CHILD SURVIVAL

Risks and the Road to Health

DEMOGRAPHIC DATA FOR DEVELOPMENT PROJECT

Institute for Resource Development/Westinghouse

Child Survival:
Risks and the Road to Health

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Child Survival: Risks and the Road to Health

Prepared by
The Demographic Data for Development Project

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March 1987

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Editor's Note:

Infant and Child Mortality Rates

This report clarifies the presentation and interpretation of infant and child mortality rates in two ways: first, mortality rates are reported as percentages. Second, child mortality rates are reported as the percentage of children born who die between exact ages 1 and 5. Because the denominator for both rates is the same, infant and child mortality rates are additive, i.e., adding infant mortality rates to child mortality rates provides percentages of children born who die before age 5.

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World Patterns and Rates of Child Survival

I. WORLD PATTERNS AND RATES OF CHILD SURVIVAL

A child born in one of the high-mortality African and Asian countries today is on average 20 times more likely to die before reaching age 5 than a child born in the United States, Japan, or Sweden. The "accident" of geographic location of birth—and the risk of dying that accompanies this accident—have little or nothing to do with genetic inheritance and nothing at all to do with choice by the child. The level of childhood mortality in developing countries signals both alarm and opportunity: alarm because of the startlingly greater risk of death children face in these countries; opportunity because we have the means at hand to dramatically reduce childhood mortality.

The scarcity and uneven distribution of health facilities and services and the marginal economic and human resources that invite infant and childhood disease occur within distinct world and country boundaries, as shown in Fact Sheet 1. Of every 100 children born in Africa, 12 die before age 1; 10 of every 100 infants die in Asia, 9 in the Near East, and 6 in Latin America and the Caribbean. In Japan and Sweden, by contrast, fewer than 1 percent of newborns fail to reach their first birthday. The U.S. rate is slightly higher than 1 percent; the average for all developed countries is closer to 2 percent. The death of a child, a relatively rare tragedy for parents in developed countries, is a frequent occurrence in the developing world. In Egypt, for example, two-thirds of women experience the death of one or more children by age 50.

In 1985 there were 570 million children under 5 in the world, a total higher than the population of the African continent. They account for almost 12 percent of the world's total population, as seen in Figure 1-A. During the 15 years between 1985 and 2000, approximately 2 billion children are projected to be born. Of this number, 87 percent (1.8 billion) will be born in the developing world. At 1980-85 levels of infant and child mortality in these countries, 240 million of these children can be expected to die before age 5. If mortality levels were instead comparable to those of developed countries, 87 percent, or 207 million of these children, would live. This is a child population almost as large as the total number of inhabitants in 1985 of the United Kingdom, West Germany, France, and Poland.

The wide variations in risk of death between developed and developing regions are also seen within regions. While nearly 20 percent of all African children die before reaching age 5, this proportion rises to 31 percent in Sierra Leone and falls to a relatively low 13 percent in Zimbabwe. Variations among countries within world regions are shown in Fact Sheet 3.

Large differences in levels of childhood mortality often occur within the same country. Regional differences within countries are often as large or larger than those between countries and world regions. Consistent differences are found both between urban and rural areas of countries and among the urban and rural areas themselves. As shown in Fact Sheet 3, the risk of dying before age 5 in a rural area can be twice that of an urban area in the same country. Further, the highest mortality levels found in urban areas within a country are often higher than the levels of better-off rural areas.

These dramatic differences in levels of infant and childhood mortality underlie worldwide concern for the tremendous inequities in children's opportunities to survive and be healthy. Yet these geographical inequities are in one sense cause for hope. Although a country may be located in a developing region, it does not necessarily follow that it will have high child mortality rates; some countries in each region already have relatively low rates. Moreover, varying rates within countries indicate that low childhood mortality can and is being achieved.

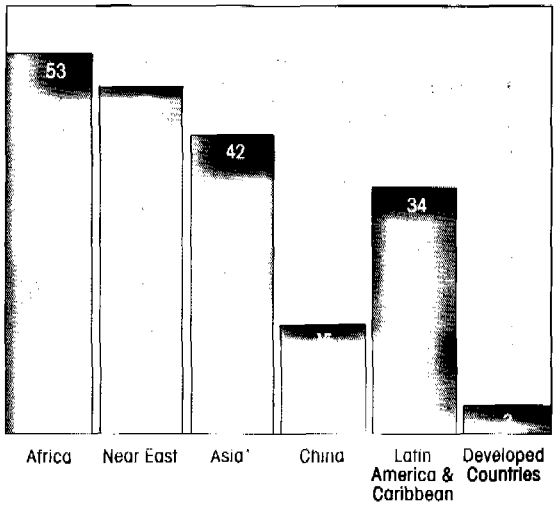
The major impediments to child survival have been identified, as have many strategies for removing these impediments. Infectious and parasitic diseases, malnutrition, and the risks associated with high levels of fertility are the major obstacles. Because they flourish in poverty, lasting solutions to these problems may require long-term socioeconomic development. Nonetheless, for every major impediment to child survival, we now have the means, within current resources, to rapidly and dramatically reduce the terrible burden of illness and death on the world's children. Among the most effective are oral rehydration therapy, mother and child immunizations, and wider spacing of births, which can save millions of lives and prevent untold suffering in developing countries between now and the end of the century.

MORTALITY REDUCTION TARGETS

Increased understanding of the various impediments and the possibilities for their removal, heightened by the remarkable achievements of child survival projects in various countries, is stimulating national and international efforts to lower childhood death rates. Of the various targets for reductions in infant and child mortality by the year 2000 that have been suggested, this report uses the following: In countries where rates of infant mortality are above 12.5 percent, the target is to reduce this number to 7.5 by

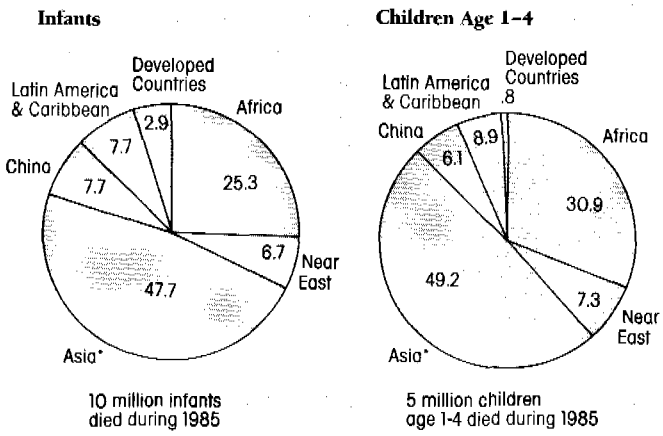
Fact Sheet 1 — Child Mortality and Numbers of Deaths by Region

A: Deaths of Children Under Age 5 as a Percent of All Deaths, 1985



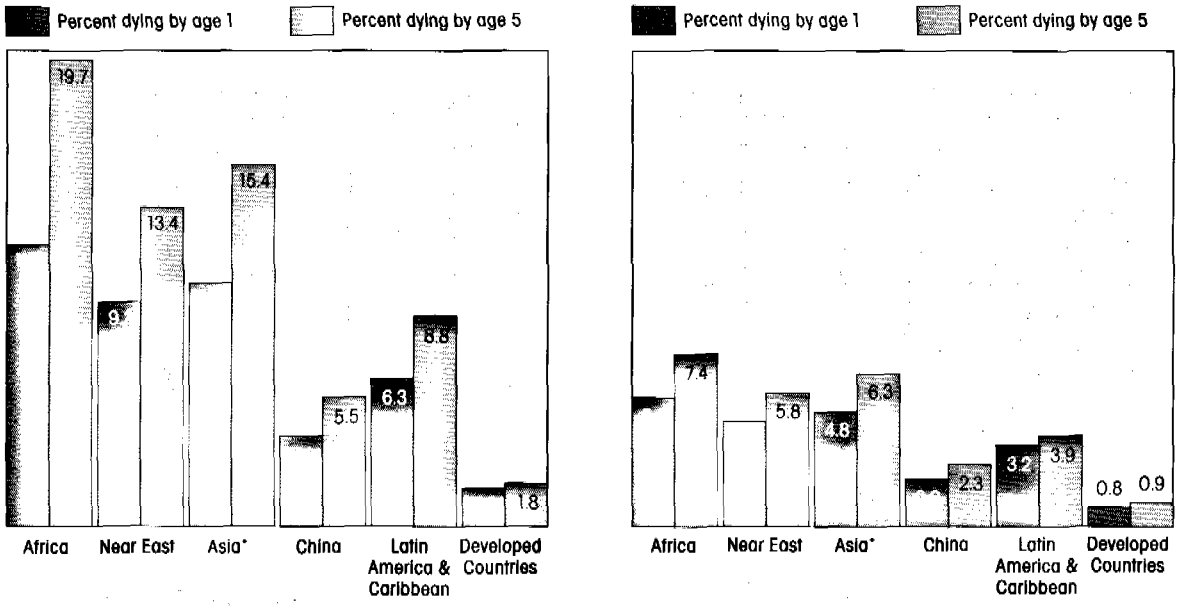
The 11.9 percent of world's population under age 5 contributed almost one-third of all deaths.

B: Percent of Deaths Occurring In Each Region, 1985



Mortality during the first year of life exceeds mortality during ages 1–4. Globally, there are approximately 2 infant deaths for each death of a 1–4-year-old. Higher levels of overall mortality are associated with proportionately higher levels of child mortality. In Africa, the ratio of infant to child deaths is 1.6 to 1; in developed countries the ratio is 6.6 to 1.

C: Percent of Children Dying Before Age 1 and Before Age 5



Goals for reduced mortality would still not bring levels of child mortality in developing regions to 1980-85 levels of mortality in developed regions.

*Excluding China

Source: Data are included in Tables 1, 2, 3, and 4 of Appendix 1.

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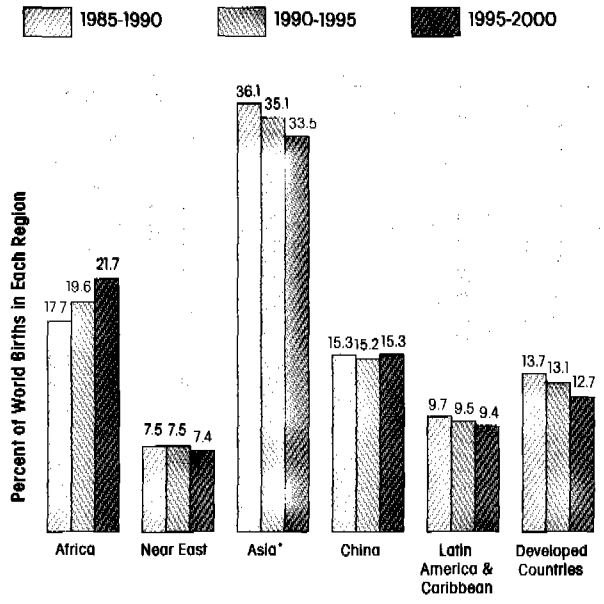
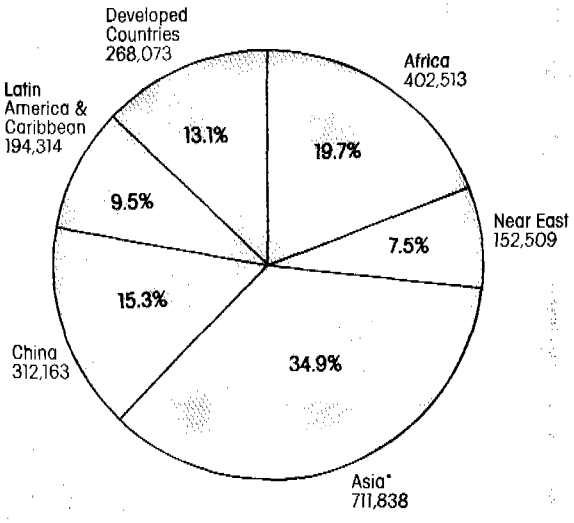
Fact Sheet 2 — Births by Region

A: Percent of World Births Occurring in Each Region



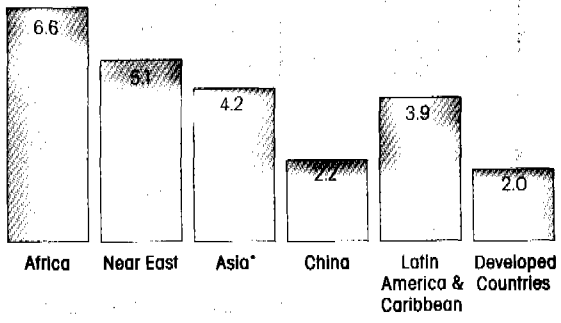
Including China, more than 50 percent of the world's children are projected to be born in Asia between 1985 and 2000. Due to an *increasing number of women of childbearing age* and high birth rates, the percentage of the world's children born in Africa is expected to increase rapidly.

B: Number of Births During 1985-2000 (in thousands)



More than 2 billion children are projected to be born in the world between 1985 and 2000. Some 87 percent, or 1.8 billion, will be born in developing countries.

C: Average Number of Children Women Bear

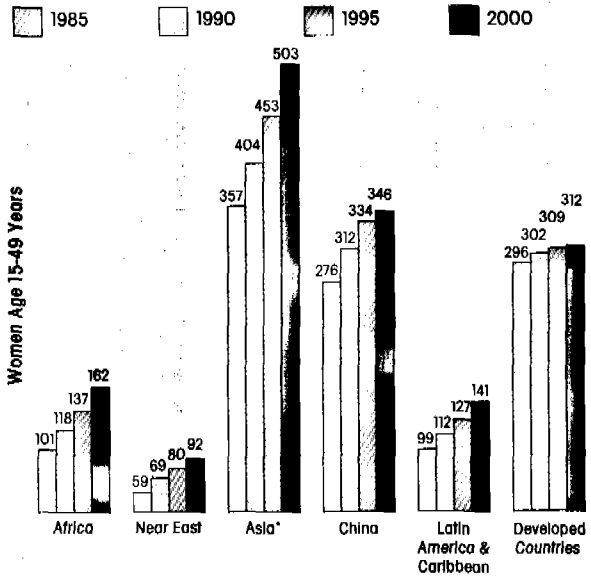


Fertility of women in developing countries is almost twice that of women in developed countries. In some African countries women bear enough children to replace their generation fourfold, while in some European countries and the United States, fertility is below replacement level.

*Excluding China

Source: United Nations (Data are included in Table 6 of Appendix 1.)

D: Number of Women of Reproductive Age: 1985-2000 (in millions)



The number of women of reproductive age will increase through the end of the century, reflecting momentum from higher birth rates in the past. As a result, the total number of births occurring each year is projected to grow, despite overall declines in fertility taking place in all regions of the world.

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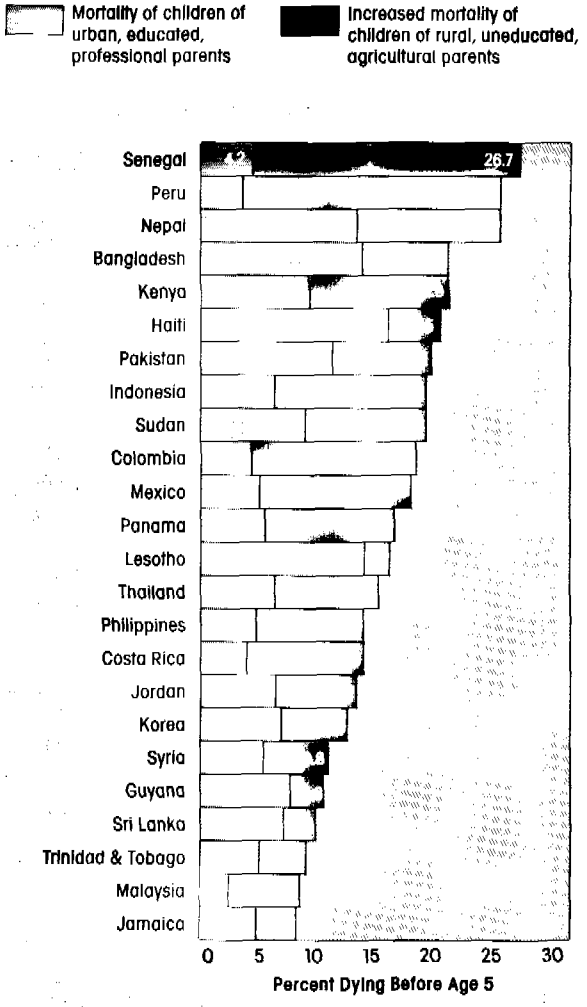
Fact Sheet 3 — Geographic Inequalities in Child Mortality

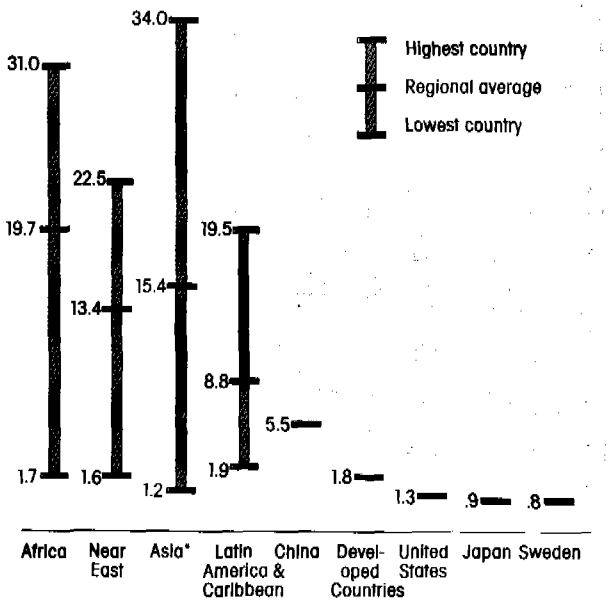
A: Mortality of Children of Urban, Educated, Professional Parents and of Rural, Uneducated, Agricultural Parents



The risk of death for a child is associated not only with urban or rural residence, but very importantly with the education and work status of his or her parents. Mortality levels of children of urban, educated, professional parents are often less than one-fourth of those of rural children with less educated parents working in agriculture.

