Third, if the targets are handed down from above and are not within the capacity and willingness of those responsible for achieving them, the programme operations may be adversely affected. Fourth, programme planning should focus on activities and tasks and not simply on objectives and targets. In the earlier years, emphasis on sterilization might have been useful, but at the current stage of development, this strategy is likely to be a hurdle to increasing the contraceptive prevalence rates. Fifth, the target setting system needs to be reoriented with the changing levels of these rates. PHC performance variations should be reflected in their targets and the target setting system should be made more participative.^{5/}

Need for planning

The number of activities conducted and the range of operational responsibilities at the PHC call for a systematic approach in service delivery. For example, an understanding of the client composition can help in placing differential degrees of emphasis on different contraceptives, in estimating the supply of contraceptives and in scheduling field visits. Motivational activities can also be fine-tuned to suit a particular client composition. Planning is particularly useful because of the nature of the services, such as ante-natal, intra-natal, post-natal, immunisation and family planning, all of which are different segments of the same continuum.

The performance of a health centre depends on workers' attributes, area characteristics, client composition, logistics and supply, administrative problems, organisational climate and systems support. All of these factors are important in planning and improving the congruence between client demand and programme supply.

Broadly, three levels of management are involved in such planning. The top level develops strategies, negotiates goals, allocates resources and generally plans for the outcome. The middle level provides support to the lower level

^{5/} A review in 1982 of the Indian Family Welfare Programme by the Population Council suggested the following in this context: "If State Governments could be induced to play a more active role in redesigning their own family welfare programmes, they might take greater efforts to ensure their success. This same principle is probably applicable at all levels; district managers will be more committed to successful implementation of plans that they have had a part in designing as will the personnel of PHCs and subcentres and village leaders".

in achieving programme output. The operating level plans for activities such as home visits, follow-up, supervision, record keeping etc.

This paper describes our experiences in suggesting a planning system for the operating level. Some emphasis is placed also on the middle level, without the support of which no planning system at the lower level could function. That level is responsible for ensuring the availability of physicians and other staff, basic facilities to run a health centre, an environment conducive to work and adequate administrative and technical support. All of these factors are essential preconditions for an effective planning system at the health centre level.

The objective of this experiment was to evolve a design for an operational planning system at the PHC level and to gain experience in its implementation. Therefore, the methodology used is not that of a classic experiment-control design. As a first step, an analysis of PHC performance was carried out in the selected district with the help of responses by medical officers to a questionnaire prepared to assess the PHC's status. Since the questionnaire did not seek detailed quantitative responses, it was filled out by the physicians in the somewhat formal setting of a workshop.^{6/} Based on this analysis, three PHCs were selected for experimentation in consultation with district- and state-level administrators. They were chosen because they offered sufficient contrast and, taken together, represented the spectrum of PHCs in the district. Those with good performance were designated as PHC-A; with average performance, PHC-B; and with poor performance, PHC-C.

Preliminary analysis

A visit to PHC-C indicated that it did not meet certain preconditions needed for the implementation of the planning system. There was no medical officer in charge of that PHC; instead a physician posted at a dispensary about 20 km away was discharging that duty. In the opinion of that physician, the performance of PHC-C was poor because the community resisted family planning. Moreover, the PHC's newly constructed facilities were located in a very

^{6/} The questionnaire obtained some basic information about each PHC, such as number of institutions, staff strength (fractional and actually posted), locational factors and PHC facilities. About 10 programme-related factors were listed and the medical officers were asked to indicate how each one of them influenced PHC activities. Some of these factors are receptivity of the community, involvement of other agencies, supplies, supervision and monitoring. Similarly, a set of performance-related factors was listed (such factors included workers' skills, motivation, community characteristics, client contacts, co-operation with other workers) and the officers were asked to indicate the factors in terms of their importance in influencing the achievement of targets in MCH and family planning.

small village; consequently, medical officers were not willing to be posted there. Most of the staff lived in towns or large villages and commuted to the PHC. Our discussions with the staff members there revealed that, because medical officers had not been posted at PHC-C for quite some time, the work routine was not established and records were incomplete. Although it was difficult to establish whether the poor performance of this PHC was due to supply- or demand-related factors, it would be necessary first to provide required inputs before institutionalising a planning system. Therefore, action was needed at the district and state level to provide such inputs. In the absence of proper staff, it was not possible to experiment with the development of a planning system at PHC-C and, therefore, further work was not pursued there.

PHC-A and PHC-B differed in terms of environment- and organization-related factors, both of which affect performance. PHC-A had better infrastructural facilities compared with PHC-B. PHC-A had 44 health institutions (family welfare centres, subcentres and dispensaries) compared with 26 institutions under PHC-B, although their population coverage was nearly the same. PHC-A had very few vacancies for staff whereas PHC-B had far more vacancies. The selection of VHGs had been stopped in PHC-B owing to conflicts in the selection process. Consequently, it had only 40 VHGs in place compared with 106 at PHC-A. PHC-B also experienced some conflicts among the staff while PHC-A reported an environment conducive to work.

Another important difference was that PHC-A rated none of its 20 subcentres as poor with respect to performance, accessibility to the community and level of supervision. PHC-B rated 10 subcentres as poor on each one of the three aforementioned dimensions. Supervision at PHC-B was weak since positions for female supervisors had remained vacant for a long time. In addition, its vehicle was out of commission. Thus, PHC-B faced difficulties related to its physical and organisational environment. However, the medical officers of the PHCs felt that performance improvement was possible, but it would be somewhat difficult.