Source: Haberatt, J.N., J.W. McDonald, S.O. Rutstein "Socioeconomic Factors in Infant and Child Mortality: A Cross National Comparison," Population Studies, 38(2), table 14, 1984.

B: Percent of Children Dying Before Age 5: Range and Average for Regions and Selected Countries

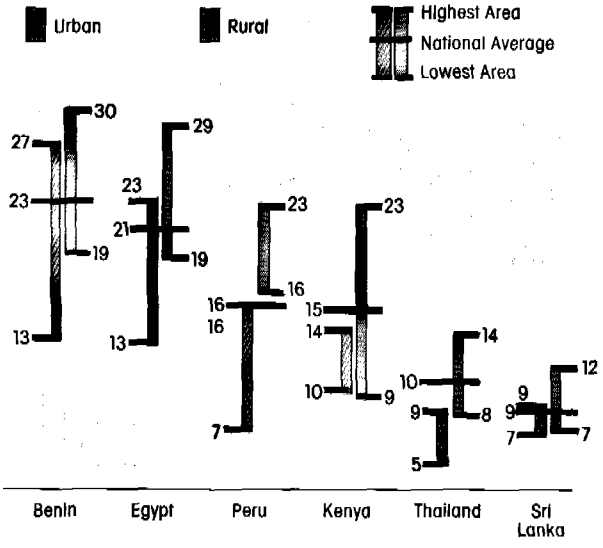


The range of national child mortality levels within each region is very wide. It is notable that all regions have at least 1 country with mortality below 2 percent, and that mortality is never above 25 percent in the Near East, and Latin America and the Caribbean.

*Excluding China

Source: UNICEF (Data are included in Table 2 of Appendix 1.)

C: Percent of Children Dying Before Age 5: Range and Average for Rural and Urban Areas of Selected Countries



Within countries, different regions experience different levels of child mortality. Generally, mortality in urban areas is lower than in rural areas.

Source: Unpublished World Fertility Survey data, Tech. No. 2364, courtesy of S.O. Rutstein.

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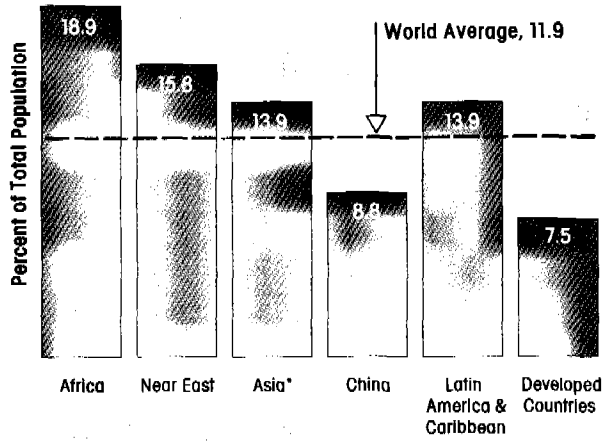
Figure 1-A

Percent of Total Population Under Age 5 by Region



Nearly 12 percent of the world population in 1985 consisted of children under 5 years of age. In Africa, about 20 percent of the population, or 1 in every 5 persons, was under age five.

*Excluding China

Source: Tables 1 and 5 of Appendix 1.

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the year 2000. Current rates of 10.0 to 12.5 percent are targeted to fall to 5.0, and where rates are below 10.0 the goal is to halve the current rate. These targets are the basis for projecting the numbers of children likely to survive, based on continuing the 1980-85 mortality rates and achieving the improved targeted rates (a discussion of the methodology appears in Appendix 2).

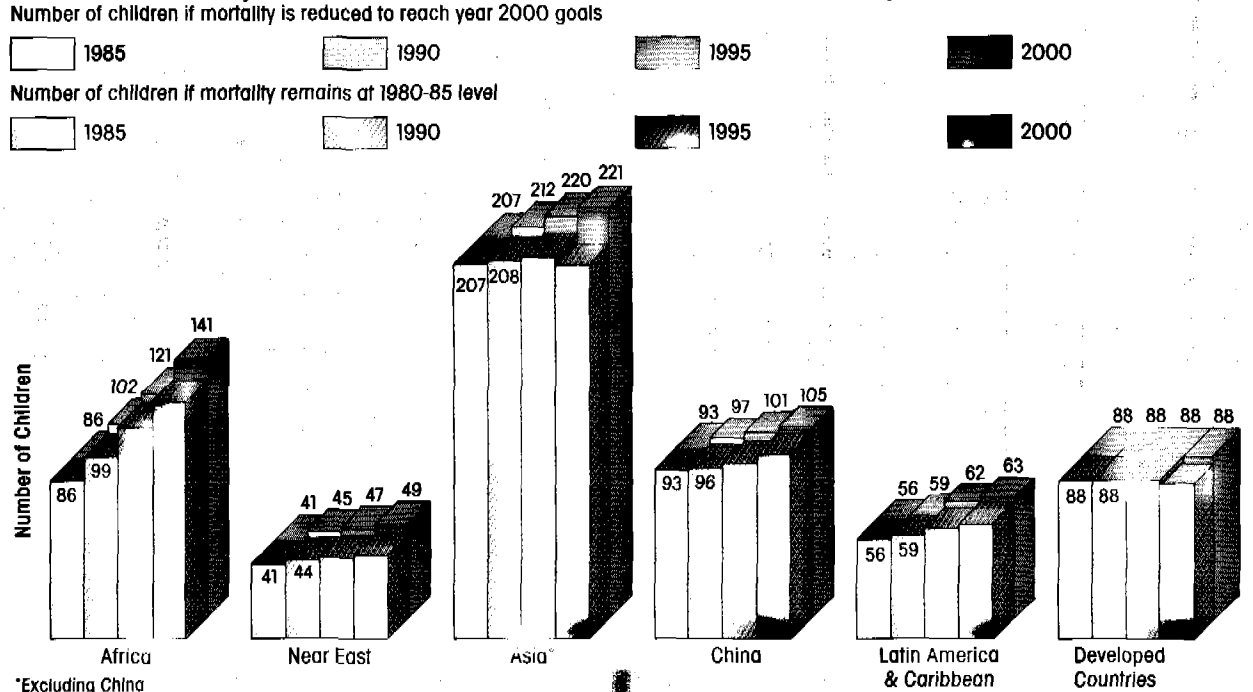
Estimates of the number of children who would live, based on year 2000 target rates, are shown for each country in Appendix 1. The numbers of additional children that would survive within each region of the developing world are shown in Figure 1-B. During the year 2000 the death toll would be cut by 3.3 million children in Africa, 684,000 in the Near East, 3.8 million in Asia (excluding China), and 586,000 in Latin America. If China is included, the total number of children whose lives would be saved in developing countries exceeds 8.9 million; a number greater than the 1985 population of Sweden. These numbers are illustrated in Figure 1-C.

A MODEL OF CHILD SURVIVAL

Why do so many children die? There is no simple answer. Disease and malnutrition cause millions of children to die. Is cutting the death rate then essentially a matter of preventing disease and malnutrition? Many agree that this approach is sound, but others argue that it tends to ignore the social

Figure 1-B

Numbers of Children Under Age 5 by Region at 1980-85 Mortality Levels and at Goals for Year 2000 Reduced Mortality Levels (in millions)



*Excluding China

Source: Tables 1 and 3 of Appendix 1.

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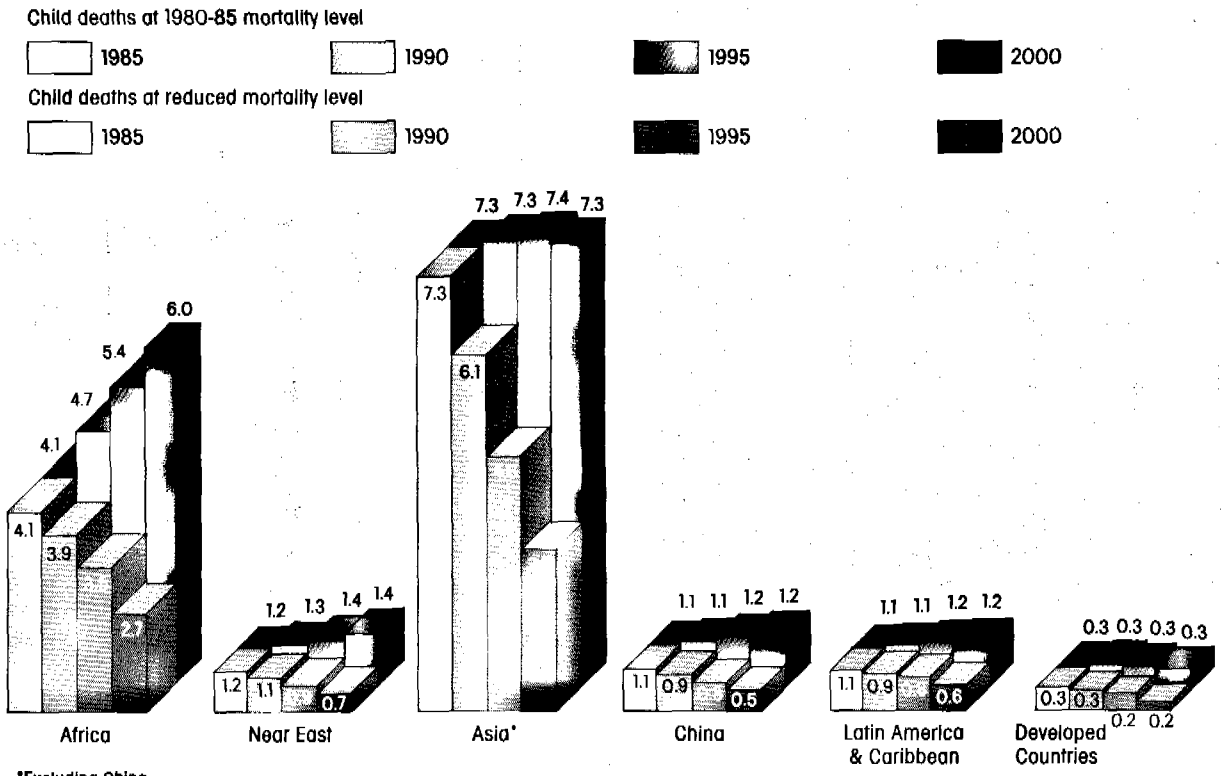
Figure 1-C

Number of Child Deaths at 1980-85 Mortality Levels and at Reduced Mortality Levels (in millions)



*Excluding China

Source: Tables 2 and 4 of Appendix 1.

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context in which disease and malnutrition occur; that biological answers cannot explain the huge differences in child mortality around the world, nor the fact that a disproportionate burden of disease, malnutrition, and death falls on children in developing nations. They contend that these are the symptoms of a single overriding disease—that of poverty—and that the only lasting solution to the problem is to alleviate the poverty in which these children live.

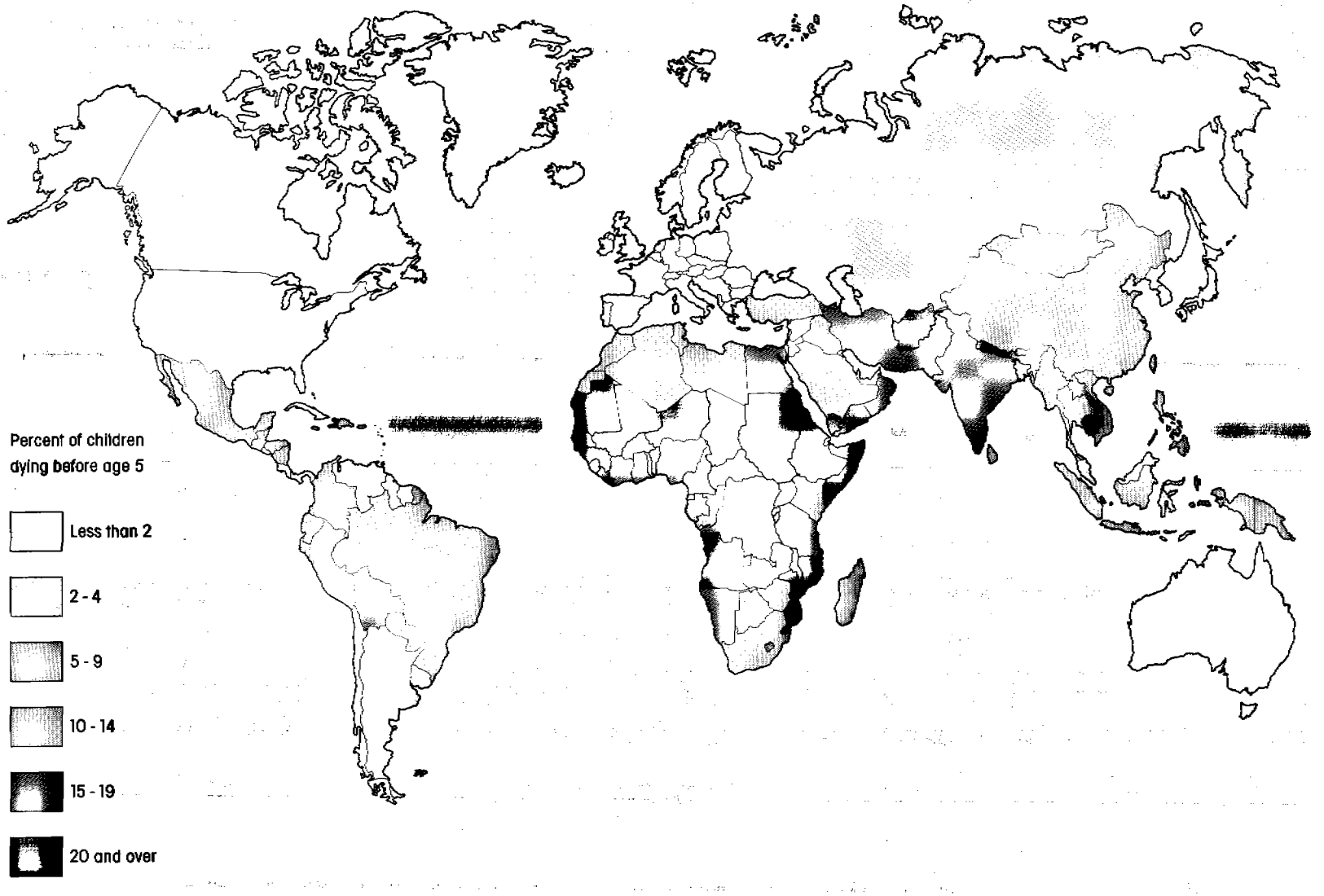
Both arguments of this historic debate are valid. There is a biological cause for every death. A child drinks water from a contaminated well and dies from severe dehydrating diarrhea. The bacteria cause the dehydration; the dehydration precipitates the death. But poverty plays a crucial role: a tragic outcome might have been avoided had the community been able to provide clean water, or had the mother been able to read the directions on an oral rehydration salts packet. Poverty paves the way for both the disease and the eventual death.

Bringing about the child survival revolution therefore requires systematic understanding of both aspects of child mortality—social and biological—and their interaction in the world. If child survival is to be improved at the rapid rates we now know are possible, it is essential to take action on the comprehensive model now being developed by leading authorities in the field, which takes account of both factors. The following pages, which borrow from this model, are devoted to both the immediate determinants of child mortality and the socioeconomic context in which children live. This includes the general categories of nutrition, infection, and maternal factors that put children at risk, as well as health attitudes and resources that influence child mortality through preventive and curative actions. Each chapter in the first section describes a major impediment to child survival and existing technologies that can be used to remove it. The second section focuses on major socioeconomic resources and their importance. How successful we are in overcoming these impediments and developing these resources will determine how many of tomorrow's children live or die.

Perhaps the most important aspect of efforts to improve childhood survival is what might be called "political and social will": the resolve to commit resources at national and international levels and to develop broad-based health and child-spacing programs that will both initiate and sustain the dramatic increases in infant and child survival now within reach.

World Child Mortality Rates

Map 1-A



Source: UNICEF (Data are included in Table 2 of Appendix 1.)

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Major Impediments to Child Survival and Strategies for their Removal

Diarrheal Disease
Vaccine-Preventable Diseases
Acute Respiratory Infection
Malaria
Malnutrition
High-Risk Fertility Behavior

II. DIARRHEAL DISEASE

PROFILE

Diarrheal disease is the leading cause of infant and child death in the world today. It is also one of the most frequent causes of childhood illness and a major contributor to the problem of childhood malnutrition. In developing regions between one-fourth and one-third of deaths under age 5 have been attributed to this cause. In absolute terms, an estimated 5 million children die from diarrhea every year. At least 60 percent of these deaths result from acute dehydration, which we now know can be readily prevented.