The perceived constraints on performance by the medical officers in charge of these PHCs also seemed to differ. In PHC-A only three factors, namely, inadequate budgets for fuel, the posting of local staff and a shortage of medicine, seemed to influence performance. PHC-B also perceived these factors as constraints, but identified several additional ones such as the unavailability of a vehicle; lack of support and guidance from the district; lack of co-operation from other agencies; and lack of sincerity, motivation and skill among all workers and health guides. Thus, two PHCs provide examples of a fairly distinct set of PHCs and, consequently, the focus of their operational planning system would differ.

The workers from both PHCs were involved in developing village profiles. For each village, data were collected on the number of eligible couples and current contraceptive users by age and number of living children, and village amenities such as water supply, electricity, road, bus-stand, and distance from the nearest health institution.

The effect of some of the key physical attributes of a village on the rate of contraceptive usage among couples was also analysed for 81 villages covered by PHC-B. Except for electricity supply, none of the other physical attributes (size, water supply etc.) accounted for differential contraceptive usage and, thus, did not call for different programme activities in the villages covered by PHC-B. Therefore, similar analysis was not carried out for PHC-A. However, it was clear from the previously described distinctions between PHC-A and PHC-B that different planning strategies were required. For example, PHC-B would first have to concentrate on providing required inputs for improving the performance of workers, but PHC-A, which already had a higher level of contraceptive usage, should plan for improving performance with more direct emphasis on demand generation.

Target setting

For a planning system to be effective, the targets set should be clearly understood by everyone, should be believed to be achievable and should be backed up by a commitment to achieve them. However, the current target setting process is weak with regard to these attributes. Therefore, the monthly PHC staff meeting was used for conducting a target setting exercise to test whether workers' participation in target setting was feasible and to determine the resultant size of targets.

It was suggested that the workers should review their performance in the previous and current years and then given their expected achievement for the succeeding year.

They were concerned that the results should not be conveyed to higher level officials. This assurance was given by the PHC medical officers and the workers were urged to be quite realistic in estimating what they could achieve, keeping in mind their client population, past performance and future potential.

A total of 38 workers from PHC-A and 23 workers from PHC-B participated in this exercise. They set targets for themselves in terms of acceptors of sterilisation, IUDs condoms, oral pills and immunisation. An aggregate comparison between their recent achievement and their estimated target in the ensuing year indicated that for all the aforementioned services (except for

oral pills) the targets set were higher than what had been achieved. The following observations particularly stood out in this comparison:

- Both PHCs indicated a very large potential for IUD insertions. They also felt that the distribution of condoms could be doubled.
- PHC-B indicated a lower potential for performing sterilisations than PHC-A, where the results were already good.
- PHC-B also showed greater potential for improving immunisation coverage than PHC-A.
- Overall, PHC-B workers indicated that there was scope for better performance, but also pointed out that lack of inputs, supervision and leadership were major impediments to improved performance.

Two problems were experienced in the process of negotiated target setting. First, the level of mutual trust and confidence between the higher authorities and the staff was not high enough to make this process useful. Second, the programme must have some level of managerial capability to implement suggestions made by workers. A plan of action to resolve the administrative irritants inhibiting worker performance would have to be devised to supplement this exercise. In this regard, the role of the district would be of crucial importance. However, this exercise suggests that workers' commitment, motivation and performance may be improved through a process of formally negotiated targets for performance levels.

Planning to improve worker performance

As previously stated, the two PHCs facing different types of constraints and environments require different planning strategies appropriate to the particular configuration of factors affecting their performance.

PHC-B, which was fairly far behind in terms of target achievement, would need to increase workers' performance and reduce the variation in their level of performance. Supervision would have to be improved by filling up the vacant positions for female supervisors and by improving mobility. The medical officer felt that unless this was done and some of the administrative bottlenecks were removed, planning on his part would not be useful. In fact, he asserted that by just improving mobility, the performance of that PHC could be improved substantially. The organisational climate was not very harmonious since there were some conflicts among the PHC staff. This feedback was made known to district level officials who were able to resolve some of the difficulties.

Simultaneously, an analysis and a review of workers' performance were

carried out with the active involvement of the medical officer. With regard to family planning, the overall results of PHC-B in the previous year were poor as it achieved only about 30 per cent of the target even though it gave special attention to female sterilisation. Also, there was considerable variation in the performance of individual workers as shown below:

PHC-B: Per cent target achievement in female sterilisation	No. of workers
Less than 10	4
11-20	6
21-30	4
31-40	3
More than 41	5

The lowest level of individual performance was 8 per cent of the target for one worker. Another worker reached 63 per cent of his target and yet another achieved 100 per cent. Prior to the analysis, this variation did not attract the particular attention of the medical officer or the extension educator. The average performance of PHC-B in achieving immunisation targets was also less than 35 per cent.

Record keeping was also found to be weak in that PHC. The workers did not know how client information could be useful to them in planning their routine activities. Assistance was provided to the medical officer in reviewing the workers' performance, in relating family planning performance with MCH services and for identifying corrective action aimed at increasing the average performance and decreasing the variation in performance among workers. Monthly meetings of the medical officer with the PHC staff provided an opportunity for such assistance. However, this could be done for only two monthly meetings as the medical officer, who had been seeking a transfer for some time, succeeded in obtaining a posting at another PHC. As the replacement was not in place, this process, although beginning to yield results, could not be carried out further.

Planning activities to match client needs

As previously described, PHC-A had performed well in providing MCH and family planning services. With the exception of one or two workers, the performance of the staff did not vary much. To improve immunisation services, the medical officer had started a system of focusing on one cluster of villages at a time and providing concentrated services in these selected clusters

by slightly modifying the area responsibilities and visit patterns of the workers. Teamwork in the provision of MCH services was seen as having a close relationship with performance in family planning.