Agent

Diarrhea is only the common symptom of a large number of intestinal diseases. The source of infection may be a virus, a bacteria, or a parasite, or, often, a combination of these. They all share the ability to alter intestinal function, increasing fluid loss from the body and decreasing the retention of nutrients. The severity of an episode varies widely, depending on the type of diarrhea and the intensity of infection. Cholera has a well-earned reputation as the most deadly diarrheal disease. It can kill in a matter of hours and has claimed more lives in recorded history than any single infectious disease, including the bubonic plague. Yet cholera can also be a relatively mild disease, which illustrates the broad range in severity of diarrheal infections. The impact of diarrhea is seen less in the severity of individual cases than in the effects of the recurring mild infections that characterize childhood in many developing countries.

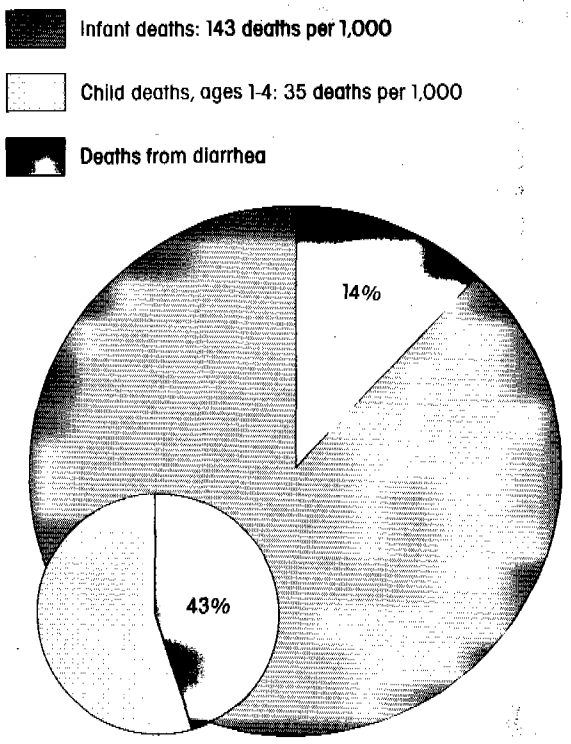
Diarrhea kills primarily through dehydration. Although life-threatening dehydration occurs in only 1 percent of all episodes, it is responsible for 60 to 70 percent of all diarrhea deaths. Without treatment, severe episodes literally wring out body fluids from the victim faster than they can be replaced. The first symptoms of dehydration appear after fluid loss equivalent to 5 percent of body weight. When fluid loss reaches 10 percent, shock often sets in, and the cascade of events that follows can culminate in death unless there is immediate intervention. Rehydration, whether given orally or intravenously, is the only effective therapy.

Transmission Factors

Diarrheal disease is primarily transmitted from person to person via soiled hands and via food and water that have been contaminated by human waste. It is characteristically endemic in areas where sanitation and hygienic habits are poor. Seasonal cycles play an important role. In general, the highest rates of diarrhea occur during the hot and rainy seasons. At high temperatures, bacteria multiply quickly in food and water that have been left standing, and high rainfall facilitates the spread of these organisms. The highest prevalence often coincides with peaks in annual rainfall. One study has found that during the rainy season in The Gambia, the average child suffers from diarrhea more than 25 percent of the time.

Figure 2-A

Diarrhea Mortality as a Percent of Mortality from All Causes: Rural Bangladesh



Source: Chen, L.C., M. Rahman, A.M. Sarder, "Epidemiology and Causes of Death Among Children in a Rural Area of Bangladesh," International Journal of Epidemiology, 9(1): 25-33, 1980.

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Host Factors

Diarrhea can strike at any age. But when diarrhea kills, its victims are almost always children. It is estimated that 80 percent of child deaths from diarrhea occur before the age of 2. The absolute risk of death from diarrhea declines

through the remainder of childhood, following the general decline for overall mortality. But diarrhea then becomes a more important cause of death in relation to other causes. An analysis of child mortality in Bangladesh is shown in figure 2-A. The proportion of diarrheal deaths rises from 14 percent of all infant deaths to more than 40 percent of all deaths among 1- through 4-year-olds.

The reasons for this increased vulnerability lie in the unique transition children must undergo from their initial state of nutritional and immunological dependence. During the first 4 to 6 months of life, a fully breastfed infant receives both a complete diet and disease protection from breastmilk. Exclusive breastfeeding also spares the infant early exposure to contaminated food and water. The inevitable introduction of supplemental foods, however, requires an adjustment to diseases in the environment—an adjustment not unlike that experienced by travelers in new surroundings. As seen in figure 2-C, the highest rates of diarrhea among children, which occur from the age of 6 months through age 1, coincide with the weaning period.

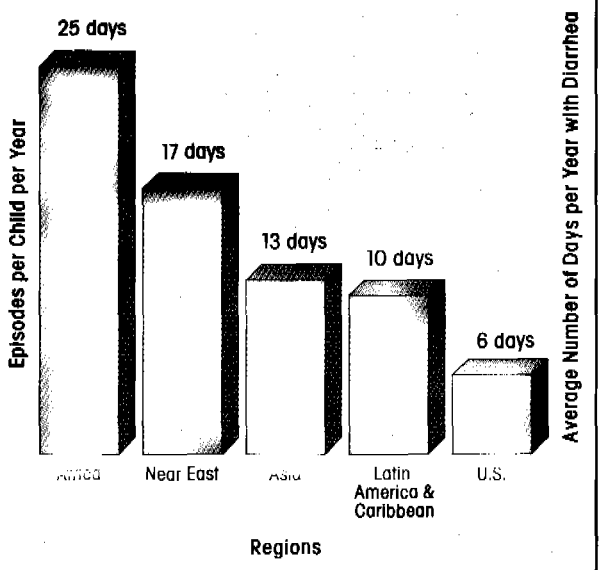
Diarrhea and malnutrition are so closely related that they may arguably be considered a single complex of diseases. Diarrhea causes malnutrition. During a diarrheal episode a child is likely to eat less, either because of loss of appetite or intentional withholding of food, and absorbs less of the food he does eat due to the effect of the diarrhea itself. At the same time, malnutrition increases the risk from diarrhea. Poorly fed children suffer longer and more severe episodes. Even children who are of normal weight but have selective vitamin A deficiency appear to be more vulnerable to diarrheal attacks. The reciprocal effects of malnutrition and diarrhea tend to multiply each other, together becoming a more powerful agent of death than either one alone.

An isolated case of mild diarrhea carries an imperceptible risk. Yet children in developing countries face multiple episodes of acute diarrhea every year. In some areas the total is as high as 12. The cumulative nutritional deficit from these relentless infections can interrupt normal growth and development and place the child in a precarious nutritional and health status.

Figure 2-B

Estimated Annual Episodes of Childhood Diarrhea and Average Number of Days of Diarrheal Illness

Developing Regions and Selected U.S. Example



Note: An average episode of diarrhea is expected to last 5 days.

Source: For Developing Regions: World Health Organization, "Fourth Programme Report for Control of Diarrheal Diseases 1983-1984," Program for Control of Diarrheal Diseases, Geneva, Switzerland, 1985.

For U.S.: An average rate of 1.09 episodes/child under 5/year was calculated from a community study in Michigan.

Monto, A.S., J.S. Koopman, "The Tecumseh Study. XI. Occurrence of Acute Enteric Illness in the Community," American Journal of Epidemiology, 112(3): 323-333, 1980.

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GLOBAL IMPACT ON CHILD SURVIVAL

Current knowledge of the true global prevalence of diarrheal disease suffers from a serious shortage of accurate data. Nonetheless, available estimates provide a rough outline of who is at greatest risk and where the problem is most concentrated.

For the year 1984, the World Health Organization estimated that there were over a billion episodes of acute childhood diarrhea and almost 5 million child deaths from this cause alone. More than 90 percent of these episodes and almost all of the deaths occur to children in developing countries. The incidence of acute child diarrhea in the developing world is 3 to 4 times greater than in the United States and other developed countries.

The median diarrheal incidence figures for each region are shown in figure 2-B, which also shows the average number of days during a year that a child in the region might suffer from diarrhea. These estimates, which are conservative, suggest the great burden of illness on children from this disease alone. The estimated annual attack rate for Africa of almost 5 diarrheal episodes per child denotes a formidable health risk. Assuming that each episode lasts an average of 5 to 6 days, a child born in Africa today will spend 1 month of every year with diarrhea. Averages and medians, however, always obscure the variation observed for such a large and diverse area as Africa. Estimated incidence rates over the continent range from 2 to 10 episodes annually. The greatest burden of illness falls on the youngest children and the highest frequency is experienced during

one season of the year. The health risk of diarrhea to young children during peak months in the poorest areas is thus far more serious than the regional figures suggest. These high rates serve as a real barometer for malnutrition, poor sanitation, and marginal health conditions.

THE ROAD TO HEALTH

The loss of life from diarrheal disease is staggering. Yet the potential for saving the lives of children who die from this disease is equally dramatic. Increasing attention has been given to the problem of diarrhea since the development of a simple technique to combat dehydration, which is the principal cause of diarrheal death. The technique is oral rehydration therapy, or ORT.

Oral Rehydration Therapy (ORT)

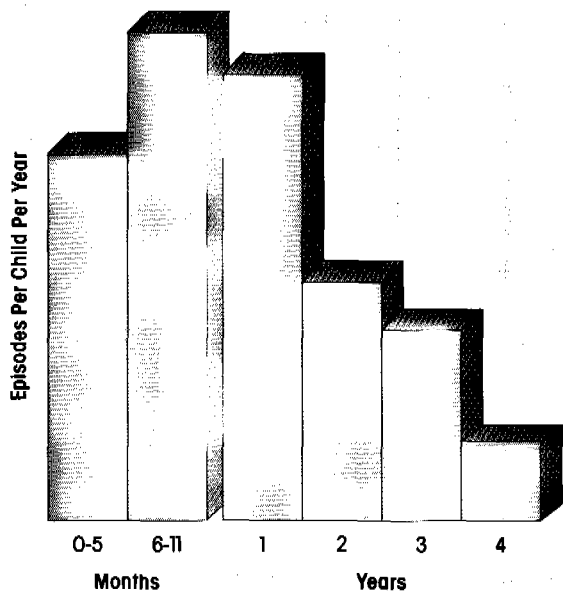
ORT is a three-tiered strategy that combines administration of a simple solution of sugar and salts with continued feeding through a diarrheal episode and referral when appropriate.

ORT acts to replenish the water and electrolytes lost from the body during a diarrheal episode. Diarrheal organisms normally resist efforts by the body to balance these losses by reducing intestinal absorption of fluid and nutrients. Rehydration therapy is the only effective treatment for dehydration, which in most cases is the ultimate cause of death. For many years, intravenous rehydration was the accepted treatment. It has now been found that a relatively simple mixture of sugar and salts in a liquid solution can be absorbed even during the course of severe illness. Administration of this mixture does not cure diarrhea, but it can maintain or restore the body's critical fluid balance until the infection subsides. Continued feeding during the illness lessens the risk of malnutrition that accompanies frequent episodes. Because it is not specific to any one type of diarrheal agent, ORT can be used against all cases of diarrhea. Only in the severest cases of dehydration is intravenous therapy still required.

ORT stands as a model of existing child survival measures that are simple, effective, and low in cost. The ingredients of oral rehydration solution are inexpensive and widely available. The solution itself is simple to prepare once the technique has been learned. And it can be made either from a premixed packet of oral rehydration salts or from common home ingredients (see figure 2-D). In practical terms, this means that this simple yet powerful lifesaving technique can be practiced in the home and disseminated in areas beyond the reach of a hospital or clinic, where the majority of children in the developing world live. Accordingly, ORT has been hailed as the most significant medical advance in child survival since the development of vaccines.

Figure 2-C

Estimated Median Diarrheal Episodes Per Year by Age



Source: Snyder, J.D., M.H. Merson, "The Magnitude of the Global Problem of Acute Diarrheal Disease: A Review of Active Surveillance Data," Bulletin of the World Health Organization, 60(4): 605-613, Geneva, Switzerland, 1982.

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Expanding ORT Use

Despite intensive efforts to reach children at risk, ORT is still not in widespread use. Since the technique's introduction in the 1970s, the global supply of oral rehydration salts has increased dramatically. A number of developing countries have begun to manufacture their own packets. But these efforts have only begun to meet the world need. Figure 2-E shows minimum estimates for the proportion of children who have access to centers that dispense packets and the proportion of estimated diarrheal episodes actually treated, using packets or home solution. Minimum estimates assume that countries not reporting have no coverage. Typically, the geographic areas of greatest need have the lowest rates of both access and use. Moreover, available statistics are largely drawn from the small number of countries that gather reliable statistics and, not coincidentally, offer better health services in general. Hence the regional estimates provided here, low as they are, probably do not understate the actual situation.

Making the lifesaving potential of ORT a reality means placing this practice in the hands of those who need it most. One of the greatest difficulties has been to get peo-

ple to recognize the need for treatment before it is too late. Diarrhea is a common fact of life for many children. Perhaps only 10 percent of cases become dehydrated, and the symptoms of dehydration appear late in the course of the disease. People in local communities, especially mothers, need to learn how and when to give ORT when their children contract acute diarrhea. Caregivers must be carefully taught to use the correct proportions of salts in water, because an over-diluted solution is less effective and one that is too concentrated can be dangerous. The importance of using the cleanest possible water must also be stressed, to avoid exposing the child unnecessarily to further contaminants. But even if safe water is not readily available, the benefits of fluid replacement in diarrhea far outweigh the risk of using contaminated water to make up oral rehydration solution. The crucial role that water plays in disease transmission and health in general is discussed further in chapter 12.

Finally, the spread of ORT can be greatly accelerated by carefully designed and implemented programs. This difficult work is now being undertaken in efforts to make ORT and diarrheal control an integral part of comprehensive health services for children in the future.

The Importance of Continued Feeding

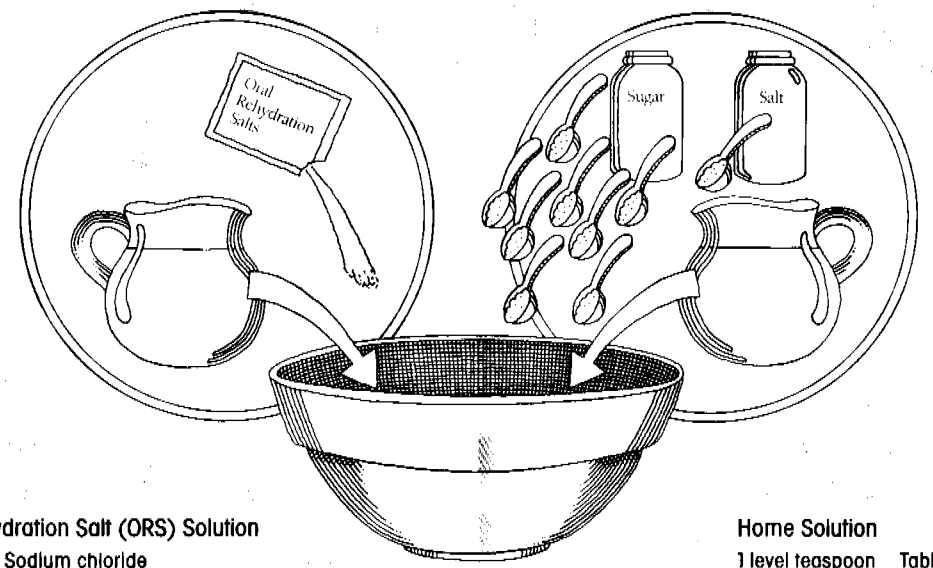
The solution of sugar and salt may prevent dehydration, but does not address the problem of malnutrition that diarrhea frequently precipitates. Continued feeding through a diarrheal episode plus extra intake during the recovery period are essential if a child is to maintain normal growth and development. It is especially important for children who are still breastfeeding.

Unfortunately, the common response to diarrhea is to stop feeding altogether. It is a problem of conflicting perceptions of this disease. Common sense tells many parents that diarrhea works like a pipe. If you stop feeding things in at the top, they will stop coming out at the bottom. This belief is seemingly confirmed by the observation that diarrhea increases with feeding. Much of the food and liquid ingested during diarrhea is indeed lost. But while gut function is reduced, the body can still absorb over 50 percent of nutrients during a diarrheal episode. Continued feeding in conjunction with oral rehydration is thus best for the child. Even if the diarrhea appears to get worse, feeding is a far better alternative than fasting.

Young children in many parts of the world spend a

Figure 2-D

Oral Rehydration Solution



Oral Rehydration Salt (ORS) Solution

3.5 grams Sodium chloride
20 grams Glucose
2.9 grams Trisodium citrate dihydrate*
1.5 grams Potassium chloride
1 liter of cleanest water

OR

Home Solution

1 level teaspoon	Table salt
8 level teaspoons	Sugar
pinch	Baking soda**
pinch	Potassium salt**

1 liter of cleanest water

* Although the World Health Organization now recommends the use of trisodium citrate, oral rehydration packets substituting 2.5 grams of sodium bicarbonate remain safe and highly effective.

** Although these increase the effectiveness of home solution, it is still effective without them. Readily available foods such as bananas, orange juice, and green coconut water contain potassium, although relatively large quantities of these foods are needed to replace potassium lost from diarrhea.

Source: World Health Organization, Treatment and Prevention of Acute Diarrhea: Guidelines for Trainers of Health Workers, Geneva, Switzerland, 1985.

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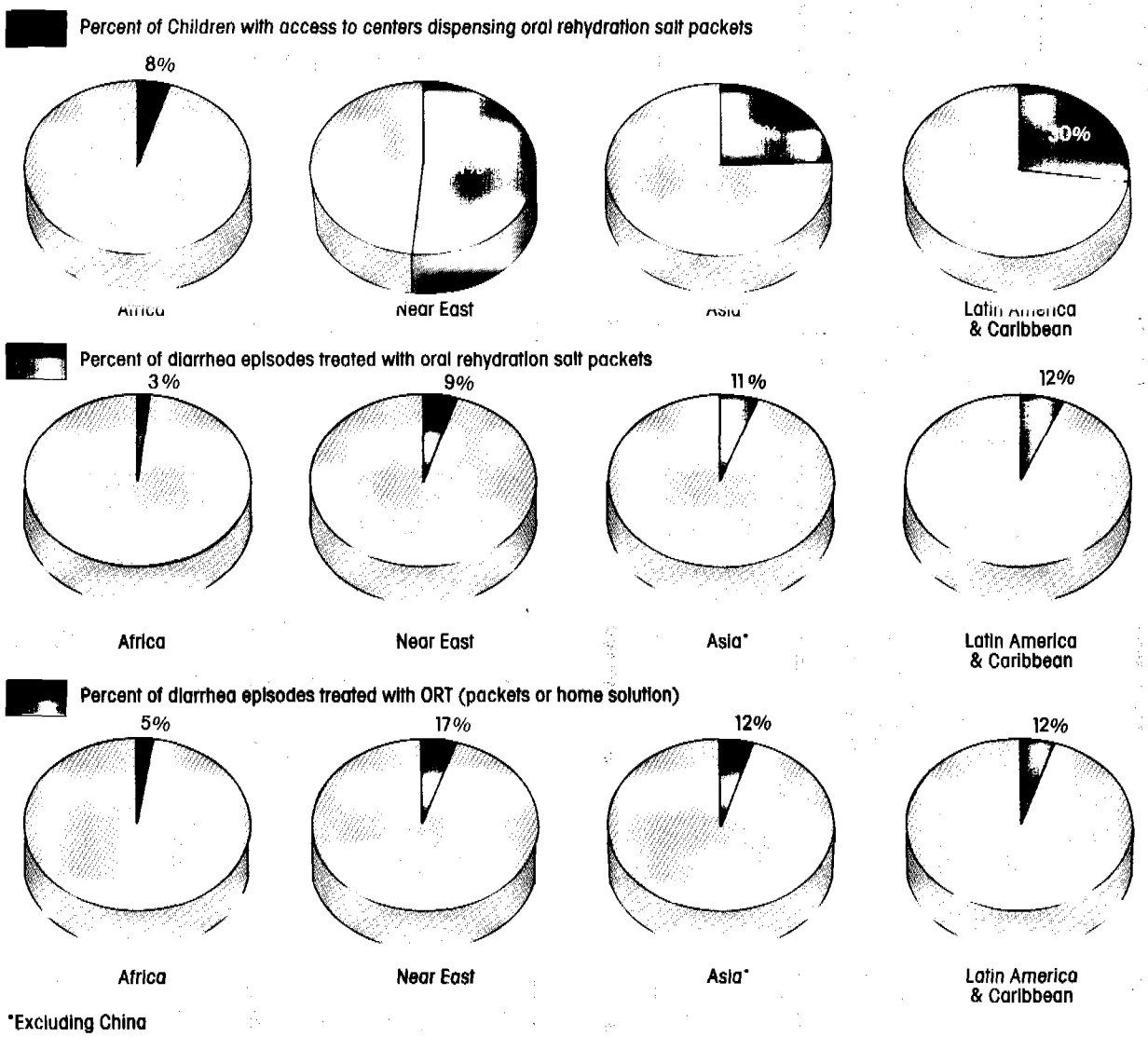
Figure 2-E

Estimated Access and Use of ORT In Developing Regions



*Excluding China

Note: Regional averages represent minimum estimates for access and use. Countries not reporting are assumed to have no coverage.

Source: Adapted from data provided by the Program for the Control of Diarrheal Diseases/World Health Organization. Data Available as of May 8, 1986.

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significant proportion of their lives with diarrhea. If food or breastmilk were to be withheld for each episode, it would be tantamount to requiring the hardest-hit children to fast for a full month or more out of every year.

Diarrhea Prevention

Handwashing: The ultimate aim of diarrhea control programs is to prevent the disease itself. Improvements in sanitation and water supplies will certainly play an important and necessary role in the permanent reduction of diarrheal illness. But the costs of building these systems and maintaining them once they are built are prohibitive for many areas at current levels of development. Meanwhile, a number of simple preventive measures can have an immediate impact on the incidence of diarrheal disease. The promotion of simple hygienic practices within the household is a good example. Figure 2-F shows the impact of a program in Guatemala to promote health awareness and good hygiene among mothers in the country's Pacific lowlands. The incidence of diarrhea was lower and the length of diarrheal episodes shorter among children of mothers in the program than among children in similar living conditions whose mothers did not participate in the program. The most dramatic results were achieved at the

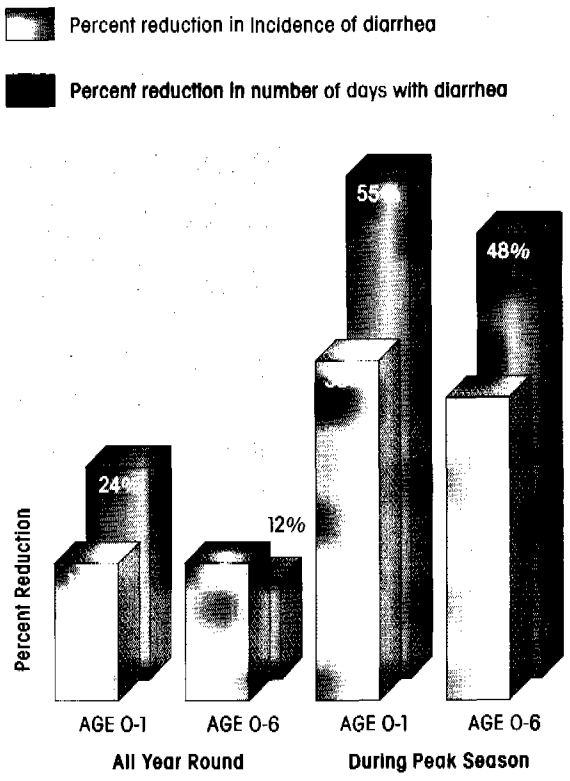
peak diarrhea season among children under two. Diarrheal incidence in this group declined by 36 percent, and the time spent with diarrhea was reduced by more than half. A simple bar of soap can be a powerful force for child survival.

Breastfeeding: The practice of breastfeeding provides a similarly dramatic level of protection from diarrhea. A recent study of diarrhea in Costa Rica found that infants who were exclusively bottlefed in the first 6 months of life contracted diarrhea at 4 times the rate of partially breastfed infants and almost 7 times the rate of exclusively breastfed infants.

When mortality from diarrhea among exclusively breastfed infants is compared with mortality among infants experiencing other feeding patterns, an even more striking pattern emerges. During the first 6 months of life, exclusively bottlefed infants are between 5 and 25 times more likely to die from diarrhea than their exclusively breastfed counterparts, and between 2 and 13 times more likely to do so than partially breastfed infants. The level of direct disease protection from breastfeeding declines over the first year. But breastfed children probably remain at a nutritional advantage during the recovery period from a diarrheal episode. The World Health Organization has estimated that breastfeeding promotion programs could yield an 8 to 20 percent reduction in incidence of diarrheal illness and a 24 to 27 percent decrease in deaths from diarrhea. The role of breastfeeding in child survival is discussed in greater detail in the section on Malnutrition.

Figure 2-F

Impact of Hygiene Education on the Incidence and Duration of Diarrheal Illness: Guatemala



Source: Feachem, R.G., "Interventions for the Control of Diarrheal Diseases among Young Children: Promotion of Personal and Domestic Hygiene," Bulletin of the World Health Organization, 62(3): 467-476, Geneva, Switzerland, 1984.

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Immunization: Direct vaccination against diarrheal infection may soon provide an important weapon in the control of diarrheal disease. In recent years, substantial resources have been invested in research to develop a new vaccine against rotavirus and an improved vaccine against cholera. Rotavirus is a leading cause of severe, dehydrating diarrhea among children around the world. While rotavirus-associated diarrhea may account for only 6 percent of all diarrheal episodes among children under age 5, it may be responsible for 20 percent of all diarrheal deaths in that age group and as many as half of all episodes that result in dehydration. Several candidates for a vaccine that can be administered orally are currently being tested, with some promising results. Once perfected, a rotavirus vaccine might be given to children in conjunction with oral polio vaccine, thus building on existing immunization programs that have established broad coverage.

Cholera is rare by comparison to other major causes of diarrhea, but its frightening severity and ability to create explosive epidemics make it a logical target for continued vaccine research. A number of oral vaccines are being tested to improve on the duration and efficacy of the current injectable vaccine. Work also continues in developing vaccines against other important agents of diarrhea, including enterotoxogenic E. Coli, Shigella, and Giardia lamblia.

A final prevention strategy against diarrhea takes advantage of the interaction of other disease antagonists with diarrhea in affecting child survival. Diarrhea is a frequent and often fatal complication of measles. The risk of a child's dying from measles combined with prolonged diarrhea is 4 times that of dying from measles alone. Immunization programs aimed at measles should therefore have a tangible impact on the death toll from diarrhea as well. The World Health Organization has estimated that if 60 percent of 1-year-olds were to receive measles vaccinations, the ensuing reduction in mortality from diarrhea among children under age 5 would range from 9 to 18 percent. It is estimated that up to one-fourth of diarrheal deaths could be eliminated by 90 percent measles immunization coverage.

III. VACCINE-PREVENTABLE DISEASES

PROFILE

Immunization is one of the most powerful weapons in the arsenal of existing child survival technologies. The World Health Organization's Expanded Program on Immunization (EPI), with the support of USAID, UNICEF, and other major groups, is conducting an ambitious effort to establish universal immunization against six common childhood diseases. They are measles, diphtheria, pertussis, tetanus, poliomyelitis, and tuberculosis. Vaccines against these diseases are for the most part safe, effective, and inexpensive. Widespread immunization in industrialized countries has come close to eliminating these diseases altogether. Real progress has also been made in efforts to reach children in the developing world, as seen in figure 3-A. In 1985 vaccination is estimated to have prevented nearly a million child deaths. Nevertheless, an estimated 3.5 million infants and children continue to die annually from the target diseases and their complications. An equal number are left blind, crippled, or mentally retarded.

AGENT

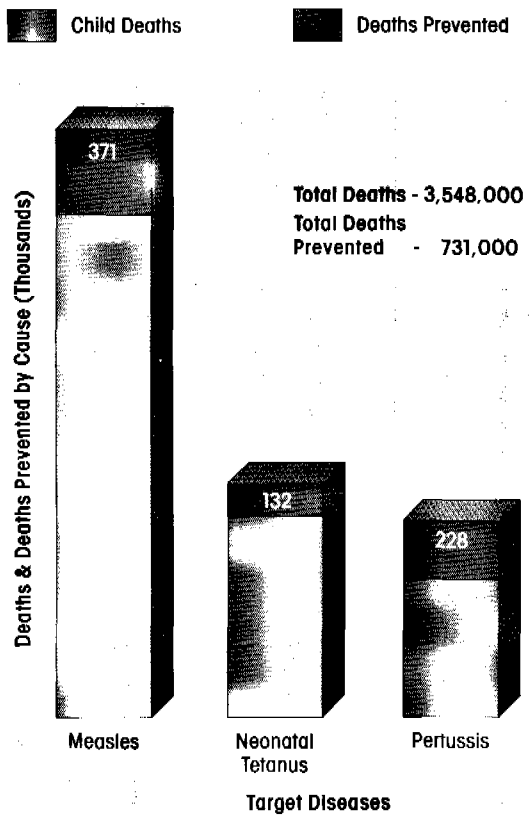
Measles: Measles is a viral infection that causes more child deaths than all of the other target diseases combined. According to the most recent data available, more than 2 million children died from measles and the diarrhea, pneumonia, and malnutrition that measles precipitates. The disease is characterized by high fever, cough, runny nose, and a blotchy rash that appears over the body 3 to 7 days after the onset of symptoms. The virus is highly contagious and easily spread from person to person. Without immunization, virtually all children will contract measles.

The power of this disease to cause death stems in large part from its devastating effects on the nutritional and immune status of its victims. The fever can quickly deplete the body's reserves of both protein and vitamin A, even in children who are well-nourished. The danger is far greater for children already in a precarious nutritional state. Because protein and vitamin A play a role in maintaining the body's defenses against disease, a child suffering from measles is immunologically compromised, which renders him vulnerable to a cascade of complicating infections. Measles rarely kills alone. It is almost always aided by at least one other disease, most commonly diarrhea or pneumonia. Children who recover are often left with a serious nutritional debt. Measles has frequently been cited as the major precipitating event in severe protein-calorie malnutrition, leaving as many as one-fourth of infected children with a formidable 10 percent weight loss.

Measles is never a trivial disease. Among impoverished children, high levels of malnutrition, crowded living conditions, and very young age at infection combine to make it particularly devastating. Fatality rates from measles are many times higher in developing regions, particularly in Africa, than they are in industrialized countries. In the United States fewer than .001 percent of measles infections result in death. In developing countries today, the average figure is close to 3 percent, with observed rates of nearly 4 percent in Bangladesh, 6 percent in Zaire, and more than 15 percent in Guinea-Bissau, according to a recent study.

Figure 3-A

Annual Child Deaths from Vaccine-Preventable Diseases and Deaths Prevented by Immunization in Developing Countries



Source: WHO Expanded Programme on Immunization. Data available as of July, 1986.

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Tetanus: Tetanus is a highly lethal infection caused by the toxin of the tetanus bacillus. It is responsible for close to one million deaths each year; most of those who succumb are newborn infants. This organism exists harmlessly in the gut of many animals and humans. It is only when the bacillus enters through the skin or an open wound that it becomes fatal. The usual mode of transmission is through exposure to the soil, where excreted tetanus spores can remain intact for years. People of all ages can be susceptible to infection. It is of particular concern to those who live in rural areas and in the unsanitary conditions under which the tetanus bacillus thrives. Vaccination with tetanus toxoid confers immunity for up to 10 years and can provide important protection for older children and adults in high-risk areas.

Neonatal Tetanus: Tetanus that occurs during the first month of life, or neonatal tetanus, accounts for the greatest number of deaths from this disease. It results primarily from unsanitary practices surrounding birth. The newly cut umbilical stump provides an easy portal of entry for the tetanus bacillus, which can be introduced by contaminated cutting instruments or by the traditional dressings sometimes placed on the umbilical stump. The first sign of neonatal tetanus is inability to feed. In a matter of days, the disease proceeds to general muscular stiffness with spasms and convulsions. Death follows rapidly. Most deaths occur between 4 and 14 days of birth, several days after the first symptoms appear. Without treatment neonatal tetanus is almost uniformly fatal; the assumed case fatality rate is 85 percent. Even when treatment is available, mortality is high because babies are rarely brought to the hospital before severe symptoms have set in.

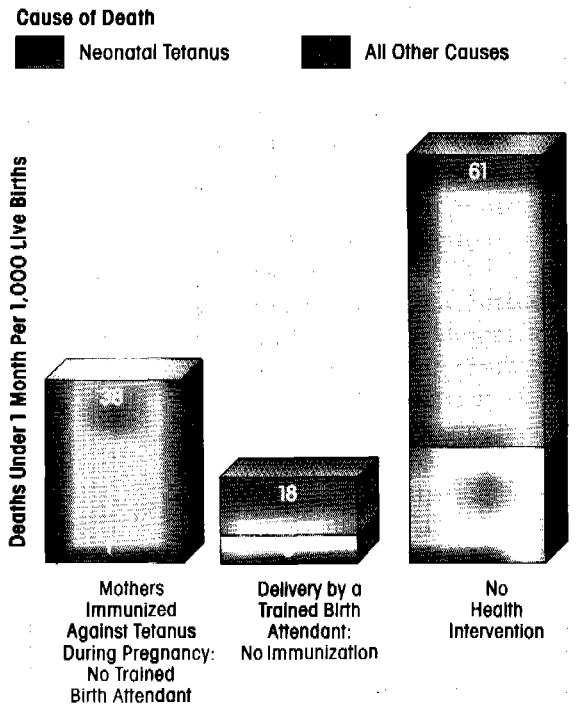
Until recently, the global significance of neonatal tetanus had gone largely undetected. The death of a child during its first few weeks of life may be hidden from view for cultural reasons. In many traditional societies, a child must survive for a certain period of time after birth before it is acknowledged as a "life." Naming ceremonies and other rituals marking the arrival of a new life are purposely delayed by those accustomed to high rates of infant mortality. The fatalistic attitudes that prevent parents from seeking help also make them unlikely to report the death of a newborn infant. As a result, the problem of neonatal tetanus has been endowed with what has been called a "peculiar quietness," going largely unrecognized as a major cause of infant death.

The true magnitude of neonatal tetanus mortality is uncertain. Current estimates hold that close to 1 million infants die from this cause every year. In some areas it accounts for more than half of all deaths in the first month of life and 1 in 10 deaths during the first year.