In PHC-A, the intervention was to move beyond the stage of performance analysis by worker and to concentrate on planning to match programme activities with the needs of clients belonging to different segments of the adoption process. Some client data for such segmentation were already available in eligible couple registers at the PHCs, but they did not enable assessment of future potential and the derivation of specific actions aimed at improving performance. To make the required demographic impact, it would also be necessary to have acceptors with lower parities and to place emphasis on providing a contraceptive mix through the delivery system.

As a first step in developing a planning system, the workers were assisted in carrying out an analysis of their client data on the number of living children, age of last child, immunisation status and practice of contraceptive methods so that certain direct action implications could be derived. For example, identification of certain attributes of the client population would help the workers in deciding the nature of their interaction with clients. To get additional information not normally available in the records, a sample survey was conducted in the selected cluster of 16 villages served by PHC-A; assistance in conducting the survey was provided by field workers, supervisors and the extension educator. As a part of this survey, the field workers contacted 1,195 women who had three or more living children.^{7/} Of these, 487 (40.8 per cent of the total) were currently practising contraception; 354 (72.7 per cent of the latter) had been sterilised and the rest were using temporary methods of contraception. The rate of contraceptive practice for women with four or five living children was lower than what would be expected. The rate for women with three living children was 36 per cent, which was lower than for those with a larger number of living children. This preliminary information was quite revealing to the field workers and some of them gave possible reasons for this phenomenon. The sample respondents were also asked to give reasons for not practising contraception and their responses were analysed.

^{7/} The involvement of field workers, the extension educator and the medical officer of PHCs was ensured at all stages of this survey. All 16 villages in which the medical officer initiated team work for immunisation have been included in the survey. The respondents were chosen at random but the sample size in each village was roughly proportional to the size of the village. The sample was drawn from all eligible women with three or more living children residing in those villages, since those families were more likely (than those with two or fewer children) to accept permanent methods of contraception. While this is an illustration, such an understanding is required for women with two or fewer children as well for developing a proper contraceptive mix.



Wide-spread awareness of family planning is achieved through a variety of means suitable to a country's culture. In India, the national symbol for family planning provides an attractive backdrop for a traditional dance show.

Increasing the acceptance of family planning through IEC activities requires some details about those who are not using any contraceptive method. In this survey, information was obtained on three status variables, namely, knowledge of family planning, desire for more children, intention to practise contraception in the future.^{8/} Based on this information, the women were divided into four groups:

- Group 1: Women with no desire to have more children and who intend to practise contraception in the future;
- Group 2: Women with no desire to have more children and no intention to practise contraception in the future;
- Group 3: Women who desire to have more children but intend to practise contraception in the future; and
- Group 4: Women who desire to have more children and who do not intend to practise contraception in the future.

The workers felt that such a segmentation of the client population would help a great deal in fine-tuning their motivational efforts and other inputs to

^{8/} Bhatnagar and Gupta, "An Experiment in Activity Planning in Singhpur"; PSG Monograph No. 24, (Ahmedabad, Indian Institute of Management, April 1980).

better match individual needs. For example, women in Group 1 have the potential to be approached through the proper and timely provision of contraceptive services. Group 4 represents those who are difficult to motivate, i.e. the “hardcore” non-users. Group 2 requires an understanding of why its individual members have no intention to practise contraception in spite of their desire not to have any more children, in order that proper corrective action may be taken. Group 3 requires educational inputs regarding the problems of a large family. It is here that some of the developmental efforts can be of use in influencing family size norms.

Even though workers’ appreciation of this simple client analysis was important, it was necessary to locate this responsibility with the medical officer and the extension educator at the PHC level. The analysis should lead to action implications relevant to IEC strategy, minor reallocation of workers’ field areas and supplies (contraceptives and vaccines) based on identified needs and support from the district level. To illustrate the process, an analysis of non-users from a sample of four villages is presented below:

**Percentage of women (with three or more living children)
not practising contraception:**

	Group 1 (D-, I+)	Group 2 (D-, I-)	Group 3 D+, I+	Group 4 (D+, I-)
Village 1	55.2	24.4	18.4	2.0
Village 2	12.8	41.0	15.4	30.8
Village 3	25.0	10.0	60.0	5.0
Village 4	8.6	62.9	11.4	17.1