Prevention is the only viable strategy against this disease. Unlike other diseases discussed in this section, tetanus is not contagious. It can be prevented by immunization and improved sanitary conditions, especially those surrounding maternity care. Immunization strategies against neonatal tetanus hold out the greatest hope for the immediate future. The timing of this disease requires an unorthodox solution. When a pregnant woman is immunized, her fetus also receives immunity. Following birth, the child enjoys this passive immunity for up to 5 months, safely past the period of highest risk. Basic improvements in maternity care also have important implications for child survival. Figure 3-B shows the influence of trained birth attendants and immunization of pregnant women on neonatal mortality from tetanus and from all causes combined. As might be expected, delivery by trained birth attendants reduced neonatal mortality from all causes to a greater extent than immunization against tetanus. Immunization against neonatal tetanus, however, provided virtually complete protection to infants of immunized mothers. Compared with those receiving no special care, newborns in both programs enjoyed a significant reduction of mortality during the first

Figure 3-B

Neonatal Mortality With and Without Health Intervention



Source: Stansfield, J.P., A. Galazka, "Neonatal Tetanus in the World Today," Bulletin of the World Health Organization, 62(4): 647 669, Geneva, Switzerland, 1984.

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month of life, 72 percent and 54 percent respectively, which underscores the importance of pre- and postnatal health care.

Pertussis (Whooping Cough): Pertussis, an acute bacterial infection of the respiratory tract, claims the lives of nearly 600,000 children each year. Without immunization, the toll in developing countries might be closer to 750,000 child deaths annually. Characterized by a violent cough and whooping sound with inhaled breath, pertussis is a prolonged, exhausting illness. The severest symptoms usually occur over a period of 2 to 4 weeks. A residual cough may last for months. It is highly contagious. On average, 80 percent of children in an unimmunized population will contract this disease. An estimated 1.5 to 2 percent of infected children die from pertussis and its consequences, especially from pneumonia. As with measles, children who recover are often left with a nutritional debt that weakens their resistance to the effects of other illness. More than half of the children in one African study suffered a critical 5 percent weight loss. It took from 1 to 3 months for many of these children to regain their previous weight and resume normal growth. The burden on health from this preventable disease may thus be far greater than can be measured directly.

Polio: Polio is more of a crippler than a killer. It is a viral disease spread indirectly from person to person via contaminated food and water. An estimated 272,000 children contracted paralytic polio in 1985 and perhaps one in ten of these died as a result of the infection. Spearheaded by the Pan American Health Organization's drive to eradicate polio from the Americas before the next decade, the world is gaining the edge on this dread disease. The estimated number of cases prevented by polio immunization in developing countries in 1985 was almost half the reported incidence of childhood polio in that year.

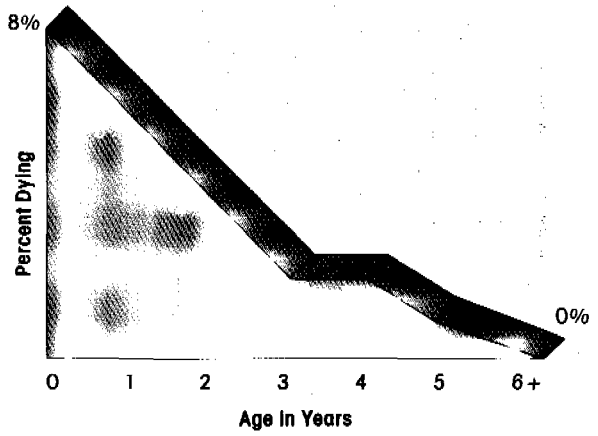
Polio was once thought to be a relatively rare disease that occurred more frequently in developed than developing countries. The disease seemed rare because most polio infections are silent. Only one of every 200 children infected goes on to develop paralysis. Amid poor health conditions, frequent exposure to polio virus begins at birth. Recent lameness surveys in developing countries reveal previously unsuspected high levels of crippling polio, comparable to those of the worst epidemics in industrialized countries before the development of vaccines. Some 3 to 10 children per 1,000 are affected in endemic areas.

Diphtheria: Since immunization against diphtheria began, this once-dreaded disease has been all but relegated to memory in temperate countries. In the United States, for example, the number of reported cases averaged four per year during the early 1980s, occurring mostly in unimmunized adults. Little is known about the scope of diphtheria in the developing world. Perhaps 5,000 children die each year from this cause. While this death toll is low compared with that of a disease like measles, immunization remains a priority. The infection is severe, killing 10 to 15 percent of its victims. Many children in endemic areas develop an early natural immunity as a result of constant subtle exposure to the bacteria through the skin. Ironically, as health and sanitary conditions improve, such exposure decreases, depriving children of this natural immunity and making them susceptible to the severe respiratory form of diphtheria later in life. Immunization thus becomes a critical factor in preventing the rise of both morbidity and mortality from diphtheria.

Figure 3-C

Measles Case Fatality Rates by Age

Percent of Infected Children Who Die From Measles: West Africa



Source: Foster, S.O., "Immunizable and Respiratory Diseases and Child Mortality," *Child Survival: Strategies for Research Population and Development Review*, Supplement to Vol. 10, L.C. Chen, H. Mosely (ed.) (New York: The Population Council, 1984).

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Tuberculosis (TB): Once the leading cause of death in Europe, tuberculosis now appears to be declining throughout the world. Throughout its history, the disease has been associated with the poverty and crowded living conditions that favor its spread. It is now rare in developed countries, but remains common in developing regions, where it continues to be a major cause of illness and death. Although the true scope of this disease among children is unknown, it is estimated that 30,000 children die from tuberculosis each year.

Tuberculosis is a chronic disease that usually starts in the lungs and may spread to other organs. Most child deaths result from a severe form of the disease known as TB meningitis, which develops when infection spreads to the

layers surrounding the brain. Like polio, most tuberculosis infections are silent. Between 1 and 2 percent of those harboring the bacillus develop outward symptoms each year. But unlike polio, tuberculosis is not self-limiting. Without treatment, the bacillus may persist in the lungs of the victim indefinitely, ready to cause infection later in life. An infected infant has a 10 percent chance of developing disease in later childhood or as an adult.

Host Factors

It is striking that the same childhood diseases can be so innocuous in one context and so devastating in another. Their tremendous impact on child survival in developing countries stems from four principal factors: low levels of immunization (discussed in the next section), young age at infection, the presence of malnutrition and other complicating diseases, and lack of available health care.

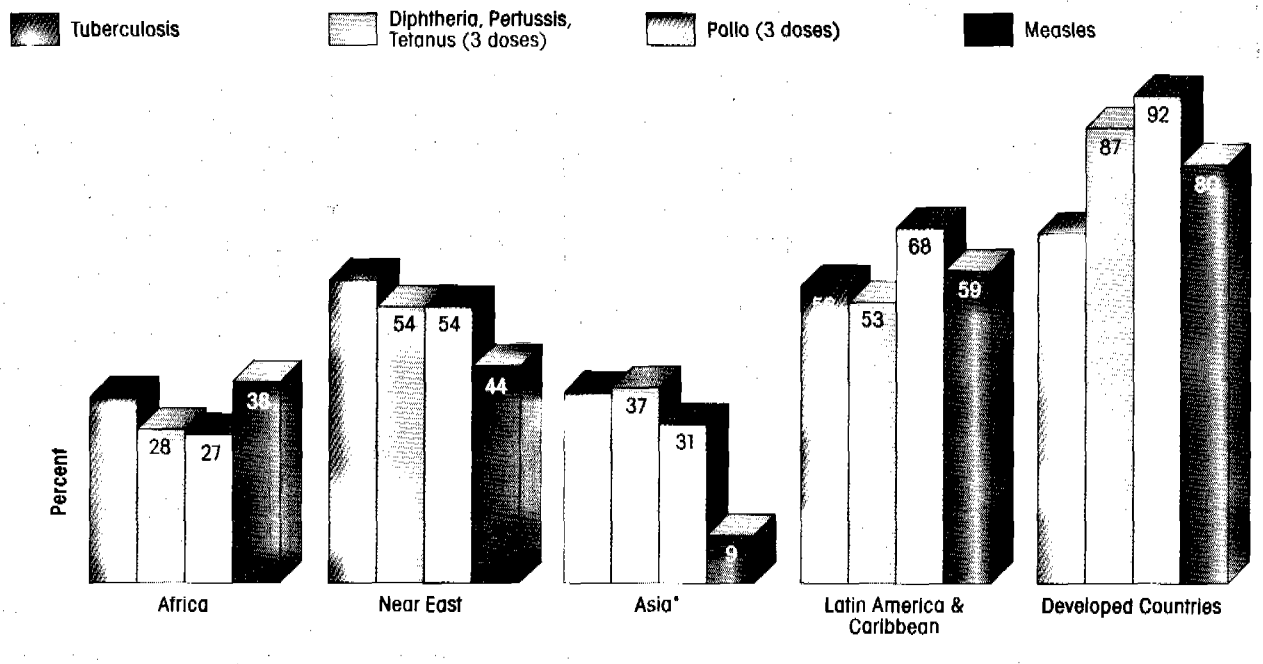
Age at infection can have a strong influence on the severity of the disease. Childhood diseases tend to strike at much earlier ages in developing countries than in industrialized countries. In poor, densely populated areas, as many as half of children will have suffered measles by their first birthday; virtually all have been infected by age 3. Contributing factors include crowded living conditions that give children early exposure to the outside world. A child who lives in one room with a number of older siblings or who rides on his mother's back to a crowded marketplace is likely to be exposed to most common childhood diseases at a very early age. In developed countries, by contrast, most children first encounter this intensity of exposure when they enter school at age 4 or 5. The pattern of declining fatality rates from measles with increasing age (figure 3-C) shows that an infant with measles is 8 times more likely to die than a 5-year-old with the same infection. Similarly, the risk of death among infants with pertussis is 3 times that of children 1 or older.

The combination of malnutrition and concurrent illness is a recurring theme in discussions of the major determinants of child mortality. The case of measles provides a classic example of the interplay between these factors. Severely malnourished children have been shown to suffer twice the measles mortality of children on adequate diets. Under famine conditions, when the prevalence of malnutrition soars, as many as half of children who contract measles die from it. Most measles deaths follow complicating infections, usually diarrhea and pneumonia. A

Figure 3-D

Immunization Coverage by Region

Percent of 1-Year-Olds Fully Immunized



*Excluding China

Note: Countries not reporting are excluded from regional averages.

Source: WHO Expanded Programme on Immunization. Data available as of July 1986.

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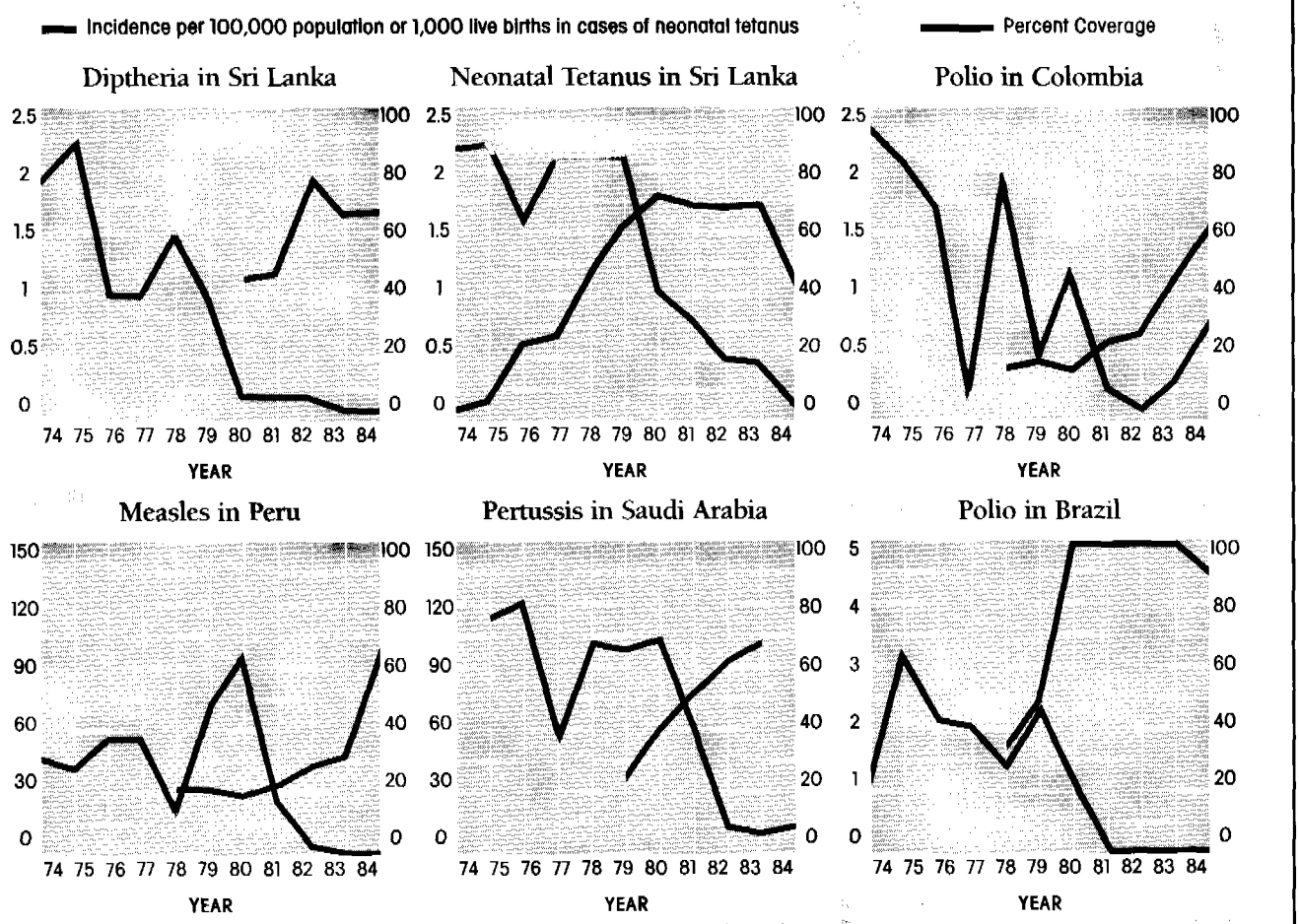
Figure 3E

Immunization Coverage and Incidence of Immunizable Diseases for Selecting Developing Countries, 1974-1984



Source: World Health Organization/Expanded Program on Immunization.

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Bangladesh study found measles followed by prolonged diarrhea to be four times more likely to be fatal than measles alone. The synergistic effect of the interaction of two diseases thus far outweighs the total of their individual effects.

Lack of health care is another contributor to high fatality rates from childhood diseases. Some of these diseases can be cured medically. Pertussis and diphtheria respond to antibiotics; tuberculosis can be halted by a complex drug regimen; and it is possible to save some children from the grip of tetanus by the use of muscle relaxants and antitoxins. But few in the developing world have access to such advanced medical services, and for other diseases, such as measles or polio, there is no known cure. Immunization is the only alternative. In any case, the continuing lack of available health care is one of the strongest arguments for immunization.

THE ROAD TO HEALTH

We hold the means to prevent millions of child deaths in our hands. The virtual elimination of the six target diseases in industrialized regions puts this goal within reach of the developing world. It is no longer a question of the ability to control these diseases; it is a question of the will to take the necessary steps.

Immunization Coverage

The latest available immunization rates for the major regions of the world are shown in figure 3-D. They reflect the progress that has been made and the distance remaining to the goal of universal immunization. Africa lags well behind other regions in terms of overall coverage. Fewer than 40 percent of infants receive full immunization against any of the six target diseases before their first birthday.

Asian countries (excluding China), provide higher levels of coverage of all diseases but measles; immunization against this disease is lower in Asia than in any other region. India, which has more children than any country in the world, has only recently initiated a measles immunization drive. Even when India is excluded from the regional average, measles immunization coverage averages less than 20 percent. China, by contrast, is reported to have reached more than half of all infants with each vaccine; nearly 83 percent are said to be protected against measles. The greatest overall success rates in the developing world have been achieved by Latin America and the Caribbean, where between one-half and two-thirds of infants are reportedly immunized annually against each of the six target diseases.

The World Health Organization's Expanded Program on Immunization (EPI) faces significant challenges. Because the targeted diseases strike in infancy in developing regions, effective immunization must occur before a child's first birthday. Vaccinations must not be given too early, however, because they can be neutralized by the passive immunity inherited from the mother. This leaves a relatively brief period of time during which it is crucial to reach the child. Additional problems include the need to refrigerate vaccines until they can be administered. Breaks in the required "cold chain" have a cumulative effect on vaccine potency, especially on the potency of "live" vaccines such as those against polio and measles. If there are too many breaks, the vaccine becomes useless before it can reach the child. Public awareness may be the most important factor in the success or failure of these programs. Adequate supplies, facilities, and personnel mean little if local communities are not informed of the availability of services or motivated to use them. Dropouts often plague immunization efforts, as when parents who bring in their children for the first inoculation of DPT or oral polio vaccine fail to return for the second or third shot.

Vigorous communication activities that get the message across to the critical audience can be of enormous benefit. Effective communication systems serve three purposes: they educate people about the importance of immunization to children's health, overcome misconceptions that discourage its widespread use, and explain where and when immunization services are available.

Nationally publicized "immunization days," during which thousands—or even millions—of children are immunized have been staged in some countries. These widely publicized efforts tend to reach children who might otherwise have gone unprotected. If these campaigns have a drawback, it is that they may sidetrack efforts to establish thorough systems of routine immunization to protect future generations. However successful they may be, single campaigns do not eliminate the ongoing need for immunization. The absolute size of this need is vast. In 1985 there were 103 million infants living in developing countries, only one quarter to one half of whom received immunizations against any of the 6 EPI target diseases. By the year 2000, the number of surviving infants is projected to grow to over 115 million annually. That means that every year there will be almost one million more children to immunize than there were the year before. Overall, a projected 1.8 billion infants will require immunization between 1985 and the year 2000. The goal of universal coverage can be achieved and sustained, but coordinated and systematic efforts will be required to support the necessary special initiatives.