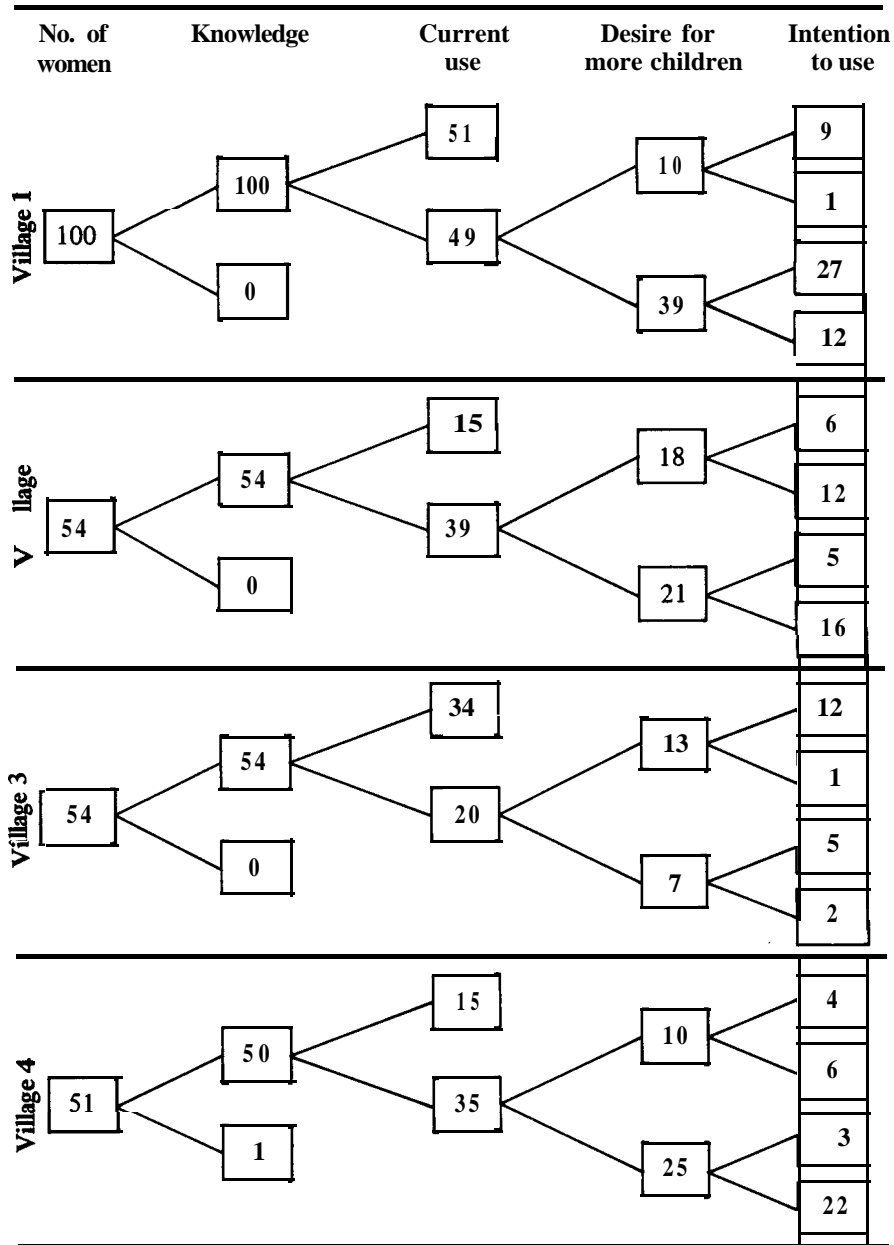
Notes: D = desire for more children + = Yes
 I = intention to use contraception in future - = No

A detailed segmentation of women from these villages is given in figure 1. The action implications for the four villages based on the above analysis by a medical officer are as follows:

Village 1

Very good potential. There is a need to emphasize the supply of services, particularly sterilisation. IEC activities should concentrate on developing motivation for practising contraception (Group 2) and on improving follow-up and visits by female workers.

Figure 1: Segmentation of sample data on village women



Village 2

A large number of women have no intention of practising contraception in the future. IEC activities should be intensified to improve motivation and dispel fears that contraception will have adverse effects on health. The role of the PHC medical officer, in co-operation with other private physicians in the area, is crucial.

Village 3

IEC activities should be concentrated on promoting contraceptive use and the adoption of spacing methods.

Village 4

Low immediate potential mainly because of religious reasons. Efforts should be concentrated on improving MCH services and the follow-up of current contraceptive users. Also, the services of more experienced female workers are needed.

In addition to these action implications, attention would be needed for some organisational factors related to supervision, mobility and supplies. The health centre staff felt that a simple planning system of this type would be very useful to them in improving the efficiency and effectiveness of their work. Most of the information used to develop this system was already available in the client registers. Information on reasons for non-use, desire for more children and intention to use contraception in the future could be added to those registers in the course of gathering routine information during field visits.

Lessons learned

The objective of this experiment was to evolve a design for an operational planning system at the PHC level and to gain experience in implementing it. This experiment led to a broad design for an operational planning system, but also revealed many implementation difficulties which may be common to programmes at a comparable level of performance. Several lessons were learned as discussed below.

Planning at the health centre level requires certain basic preconditions such as staff, supplies, a conducive working environment, an appropriate information base and willingness to encourage workers' participation in setting standards of service delivery. Also, different PHCs require different kinds of planning, largely based upon their performance; for PHCs performing poorly, the availability of key inputs must be planned first. For PHCs with average

performance, plans need to be made with the aim of improving workers' performance. For high-performance PHCs, activity plans need to be based upon village-level data. Beyond a certain level of contraceptive prevalence, community action becomes both feasible and desirable. In our experimental areas, these levels were not reached. However, in programmes which have a high degree of community participation, the community itself may generate necessary data and develop activity plans.

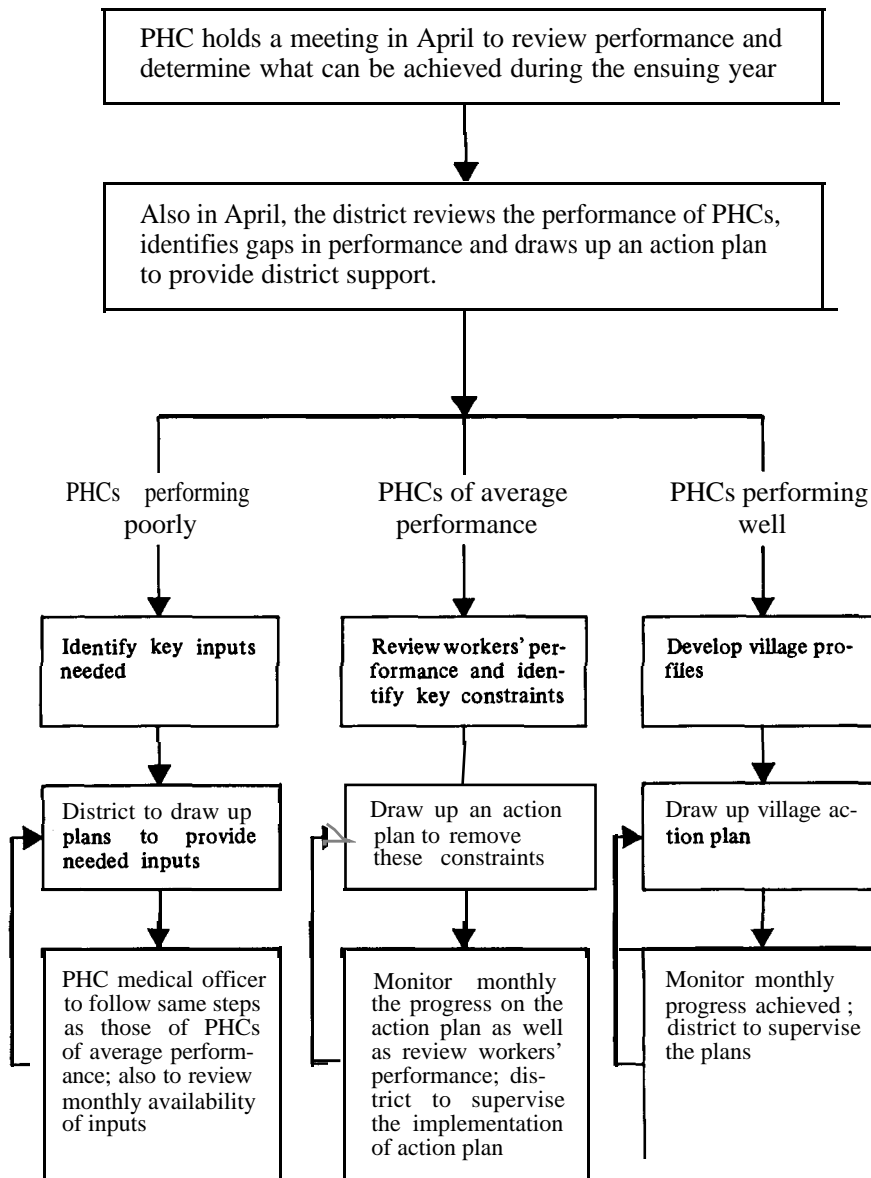
Workers generally felt that they could achieve targets if suitable facilities were made available and administrative problems were resolved. But a process involving negotiated targets could not yet be an element of a planning system given the current degree of mutual mistrust between officials and workers and the overall organisational climate. However, workers' perceptions of what they might achieve provide a useful input for planning the activities necessary to make such achievement possible. Therefore, a system of top-down and bottom-up planning processes would be necessary to institutionalise the negotiated target-setting process.^{9/}

Many of the problems faced by workers in PHCs of average performance could be resolved by the medical officer; however, district officials would have to play an active role in assisting the medical officer of the PHC in this regard. Such assistance may take the form of clearing administrative problems at the district level, clarifying the procedures to be used, and providing key inputs needed to improve performance. Figure 2 represents a schematic description of the planning cycle.

The effectiveness of the planning system will depend on the degree to which it is institutionalised. The process should be simple to follow in order to ensure the participation of all those responsible for PHC performance. The ability of field workers to use client data has to be improved through training and better supervision. At the same time, organisational support is needed for providing the required inputs, removing minor administrative irritants and developing an environment conducive to work. Monthly meetings would have to concentrate more on problem solving.

^{9/} For instance, the Indonesian family planning programme uses a three-way mechanism for this purpose. The first mechanism is from top to bottom. Each year the head office formulates guidelines which are discussed and interpreted by the provinces and are then forwarded to local implementing units. The second mechanism, as a follow-up, is from bottom to top. After receiving the guidelines, each operating unit formulates its programmes and budgets. They are discussed at each level of the hierarchy and a consolidated operational programme emerges. The third mechanism is a horizontal one, in which programme planning is integrated with other regional programmes in order to avoid overlaps while coordinating action. The whole process is carried out according to a welldefined schedule. (See National Family Planning Co-ordinating Board, Basic Information on Population and Family Planning Program, (Jakarta, 1982) pp. 74-75.)

Figure 2: Schematic representation of a typical planning cycle



Overall programme strategy is another important factor in the development of a planning system. Targets for workers are given from above; heavy emphasis is given to the achievement of sterilisation targets.

The cycle of programme operations, combined with this emphasis, creates an environment where a planning system is seen as being not helpful. This is because the programme currently operates from forces of “supply-push” rather than “demand-pull”.

Conclusion

Our visit to project districts revealed several problems involving programme operations which resulted in suboptimal performance and inefficient use of resources:

- A considerable amount of staff time was being wasted as routines were disturbed and activities were not planned in advance;
- The targets set were sometimes not realistic;
- Staff commitment varied with regard to achieving those targets;
- Constraints were not anticipated sufficiently in advance;
- Programme activities did not exactly match client needs;
- Community participation was low; and
- Innovative ways to solve problems and increase performance were not sought.

How can India's primary health care and family planning programme institutionalise a strengthened planning system?