Despite logistical difficulties of immense proportions, there is widespread agreement that the goal of universal immunization of children can be achieved before the end of the century. WHO's Expanded Program on Immunization is receiving broad-ranging support and other international organizations and world leaders have added their voices to the call for universal immunization of children by 1990. The Pan American Health Organization is spearheading a drive to eradicate polio from the Americas by that year. The worldwide demand for vaccines has tripled during the past year, and many countries have staged massive national immunization drives. The series of graphs in figure 3-E shows the impact of immunization on the incidence of disease in selected countries. Increasing immunization rates of children under age 1 accompany a general decline in the pattern of the specific target disease. The benefits of these programs are expected to accrue rapidly. As levels of immunization rise, the number of susceptible children in a given area declines. Above a certain level, different for each disease, transmission can be brought to a virtual halt, which means that even children who have not been vaccinated are sheltered from infections. The analogy has been made of a stone hitting sand. When a child contracts a disease and there is no one for him to pass it on to, the epidemic stops before it begins.

IV. ACUTE RESPIRATORY INFECTION

A host of other infectious and parasitic diseases can strike children. Some are universal diseases of childhood, others are limited to developing countries. Some are determined by climatic conditions, others by crowding and poor hygienic practices. Their impact on child survival is magnified by malnutrition and little or no access to health care. The following section focuses on the two most important infectious and parasitic diseases that affect children: acute respiratory infection and malaria.

PROFILE

With the exception of diarrhea, no single group of diseases claims as many child lives as acute respiratory infections. These infections are estimated to account for 20 to 25 percent of all child deaths in the developing world. In absolute terms, up to 4 million children die from these infections every year. In some areas, acute respiratory infection outranks diarrheal disease as the leading cause of death under age 5.

Agent

As with diarrhea, acute respiratory infections are caused by a wide variety of disease agents. More than 300 types of bacterial and viral sources have been identified, including four of the vaccine-preventable target diseases (measles, diphtheria, pertussis, and tuberculosis). These infections range in severity from the common cold to bacterial pneumonia.

Acute respiratory infections are traditionally divided into two main categories: those of the upper respiratory tract and those of the lower respiratory tract. The latter group, by far the most important cause of deaths from these diseases, is the focus of current health strategies. Bacterial infection of the lower respiratory tract is particularly dangerous; bacterial pneumonia dominates all forms of these infections as a killer of children. Control of lower respiratory infection is problematic, however, because it is relatively rare by comparison to upper respiratory infection and difficult to diagnose. It often develops from seemingly harmless upper respiratory infections, which have a notorious tendency to invite secondary, complicating illness.

Transmission Factors

Acute respiratory infections are primarily spread from person to person through the air. Their principal transmission factors are high population density, crowded living conditions, and seasonal changes that favor the spread of disease.

The evolutionary theory of disease holds that acute respiratory infections came into being when humans began to form permanent settlements with large numbers of inhabitants. Measles, for example, requires a minimum population of 100,000 in order to remain endemic in an area. Because high population density facilitates the transmission of person-to-person diseases, isolated rural communities that generally lack health benefits, may, in the case of acute respiratory infections, enjoy a health advantage over populous urban areas.

Within households, crowded living conditions also favor the spread of respiratory infection. In the often-primitive traditional dwellings and poor housing where most of the world's children grow up, it is common for the entire family to sleep in the same room. Infants and young children are thus exposed at early ages to diseases brought into the home by parents and older siblings. Moreover, intimate living conditions can increase the intensity of disease transmission. Both very early age at infection and increased intensity of infection have been implicated in the extraordinarily high fatality rates attributable to acute respiratory infections in developing countries.

Seasonal epidemics of these infections are a universal affliction of our species, regardless of economic classification or political boundaries. Every climate has its season of increased disease transmission. The cold weather "flu season" in temperate climates corresponds to the humid rainy seasons of the tropics.

Host Factors

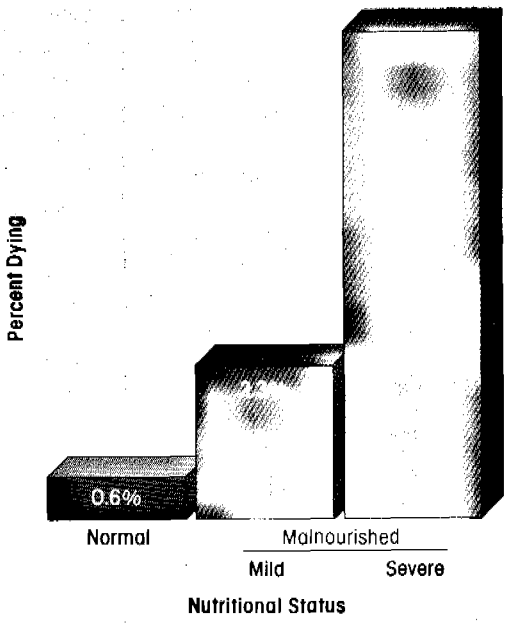
The principal risk factors for child mortality from acute respiratory infection are young age, low birth weight, and poor nutritional status. Death rates are highest during the first year of life. These infections, particularly pneumonia, are often the leading cause of infant death in impoverished areas. As with other diseases, the deadly power of a severe infection is multiplied by the convergence of such factors as weaning, the gradual loss of passive immunity, and increasing exposure to disease that mark the passage of children through the critical first year of life.

An important contributor to high infant mortality from acute respiratory infections is low birth weight. Death rates from all causes are significantly higher for infants weighing less than 2,500 grams (5.5 pounds) at birth, who appear to be especially vulnerable to respiratory illness. Pneumonia heads the list of infectious causes of death. The link between low birth weight and early death is reflected in the elevated infant mortality rates of developing regions, where about one child in six is born underweight.

Figure 4-A

Acute Respiratory Infection Mortality by Nutritional Status

Philippine Hospital Cases



Source: Tupasi, T.E., "Nutrition and Acute Respiratory Infection," Acute Respiratory Infections in Childhood, Proceedings of an International Workshop, Sydney, Australia (1984), R. Douglas, E. Kerby-Faton (ed.) (Adelaide, Australia: University of Adelaide, 1985).

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The impact of acute respiratory infections is intensified by malnutrition. In Costa Rica, children with severe protein calorie malnutrition were found to be 19 times more likely than normal children to develop pneumonia. In the Philippines, as shown in figure 4-A, mortality among children hospitalized with acute respiratory infection was far higher for malnourished children than for children of normal nutritional status.

Vitamin A deficiency, long recognized as the leading cause of blindness in childhood, may also be an important risk factor for respiratory infections. Lack of vitamin A is thought to cause physical changes in the internal linings of the lungs and digestive tract which favor bacterial infection. Figure 4-B shows the findings of recent research on this subject in Indonesia. Children with ocular symptoms of vitamin A deficiency experienced twice the rate of respiratory infection and four times the death rate of children without these symptoms. The role of vitamin A in child survival is examined further in the section on Malnutrition.

GLOBAL IMPACT ON CHILD SURVIVAL

Acute respiratory infections are by far the most common illnesses suffered by children, no matter where they live. The average child under the age of 5 experiences between 4 and 8 infections a year. These infections reportedly cause from 20 to 60 percent of visits to health services and comprise 10 to 50 percent of hospital admissions. The incidence of childhood respiratory infection is roughly the same in both developed and developing regions. This is in sharp contrast to the incidence of diarrheal disease, which is 3 to 4 times higher in developing countries.

Although there is little regional variation in overall incidence rates of acute respiratory infection, death rates are dramatically higher in developing countries. A major factor in this difference is in their higher incidence of the most severe infections, particularly the dangerous lower respiratory infections. Rates for these infections in India and Papua New Guinea are 3 to 4 times higher than U.S. rates, and in the rural highlands of Guatemala, half of 3-year-olds have at some time suffered pneumonia. The differences are not only in terms of incidence. Case fatality rates for pneumonia, which are .4 percent in the United States, range from 5 to 20 percent in developing areas. When incidence and case fatality considerations are combined, death rates from acute respiratory infections are in some cases hundreds of times greater for children in developing countries.

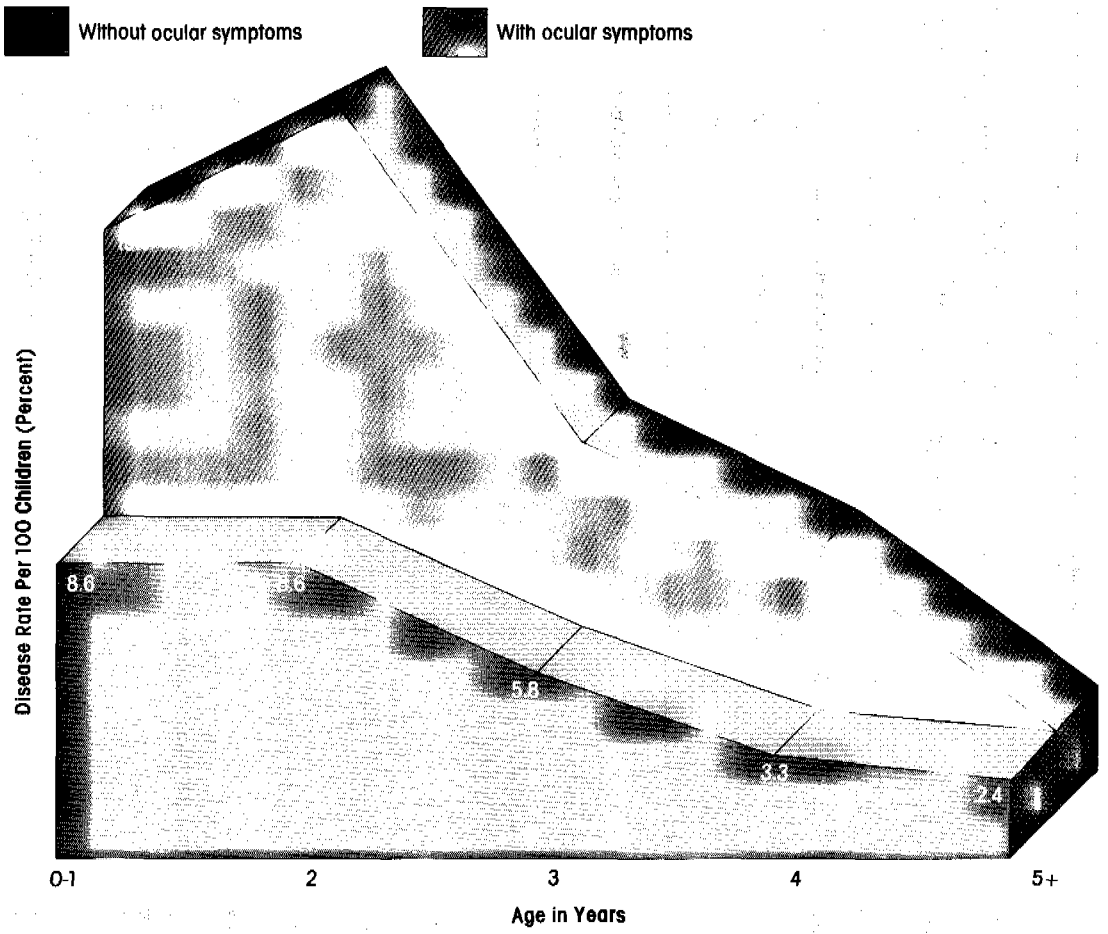
THE ROAD TO HEALTH

Acute respiratory infections are now being given increasing attention by the international health community. With the exception of those for which vaccines exist, these infections have often been overshadowed in the past by other health concerns. This neglect may have stemmed from the lack of a central strategy like oral rehydration therapy, which has galvanized the fight against diarrheal disease. But growing awareness of the magnitude of the problem of acute respiratory infections and the growing number of possibilities for their prevention and cure have stimulated new interest. Moreover, it has become increasingly apparent that the child survival revolution will not take place without successfully confronting this major cause of childhood mortality in the developing world.

Existing control technologies include immunization, drug therapy, and a variety of measures to reduce the risk from this disease group. Four of the most important respiratory infections — measles, diphtheria, pertussis, and tuberculosis — have been targeted by the Expanded Program on Immunization. Research on new vaccine treatments is ongoing. The development of vaccines against lower respiratory infections could provide a much-needed catalyst for the control effort. Drug therapy provides a potent defense against respiratory infections in developed set-

Figure 4-B

Incidence of Acute Respiratory Infection Among Children With and Without Ocular Symptoms of Vitamin A Deficiency*—Indonesia



* *With* ocular symptoms = children with night blindness or Bitot's spots at both start and end of 3-month observation interval.
Without ocular symptoms = children with normal eyes at both start and end of interval.

Source: Sommer, A., J. Katz, I. Tarwotjo, "Increased Risk of Respiratory Disease and Diarrhea in Children with Pre-existing Mild Vitamin A Deficiency," American Journal of Clinical Nutrition 40, 1984.

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tings, but its use poses special difficulties in many developing countries. Requirements for facilities, trained health personnel, diagnostic capabilities, and continuous drug supplies can be daunting. Most developing countries lack the resources to provide this type of curative service to more than a small segment of the population in need.

Additional measures that would aid efforts to control acute respiratory infections include promoting good nutrition, improving housing conditions, and expanding health facilities and health education. Teaching mothers and other caregivers to recognize the early stages of lower respiratory infection in areas where medical help is available could be lifesaving for many children.

Reductions in respiratory diseases accounted for a significant proportion of the mortality decline in developed countries over the last century. Much of this decline took place before the introduction of modern medical cures. Improvements in nutrition, sanitation, and housing conditions are generally given most of the credit. Similar socioeconomic improvements aided by current medical knowledge hold the promise of still more rapid declines for developing countries.

V. MALARIA

PROFILE

Malaria has been called "the king of diseases." The hundreds of pathogens that cause diarrhea and respiratory infections may claim more lives, but no single agent of disease can match the power of the malaria parasite to inflict suffering and death. More than half of the world's population continues to live at some risk of malaria. Only a small fraction of the estimated 200 to 400 million new cases occurring each year are ever reported.

Malaria plays a critical role in child survival: pregnant women, infants, and young children are at greatest risk of severe infection. This group is also at disproportionate risk of death. In areas where transmission is heavy, malaria may account for as many as 10 percent of all deaths before age 5. The disease also contributes to high rates of spontaneous abortion, low birth weight, and malnutrition in affected areas. Despite determined efforts to eradicate or control malaria, it remains a powerful enemy of health and survival in much of the developing world today.

Agent

The parasite responsible for malaria, a plasmodium, requires the interaction of human and mosquito to complete its life cycle, as shown in figure 5-A. Plasmodia, which reproduce inside the mosquito, are passed into the human blood stream when the mosquito bites. Once inside the human, the plasmodium passes through several stages, infecting first the liver and then the red blood cells, causing the classic pattern of chills, fever, and sweating, sometimes with delirium, that can result in death. Some forms of the malarial parasite lodge in the liver, where they retain the potential to cause recurrences of the disease throughout the lifetime of the victim. When an infected human is bitten by a mosquito, the seeds, or gametocytes, of the plasmodium in the blood pass to the insect, and the cycle begins anew.

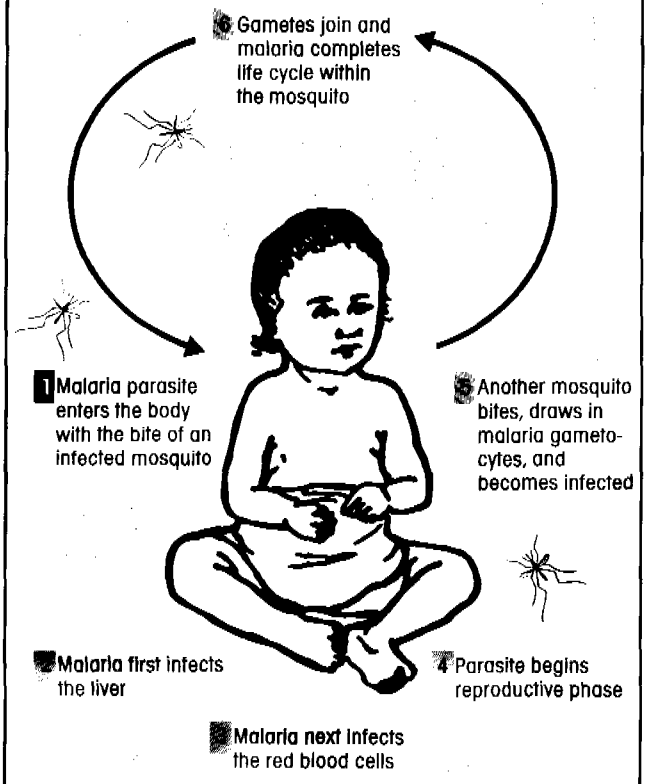
Transmission Factors

Depending on its prevalence in an area, malarial disease is considered to be either epidemic or endemic. Epidemic malaria occurs sporadically in areas where the disease is unstable. Malaria is said to be endemic to an area if the parasite is always present in the population at some level. The extent to which conditions for transmission are met determines the extent to which malaria becomes stable, or endemic.