The focus of the planning system for PHCs at different levels will differ and consequently the planning system should incorporate flexibility into the system. In this context at least three different foci were indicated: ensuring needed inputs, planning for workers' performance and activity planning based upon clients' needs. They represent a continuum in the evolution of PHCs' planning systems as their performance improves.

The institutionalisation of client-oriented planning systems in PHCS performing well would require the following. First, because the ability to use data on a client system is not up to par, it needs to be improved.

Second, PHC medical officers should have some flexibility in providing required inputs as dictated by client needs. Organisational support from higher levels is also needed both for identifying innovative ways to overcome barriers to acceptance and in implementing such innovations.

The involvement of district officials in the planning cycle is critical to its chances of success. Specifically, their tasks would be as follows:

- Review the performance of the PHCs and assist them in developing action plans;
- Provide support to PHCs in implementation and review;
- Resolve administrative problems; and
- Work towards removing the constraints of staffing, training, improving the planning skills of supervisors and medical officers, and instituting or modifying the recording system.

Medical officers of PHCs have a key role to play in implementing the planning system. They have to develop the skill of planning PHC operations, develop the skills of supervisors in planning, review the plans at monthly meetings and be able to revise plans on that basis. Only to the extent that PHC medical officers are oriented towards and are convinced of the utility of the planning system will the planning system succeed.

Overall programme planning systems also would have to be strengthened. Gradually the programme should move towards increasing the participation of implementation units in the planning process. Implementing units should have more flexibility with regard to their budgets, targets and programmes.

In conclusion, systematising PHC operations would increase the efficiency and effectiveness of PHCs by avoiding wastage, identifying in advance possible short-falls in performance, increasing staff commitment towards achieving targets, matching programme activities with clients' needs, increasing the involvement of peripheral health services staff and helping to identify innovative ways to solve problems and increase performance. However, implementation of a planning system to systematise PHC operations would require commitment on the part of State, district and PHC officials and their continuing involvement during implementation.

Correction

A typographical error on page 75 of this *Journal*, vol. 1, No. 1: The year in which the Policy Workshop on International Migration in Asia and the Pacific was held should have been printed as 1985 instead of 1986.

Mortality Trends

During the past 50 years, some countries in the Asia-Pacific region have achieved virtual control over infectious diseases which used to be endemic among their respective populations, while other countries are still fighting these battles.

Despite the overall steady progress in mortality reductions for most countries and areas in the region, the gap between high and low mortality countries continues to be unacceptably large, and the range in infant mortality is even greater and more tragic, with an average for the region of 80 per thousand live births. That average covers rates of 110 per thousand in South Asia, 74 per thousand in South-east Asia, 34 per thousand in East Asia, and 10 per thousand or less in Australia, Hong Kong, Japan and Singapore.

After many years of relative neglect, attention within the demographic community is once again being focused on the role of mortality in demographic, economic and social processes. Increasing concern over the slowing in the pace of mortality decline in some countries of the region and the persistence of high levels of infant and child mortality in several countries had been expressed by the WHO/ESCAP Meeting on Mortality in Asia held at Manila in 1980 to examine the levels, trends and differentials in mortality within the region. Its recommendations included the need for continuing investigations of the socio-economic determinants of health and mortality in such a way as to assist in the orientation and design of better health programmes.

Similarly the Third Asian and Pacific Population Conference held in Sri Lanka in 1982 called for greater attention to be given to the study of the social, environmental and other factors which inhibited further mortality decline and to the limited effectiveness of current health programmes.

Based on these considerations, ESCAP with financial assistance from the United Nations Fund for Population Activities (UNFPA), developed the project entitled "Analysis of Trends and Patterns of Mortality in the ESCAP Region". The third and final meeting of study directors involved in that project was held at Bangkok from 5 to 7 May 1986.

The meeting was designed to review the progress of a study initiated by ESCAP in conjunction with WHO, to analyse the trends and patterns of mortality in the region, taking into consideration the variability in levels and trends, as well as their antecedents and consequences. It was also designed to adopt that study's recommendations.

In-depth country studies have been carried out in Bangladesh, China, Indonesia, Pakistan, Republic of Korea and Thailand as part of the project. The studies cover the history of the development of health related policies and services in the individual countries, a review of the current health situation in them and perspectives on the national health status and likely developments up to the year 2000.

The meeting also discussed a draft comparative analysis of mortality, focusing on findings concerning individual countries and their similarities with, or dissimilarities from, other countries of the Asia-Pacific region. For example, preliminary research has identified distinctive mortality patterns for Asian populations. Among several East Asian populations a mortality pattern characterized by high male death rates at older ages in relation to their death rates at younger ages and very high sex ratios of mortality at the older ages has been found, together with some evidence that this pattern may be related to a high incidence of tuberculosis in the past which is still evident among adult males in these populations.

There is also a South Asian pattern of mortality. This pattern shows, relative to the model life tables for the Western region, very high death rates for people under age 15 and at the oldest ages, with correspondingly lower mortality for the prime age groups. It may be surmised that the South Asian pattern is related to high incidences of infectious, parasitic and diarrhoeal and respiratory diseases at the oldest ages.

South Asia is also notable for the small difference in expectation of life between males and females because female life expectancy is lower than that for males in several countries. In East and South-east Asia, on the other hand, female life expectancy exceeded that of males by at least three years; in Hong Kong and Japan the difference was five years; in Mongolia, four years; in the Republic of Korea, 6.5 years; in Singapore, 5.5 years; and in Thailand, nearly six years. To some extent, these differences reflect a shift in causes of



The life expectancy of this young Chinese mother from Hong Kong exceeds that of her husband by only five years; by contrast, in some South Asian countries female life expectancy is lower than that of males. (Photograph courtesy of Mr. Tsui King-hui)

death in the more developed Asian countries to cardio-vascular diseases, neoplasms, and automobile and industrial accidents, to which males are more prone.