The level of malaria in a community is determined by a combination of environmental factors and the interactive behavior of human and mosquito. As a primary condition, the parasite requires the presence of both humans and

Figure 5-A

The Life Cycle of Malaria



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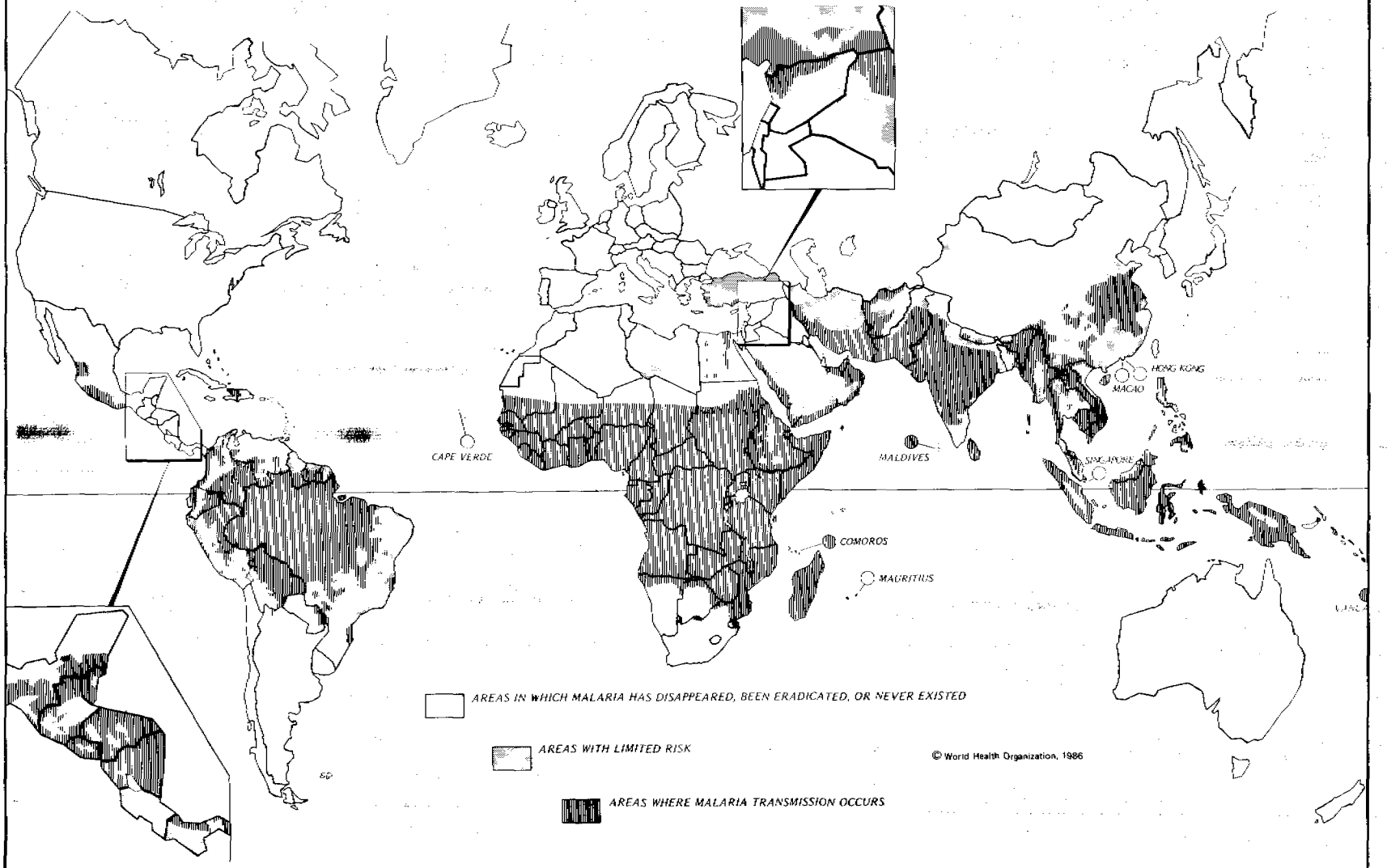
malaria-carrying Anopheles mosquitoes in sufficient numbers to ensure continuous transmission. The mosquito population and consequent risk of disease fluctuate with seasonal patterns of temperature, humidity, and the availability of breeding sites. Warm, humid climates favor the reproduction of both the mosquito host and the parasite itself. Favorable climatic conditions also extend the mosquito's life span, thereby increasing the spread of the disease. Thus, although malaria has essentially been eradicated in Europe and the southern United States, it remains deeply entrenched in most tropical and subtropical climates where mosquitoes can live and breed year-round.

The insect's behavioral patterns play an important role in the transmission and control of malaria. There are many different species of Anopheles mosquito, each with varying patterns of breeding and feeding. Some breed in shaded areas, some in bright sunlit water; some rest on the inside

Map 5-A

Epidemiological Assessment of Status of Malaria, 1984



walls of houses before biting, others feed and rest outside the confines of human dwellings. Certain species feed preferentially on humans, others live off domesticated or wild animals. The risk of malaria can therefore vary greatly even within the same climate.

Malaria transmission is often increased inadvertently by human activity. Irrigation and farming practices can provide new breeding sites for mosquitoes. Human migration can introduce the parasite into previously unaffected populations or cause a resurgence of malaria in areas where control measures have lapsed. In South America's Amazon basin, for example, rapid population influx and abrupt alterations to the environment have created the conditions for endemic malaria in an area where the disease had been virtually unknown.

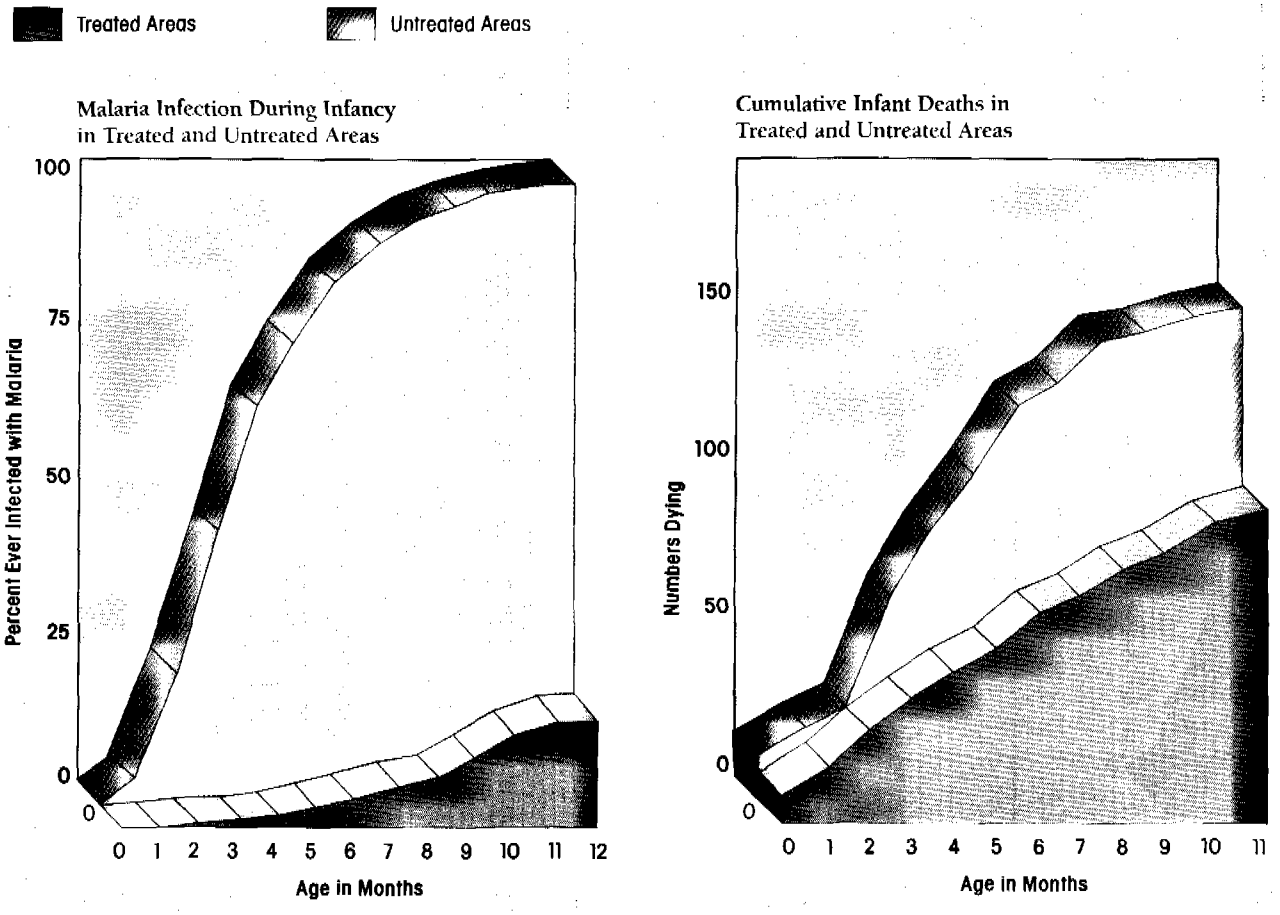
Host Factors

There is no complete natural immunity to malaria. Following repeated infections, it is possible for adults to develop limited resistance to the severest forms of malarial illness. Even then, malaria remains a serious disease. By some accounts, it causes more loss of healthy life in endemic areas than any other single disease.

The extent to which malaria is common or endemic to an area will determine its effect on child survival. In areas where transmission of the parasite is sporadic, malaria is rare and a sudden epidemic can affect all age groups equally. In endemic areas where transmission is continuous and malaria is entrenched, many adults develop a partial immunity to the parasite. Increasing levels of transmission

Figure 5-B

Impact of Malaria Control on Infant Health and Survival: Comparison of Treated and Untreated Villages in Kenya, 1970-73



Source: Payne, D., B. Grab, R.E. Fontaine, J.H.G. Hempel, "Impact of Control Measures on Malaria Transmission and General Mortality," Bulletin of the World Health Organization, 54: 369 377, Geneva, Switzerland, 1976.

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lower the average age at first infection, thereby shifting the heaviest burden of illness and death towards the youngest age group. At the highest levels, 100 percent of children suffer from malaria before age 5. Most of these children will experience their first infection in infancy.

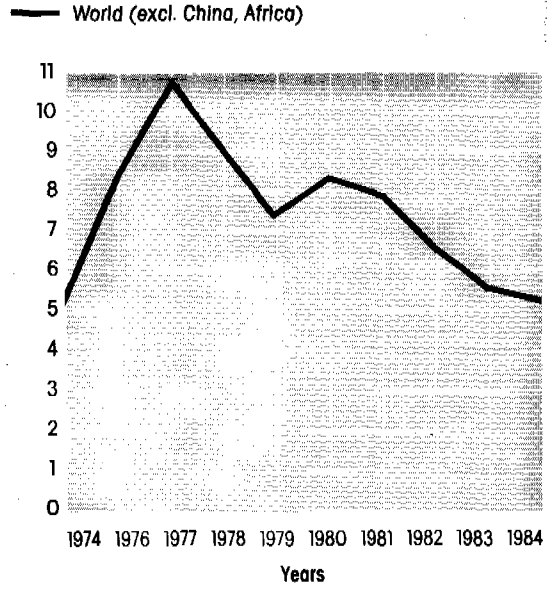
Pregnant women are at heightened risk from malaria infection. For reasons that are not clearly understood, women lose whatever partial immunity they may have against the parasite during early pregnancy. Immunologically, they revert to the status of young children. This phenomenon is most pronounced during a first pregnancy and diminishes with each successive pregnancy. Upon the birth of the child or shortly thereafter, the women regain their ability to resist the disease. But severe malarial infections during the exposed period can cause stillbirth, fetal growth retardation, or premature delivery. Low birth weight among surviving infants greatly increases their risk of death from all causes through the first year of life (see section on Malnutrition).

The potential health gains from controlling this single disease are enormous. The direct impact of malaria on child survival is still a debated issue. Malaria accounts for 10 percent of all child deaths in highly endemic areas, but this figure does not include the silent contribution malaria makes to deaths from other causes. Figure 5-B illustrates the dramatic results of a controlled insecticide program in Kenya. Two comparable villages in a heavily infested area were selected for this study. In one village, the interior walls of the houses, where the indigenous species of mosquitoes rest before feeding, were sprayed regularly with insecticide. No spraying was done in the control villages. Over a 5-year period, general mortality in the treated village declined by half and infant mortality was reduced by 40 percent in comparison to the control village. Although the health benefits from programs of this sort have proved difficult to sustain without commensurate progress in health care services and general development, they are a clear indication of the potential of malaria control to enhance health status.

Figure 5-C

Global Trends in Malaria

Number of Cases Reported, 1974-1984



Source: WHO/Malaria Action Programme

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GLOBAL IMPACT ON CHILD SURVIVAL

More than half of the world's population lives in areas where malaria is still endemic. About a fifth, largely in developed countries, live in areas where malaria has been eradicated. The credit for this achievement belongs to a combination of socioeconomic development and special programs that succeeded in arresting the transmission of malaria. Antimalarial activities in most of the regions where malaria is endemic have significantly reduced once-uncontrolled levels of transmission. Yet an important minority of the world's population—largely located in Sub-Saharan Africa—continues to suffer the full effects of uncontrolled malaria. Control efforts in these areas have proved either too difficult or too costly to maintain. Active programs to fight malaria have yielded tangible gains, but they have failed to eradicate the disease from those areas where it is most deeply entrenched. Consequently, any slowdown in the battle against malaria could result in its rapid resurgence to uncontrolled levels.

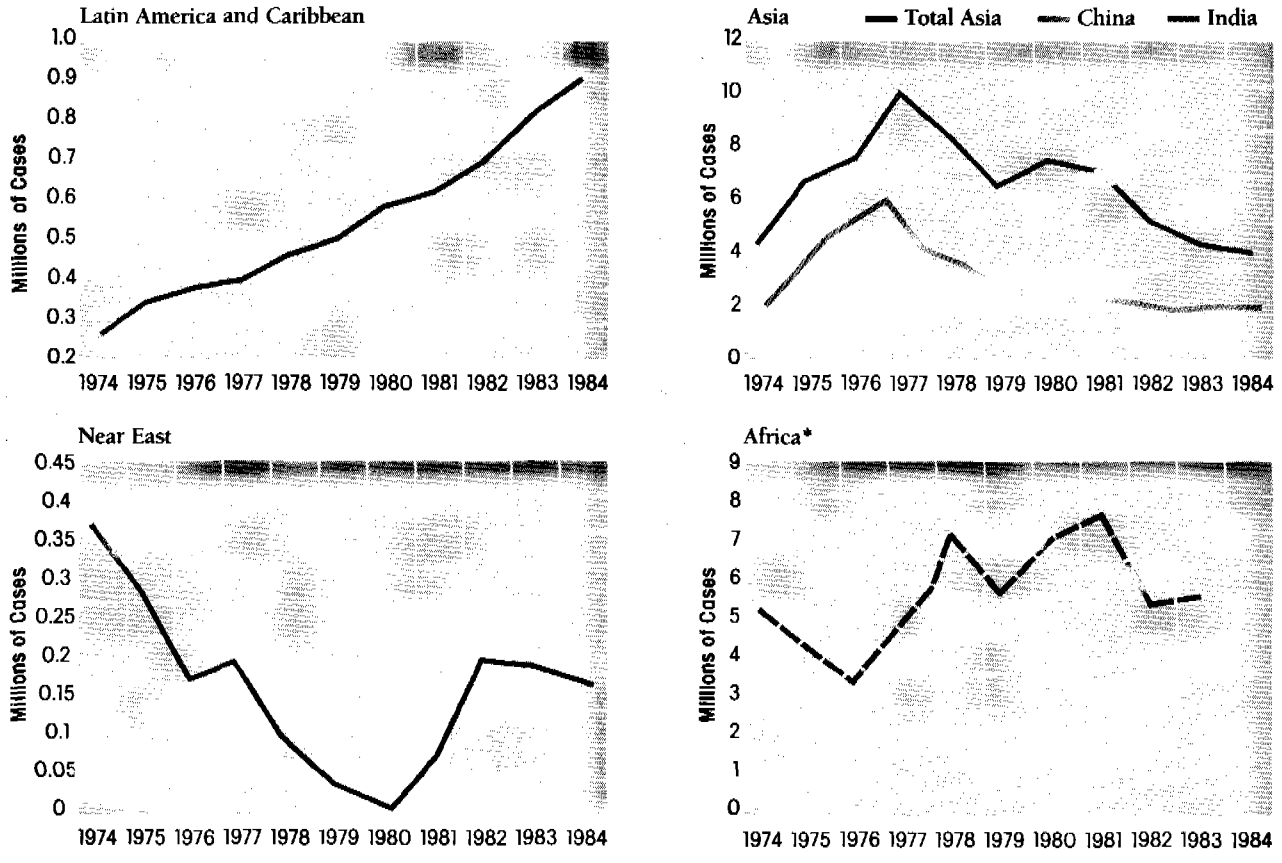
Global trends in malaria, as shown in figure 5-C, reflect an unstable equilibrium. The total number of reported malaria cases declined between 1977 and 1983, with a slight upturn for the latest year reported (1984). Regional trends, however, present a pattern of mixed success. Much of the world decline comes from effective antimalarial campaigns in the Asia region. The most significant reductions occurred in India and China, which together account for 56 percent of the world population at risk.

By contrast, the malaria situation in the Americas region as a whole has steadily deteriorated during the last decade. The major negative factors underlying the rise in reported malaria cases include the introduction of malaria to newly populated areas, the increasing resistance of malaria to insecticide and drug treatment programs, and financial pressures that threaten funding for costly antimalarial activities.

The experience of the Near East testifies to the dangers of complacency in the struggle against this disease. During the early 1970s control efforts appeared to be successfully

Figure 5-D

Regional Trends in Malaria: Number of Cases Reported, 1974-1984



* Patterns may result from unreliable reporting

Source: WHO/Malaria Action Programme data, adapted to correspond to USAID regions.