In addition to these aspects, the meeting also considered patterns of epidemiology and of mortality transition in the context of their dependence on socio-economic and cultural changes in the countries studied. The meeting examined the extent to which findings could be transformed into recommendations for the further promotion of strategies for improved health status and declines in mortality. Because actions and strategies concerning health promotion and disease prevention are not only biologically, but also socially, determined, there is no single policy or solution even to those health problems which have a unique or simple biological cause. However, development resources are limited in all countries, and Governments are often under pressure to set priorities in response to vested interests. Thus, there is a great need to identify the most important scourges which affect the majority of the population so that from limited resources the maximum benefits can be achieved. The elimination or containment of major preventable causes of disease or death would free funds for dealing with areas which present greater difficulty.

In addition to these points, the meeting discussed the topics that should be raised at the Seminar on Mortality and Health Issues, which is to be held at Beijing from 22 to 27 October 1986.

Population and Demographic Data : A Profile of India's Publication Programme *

Before solutions to population problems can be formulated and implemented, planners and policy-makers must have access to population information and database analysis. In the Asian and Pacific region, India has long been active in providing such data and information through various publications. From 1872 until 1941, data relating to population were printed in a separate volume for each of India's States or provinces and princely States etc. Each of the volumes was preceded by an analytical report. Thus, there were generally two volumes on a particular State or province, giving complete information pertaining to the population census. In addition, a number of volumes were also published relating to ancillary studies which have traditionally been a part of India's population censuses.

The first census taken after India became independent was in the year 1951. For that census, the tabulation had been more detailed than ever before and the publication programme was also much bigger than that of any previous census. For example, general population tables were printed for India as a whole and for each State. Economic, household and age, social and cultural, and subsidiary tables were printed in separate volumes. The publications produced during this census consisted of Government of India publications, i.e. all-India census brochures, all-India studies, and all-India and State reports

* This description is by Mr. S.C. Srivastava, Assistant Central Tabulation Officer of the Office of the Registrar General, Ministry of Home Affairs, India.

in 17 volumes; and State government publications, which consisted mainly of district census handbooks.

For the 1961 census programme, a number of additional brochures were printed besides those prepared for the main programme. The volumes were printed separately for India as a whole, States and Union Territories. Each volume consisted of several parts and sub-parts. Another series, the 1961 census monographs, also was produced; the monographs were based mainly on specialised census data studies.

The district census handbook contained all census tables, in many cases providing data down to the smallest administrative level. The village directory gave a primary census abstract along with details about public amenities such as schools, drinking water facilities, hospital facilities and post offices, among others.

The 1971 census marked the completion of 100 years of census taking in India and 10 special centenary monographs were brought out on this occasion. Census figures were presented in respect of all the States and Union Territories. The 1971 census publications comprised 30 series; series 1 consisted of tables and reports covering the entire country, and series 2 to 30 covered the census publications of each of the States and Union Territories. The all-India tables and the analytical reports were divided into parts covering a wide variety of subjects.

Publications are still being produced as a part of the 1981 census publication programme. The first of them, published in parts, contain provisional totals on the population of each State and Union Territory. Besides the provisional population totals, the first part contains data on literacy by sex as well as a brief analysis of the data along with a number of tables. The second part presents statistics by rural/urban break-down and by workers and non-workers. This part also contains an elaborate analysis of the statistical data.

The provisional totals for India as a whole have been brought out in three parts, the first containing the following statistics plus a brief overall analysis:

- Distribution of population, sex and ratio, growth rate and density of population in States and Union Territories;
- Population of India, States and Union Territories, 1901-1981;
- Percentage decadal variation in population, 1901-1981;
- States and Union Territories arranged in descending order of growth rate, 1901-1911 to 1971-1981;
- Population per square kilometre, 1901-1981;

- States and Union Territories arranged in descending order of density, 1901-1981;
- Sexratio, 1901-1981;
- States and Union Territories arranged in descending order of sex ratio, 1901-1981; and
- Population and number of literates, 1981, and literacy rate for 1971 and 1981, by sex.

The second part gives the rural/urban distribution of the provisional population totals as follows:

- Urban population by size of urban agglomerations and towns;
- Number of urban agglomerations and towns in States and Union Territories, 1951 to 1981;
- Number of urban agglomerations and towns and their population distribution, by size, 1951 to 1981; and
- Population growth rate, sex ratio and literacy rate of cities and urban agglomerations with populations of 100,000 and above.

Appendices published under this part also contain a brief analysis:

- Rural-urban distribution of population by districts; and
- Population of urban agglomerations, cities and towns.

The third part contains an analysis and the following:

- Distribution of main workers, by broad categories, 1981;
- Main workers and their proportion to total population, 1961-1981;
- Distribution of main workers, by cultivators, agricultural labourers and other workers, 1961-1981;
- Distribution (per cent) of main workers, by cultivators, agricultural labourers and other workers, 1961-1981; and
- Total population, main and marginal workers and non-workers, 1981.

The following comprise the appendices:

- Working population;
- Distribution of main workers, by cultivators, agricultural labourers, household industry and other workers;
- Rural/urban population and literates; and
- Distribution of population, by workers and non-workers.

The regular series of publications are to be brought out following the complete publication of all the aforementioned volumes. Thirty-two separate series of volumes will be published for India as a whole and for each State and Union Territory.

In each of these, the different series of tables (i.e. General Population Tables, Economic Tables, Social and Cultural Tables, and Migration Tables (etc.)) will be brought out as different parts. Moreover, district census handbooks will be published for each district in the country. They will contain the census tables for the district and they will contain the village and town primary census abstract, and village and town directories. (The latter will contain compilations of statistics, external to the census, relating to villages and towns; in conjunction with census data, they should prove useful to users. For India as a whole and for each State and Union Territory, the census tabulations and reports will be published as outlined starting on page 64.

The following special papers are also planned and will be published as they are completed:

- Special studies by the directors of census operations;
- Special areas surveys;
- Special tables for standard urban areas;
- Language survey reports;
- Post-enumeration check report;
- Age tables;
- Life tables;
- Reports on estimates of inter-censal birth and death rates using 1971-1981 life tables and age data; and the
- Development of vital statistics in India.

Resides these special papers, some monographs based on 1981 census data concerning subjects of topical interest will be prepared by selected scholars. It is also proposed that special studies of 1981 census data will be conducted in collaboration with others and that the results of such studies will be published as occasional papers of the 1981 census.

Vital Statistics of India

The Vital Statistics Division of the Registrar General's Office brings out the annual publication entitled *Vital Statistics of India*, which is based on civil registration records. It also contains some important data from other sources such as the sample registration system and the model registration scheme. The volume contains analytical notes on the registration data, highlighting the trend and patterns in various rates and ratios and their deficiencies. It also contains a brief note on the sample registration system and model registration scheme along with some important data, and vital rates and causes of death as obtained from these sources.

Population projections

The Registrar General's Office prepares annual and quinquennial estimates of the population figures for the various States and the country as a whole. The projections are published from time to time as a census paper. The most recent of these was published in 1984.

In addition to the publications issued by the Registrar General's Office, a number of other organizations in India also produce a number of publications that provide demographic data. For example, the Central Statistical Organization brings out the annual *Statistical Abstract*; the Information and Broadcasting Ministry, *the Annual Reference*; and the Labour Bureau, *Indian Labour Statistics*. Similarly, the Education Ministry issues a number of publications on detailed characteristics of demographic data pertaining to its field.

Census tabulations and reports for India as a whole and each State and Union Territory

Part I

Administration Report (for official use only)

Administration report - Enumeration

Part II

General Population Tables

- A. General Population Tables (A-series)
- B. Primary Census Abstract

Part III

General Economic Tables

A. Tables (B-series) of first priority covering population by: economic activity, industrial category of main workers, and marginal workers with cross classification by age, literacy, educational level and sex.

B. Tables (B-series) of second priority covering industrial classification and class of workers and main activity, and whether marginal workers and non-workers are seeking work or are available for work with a cross classification by age, sex and educational level.

Part IV

Social and Cultural Tables

A. Tables (C-series) of first priority covering composition of the population by age, sex and marital status, single year age returns, educational level and school attendance.

B. Tables (C-series) of second priority covering mother tongue, bilingualism and religion of population and household composition.

Part V

Migration Tables

A. Tables (D-series) of first priority covering distribution of population by place of birth, migrants by place of last residence, duration of residence and reason for migration as well as economic activity of migrants (reporting "employment" as reason) with cross classification by age and literacy.

B. Tables (D-series) of second priority covering migration (for purpose of employment) to urban areas from rural and urban origins and within State and outside State origins, the composition by age, sex and educational level and whether seeking work or available for work, and duration of last residence.

Part VI

Fertility Tables

A. Tables (F-series) of first priority covering age at marriage pattern, current fertility and cumulative fertility for ever married and currently married women by present age and duration of marriage (at the State and district levels). At State level, further cross-classification is made by socio-economic factors, religion, scheduled caste/scheduled tribe, educational level and occupation.

B. Tables (F-series) of second priority covering the surviving children of current fertility at the district level by duration of marriage.

Part VII

Tables on Housing and Disabled Population

Tables (H-series) covering the census of houses and their uses, and the disabled population by type of disability, with analytical notes.

Part VIII

Household Tables

A. Tables (HH-series) covering material used for construction of houses occupied by households, housing facilities available to households, household size and number of couples living in each household and households by number of main workers and whether they are seeking or are available for work, literate members, for general and scheduled caste and scheduled tribe households whether they are cultivating/non-cultivating households by tenure of land, literacy among scheduled castes and scheduled tribes, economic activity of members of scheduled caste and scheduled tribe households. These tables also

cover the household population by the religion of the head of the household and the language mainly spoken in the household.

B. This part contains tables HH-17, HH-17SC and HH-17ST on tenancy. Report on households is an analysis of the data presented in Part VIII-A and B.

Part IX

Special Tables on Scheduled Caste and Schedules Tribes.

The SC and ST series of tables, for scheduled castes and scheduled tribes respectively, cover industrial categories of main workers and marginal workers, type of activity of marginal workers and non-workers, whether they are seeking work or are available for work, age, sex, marital status, composition of scheduled caste and scheduled tribe populations and their educational level (for each caste/tribe separately). With regard to these, tables also cover their composition by religion, mother tongue and bilingualism.

Part X

Town Directory, Survey Reports on Towns and Villages

- A. Town directory.
- B. Survey reports on selected towns.
- C. Survey reports on selected villages.

Part XI

Ethnographic notes and special studies on scheduled castes and scheduled tribes.

Part XII

Census Atlas

Union and State and Union Territory Census Atlas.

Part XIII

District Census Handbook

- A. Village and Town Directory
- B. Tables (A-series) General Population Tables and Primary Census Abstract for villages and towns.