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reining in malaria in this region. A sudden resurgence in the last half of the decade, however, dampened prospects for early eradication. Turkey provides a case in point. Antimalarial programs there had contained malaria at low levels, but the conditions for epidemic malaria persisted. When the malaria parasite was reintroduced into heavily populated areas where control measures had lapsed, the result was an explosive epidemic. The number of reported cases nearly quadrupled each year for 3 years, rising from fewer than 3,000 in 1974 to some 115,000 by 1977.

SubSaharan Africa continues to be the primary focus of malaria in the world today. Of the 421 million inhabitants of this region, 372 million live in areas where malaria is endemic, more than half of them in hyperendemic areas where transmission is constant and intense. The quality of the malaria reporting is generally so poor that no real trends for the African region can be discerned from the information available, but there appears to have been little improvement in the malaria situation in this region.

A new and ominous development has also begun to hamper control efforts: current achievements are being challenged by the appearance of new drug-resistant strains of malaria and insecticide-resistant mosquitoes. Reports of malarial infections that do not respond to the standard chloroquine treatment are becoming increasingly widespread. Resistance to the second line of drug defense, fansidar, has been reported in South East Asia and South America. Similarly, the effectiveness of insecticides that once served as powerful weapons against malaria is being threatened by the emergence of malaria-carrying mosquitoes that have become resistant to one or more of the insecticides currently in use. Often-indiscriminate agricultural spraying practices have been implicated in this new threat to existing control activities. These drug and insecticide resistance problems make the development of new control techniques an urgent issue.

THE ROAD TO HEALTH

The key to controlling malaria lies in interrupting the interaction between human and mosquito. The two principal strategies of malaria control are 1) to target the mosquito vector of malaria and 2) to arrest the parasite cycle within humans.

Vector-control programs represent only the latest battle in the historic war against malaria. Development of powerful insecticides such as DDT was once expected to pave the way for eradication of the disease. Insecticides do in fact deserve much of the credit for reducing the worldwide toll of death and suffering attributable to malaria, but it is now clear that excessive reliance on this method of control gives limited results at best and at the same time fosters insecticide resistance.

Experience has demonstrated the greater effectiveness of balanced campaigns that combine chemical control with environmental measures to limit breeding sites and reduce human exposure. The possibilities here are vast. Environmental control strategies can be tailored to local communities and local mosquito species. And simple education for malaria prevention can tap into a powerful yet often overlooked resource: peoples' ability to take care of themselves.

The other principal strategy against malaria consists of fighting parastic infection. Antimalarial drugs, especially the compound chloroquine, have been the mainstay of treatment and prevention programs. The provision of antimalarials for curative purposes represents the simplest level of malaria control. This strategy, which is common in Sub-Saharan Africa, has little effect on the transmission of malaria, but does reduce mortality from severe infections. Regular periodic doses can also be used to prevent malarial infection. As with insecticides, however, the broad use of these drugs to prevent malaria represents a double-edged sword in terms of promoting the evolution of resistant strains of the parasite. Recent research has yielded a new crop of antimalarial drugs. One of these, mefloquin, has proven effective against the most dangerous form of the disease and is in the final stages of testing. The Chinese have been studying a drug called qinghaosu, which is derived from an ancient herbal remedy for malaria. Researchers hope that rational use of these new treatments can either prevent drug resistance or delay its advent.

A new weapon against malaria may soon be added to the existing arsenal: a vaccine against the first stage of malaria infection may be available within the next decade. Primates immunized with a test vaccine have successfully resisted a direct "challenge" by the malarial parasite. Field trials are presently under way and research on vaccines for the additional stages of malaria is in progress. Questions as yet unanswered about a malaria vaccine include its cost, the duration of its protection, and whether it can be given to young children. Authorities caution against the expectation that a malaria vaccine will be the "magic bullet" that can replace other control efforts. Nonetheless, a vaccine promises to be an important addition to ongoing programs against malaria.

VI. MALNUTRITION

PROFILE

Malnutrition is in many respects the common denominator of the disease and deprivation processes that reduce child survival. Undernutrition affects nearly 40 percent of all children in developing countries and contributes directly or indirectly to an estimated 60 percent of all child deaths. Lack of food is only part of the problem. Disease itself is a principal agent of child malnutrition. A heavy burden of infection places a formidable strain on what may already be a precarious nutritional balance. As a result, the child is left with a nutritional debt that causes dangerous lags in growth and further vulnerability to the cycle of disease and malnutrition. Another major factor in malnutrition is human behavior. Feeding practices, for example, especially during illness, can make the difference between normal growth and malnutrition, or even between life and death.

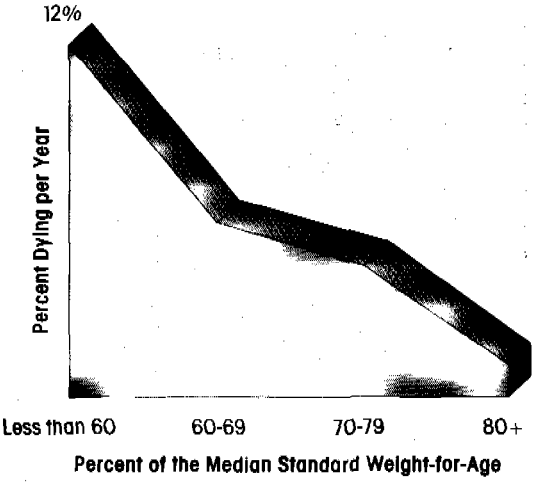
Protein-Calorie Malnutrition

Malnutrition can result from a dietary deficiency in any or all of the three major nutrient groups: proteins, calories, and micronutrients such as vitamins and minerals. Protein-calorie malnutrition is by far the most common type of malnourishment. It occurs when a child's total protein and energy intake becomes inadequate for normal growth. A child is considered to have protein-calorie malnutrition if his weight falls below the critical level of 80 percent of the standard median weight for his age group. Below this level, the child's risk of death increases exponentially. The graph in figure 6-A shows the experience of children under age 3 in Punjab, North India. Their probability of death was found to nearly double with each 10 percent drop in weight-for-age below the 80 percent level.

The most severe levels of protein-calorie malnutrition are kwashiorkor and marasmus. Although they represent only a small part of the malnutrition picture, these extremes have become familiar to television audiences as a result of coverage of recent disasters in Africa. The flaky skin, thinning hair and swollen bellies of child victims are symptomatic of kwashiorkor. It results from a reduction in protein metabolism relative to calories that can be precipitated by a chronic dietary imbalance or a severe infection such as measles. Marasmus is characterized by a state of emaciation seen most frequently among famine victims. It occurs when protein and calories are equally and drastically deficient from the diet. Children cannot survive long in either of these states. Without improvement, death comes quickly.

Figure 6-A

Risk of Death by Nutritional Status: Children Age 1–36 Months, Punjab, India



Source: Keilmann, A.A., C. McCord "Weight-for-Age as an Index of Risk of Death in Children," *Lancet*, June 10, 1978.

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Vitamin A Deficiency

Although micronutrients are only required in minute quantities, their absence from a diet can carry severe consequences. Of the many vitamins and minerals essential to a balanced diet, vitamin A, iron, and iodine play especially prominent roles in child survival. Vitamin A deficiency has long been recognized as the leading cause of childhood blindness in the world. Now, however, there is evidence that the impact of vitamin A deficiency on a child begins well before it induces blindness. Indonesian children manifesting mild symptoms of vitamin A deficiency were found to be at 3 times greater risk of illness and 4 to 12 times greater risk of death than children with no outward symptoms. The presence of these mild symptoms was more closely associated with subsequent illness and death than even the presence of protein-calorie malnutrition.

Iron and Iodine Deficiencies

Iron deficiency is the leading cause of anemia, an exhausting disease that affects more than half of all children and pregnant women in the developing world.

Iodine deficiency causes goiter in adolescents and adults but is rarely seen in children. It becomes an especially

serious issue for child survival when it affects pregnant women. Children born to iodine-deficient mothers are at risk of being mentally retarded to some degree. The most serious outcome is cretinism, where the child is born deaf-mute, mentally retarded, and shows abnormal motor development.

IMPACT ON CHILD SURVIVAL

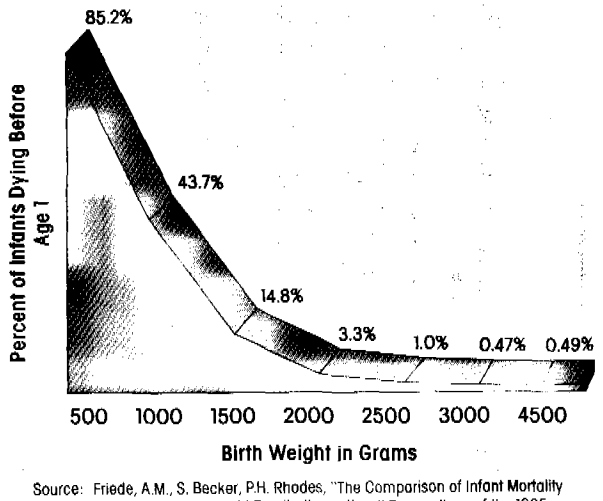
Low Birth Weight

The road to health for a child begins before birth. In developing and developed countries alike, the birth weight of an infant is the most important single determinant of its chances for survival. Low birth weight infants—those who weigh less than 2,500 grams (5.5 pounds) at birth—experience higher mortality from all causes through the first year of life and beyond. Figure 6-B depicts the pattern of decreasing risk with increasing birth weight. The data are drawn from births in the state of Massachusetts. While death rates for infants born in developing countries are certainly higher at all points, the dramatic rise in mortality below 2,500 grams occurs in all regions.

Of the many factors that influence the incidence of low birth weight, the most common relate to the nutritional state of the mother both before and during pregnancy. A woman's caloric needs increase during pregnancy and rise to still higher levels when she breastfeeds. For many women in areas where fertility is high, there is barely time to recover the nutritional debt from one pregnancy and breastfeeding experience before the next one begins. The problem is intensified by heavy physical workloads during pregnancy, maternal malnutrition, numerous pregnancies, and short birth intervals, all of which are important risk factors for low birth weight. Whatever the root cause, a low birth-weight infant faces an uphill battle. He is already malnourished when his life begins.

Figure 6-B

Infant Mortality by Birth Weight
State of Massachusetts: 1972



Source: Friede, A.M., S. Becker, P.H. Rhodes, "The Comparison of Infant Mortality Rates When Birthweight Distribution Differs," Proceedings of the 1985 Public Health Conference on Records and Statistics, Hyattsville, MD., Public Health Service, 1986: p. 370-374.

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Feeding Patterns

The impact of nutrition on the survival of a child is generally considered in two time frames, the period of exclusive breastfeeding which optimally extends 4 to 6 months from birth, and the subsequent weaning period, when the diet of breastmilk begins to be supplemented with other foods, which extends to the end of the third year. Good nutrition during the child's first 6 months is especially critical. An infant's weight should more than double during this period, when the rate of growth is faster than at any other period in life. A child's health is particularly sensitive to interruptions in growth at this time, whether they result from inadequate nutrition or from a heavy burden of infection. Nature provides both a balanced diet and important protection from disease in the form of breastmilk, as noted in The Road to Health section, which follows. The importance of breastfeeding cannot be overemphasized. In areas where there are no viable feeding alternatives, infants who are weaned early or never breastfed at all are at significantly higher risk of illness, malnutrition, and death.

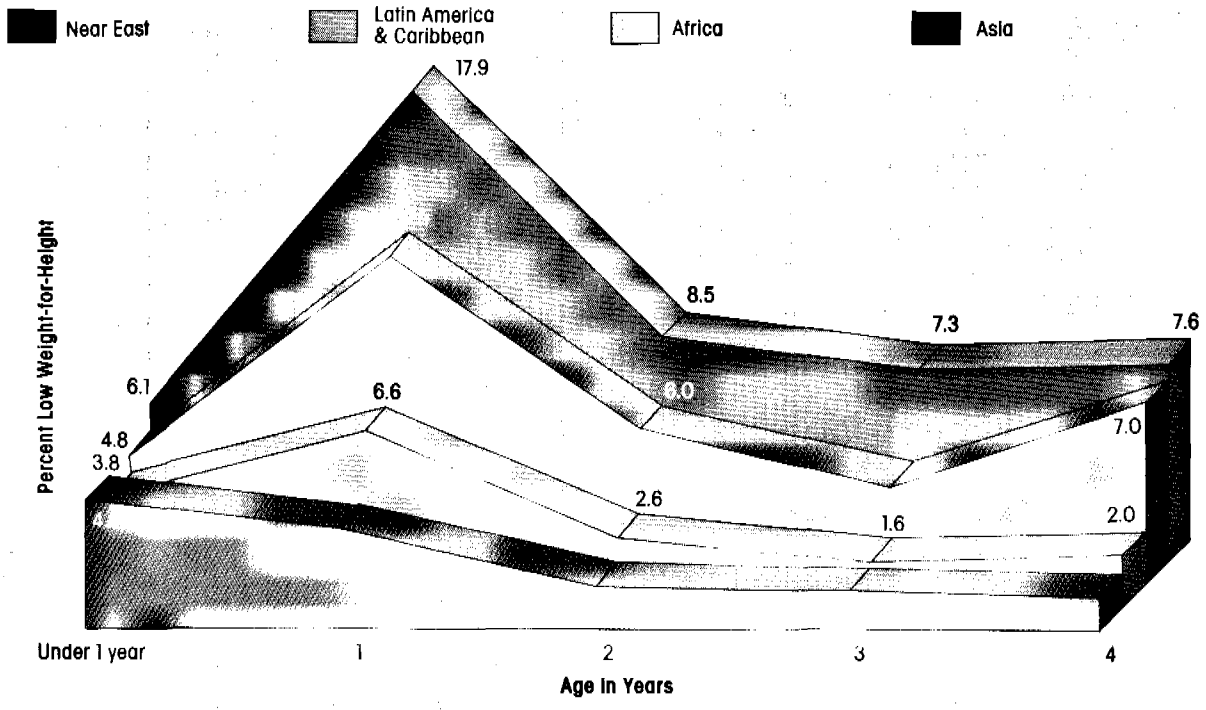
Weaning

Beyond the age of 6 months, breastfeeding alone will not meet the nutritional needs of a growing infant. The weaning period is a critical passage during which the child establishes greater independence from his mother. The price of that independence is greater exposure to the outside environment and its attendant agents of disease and malnutrition. His new supplemental diet introduces the child to common contaminants in food and water, and greater mobility brings him into contact with a range of new diseases carried by other children and adults. At the same time, the passive immunity inherited from his mother, which protected the child from many of these diseases in the first months of life, has begun to decline. As a result, the weaning period is marked by frequent illness. Respiratory and diarrheal diseases increase sharply. In developing countries, the major contagious diseases of childhood (e.g., measles, pertussis) also tend to converge at this time.

Figure 6-C

Regional Pattern of Acute Protein-Calorie Malnutrition

Median Prevalence of Low Weight-for-Height (Wasting) by Age



Note: Points represent regional medians for each age group. Data were available for 25 countries.

Source: Keller, W., C.M. Fillmore, "Prevalence of Protein-energy Malnutrition," World Health Statistics Quarterly, 36(2), Geneva, Switzerland, 1983.

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Nutritionally, the child switches from a diet that is biologically determined to one that is socially determined, often to his detriment. Traditional weaning diets frequently lack sufficient quantities of essential nutrients, particularly protein, vitamin A, and iron. Sometimes the problem is an absolute lack of food. More often, however, available foods that contain these elements are not considered "appropriate" for young children. Foods for young children need to have more calories per given amount, because while children's caloric needs are high, their stomachs are small. They cannot consume as much as adults, and therefore have difficulty in meeting energy needs from normal adult foods. For their part, children often have their own ideas about what is appropriate to eat. Foods high in protein and vitamin A are often excluded from weaning diets. As a result, children are at higher risk of malnutrition during the weaning period than at any other time. The regional patterns of acute protein-calorie malnutrition depicted in figure 6-C show a dramatic peak around age 1, which corresponds to the midpoint of the weaning period. Acute protein-calorie malnutrition, or wasting, is measured by the ratio of a child's weight to his or her height. Below 80 percent of the median weight for healthy children of the same height, a child is said to be acutely malnourished. This measure is considered to be a sensitive indicator of a child's immediate nutritional status and health risk. The problems of vitamin A deficiency and nutritional anemia also reach their highest levels in early childhood. The impact of poor weaning practices and heavy burdens of infection is seen in the high yearly toll of deaths in this age group.

The Disease-Malnutrition Link

The strong interaction between disease and malnutrition stems from both biological and social causes. Biologically, many diseases raise a child's metabolic rate and hence his food requirements. Certain parasitic organisms actually compete with the child for ingested food, and diarrheal diseases work to inhibit food absorption. Very often diseases occur together, posing a serious challenge to the needs of a child who may already be limited to a subsistence diet. On the individual level, the child's loss of ap-

petite is apt to further limit food intake. On a social level, when a child becomes sick, the parental response may be to stop regular feeding, which results in further deterioration of the child's nutritional status.

As disease can precipitate malnutrition, so malnutrition can complicate disease. Deprived of essential nutrients, the body loses its normal ability to resist disease. Both the severity and duration of disease have been shown to increase in moderately and severely malnourished children. Consequently, mortality from common communicable diseases is far higher among children in poor developing populations than among children who receive adequate diets.

The synergism of disease and malnutrition—the tendency of these conditions to complement and intensify each other when combined—is an important factor in child survival. At a critical level of growth retardation and disease burden, this synergism establishes a vicious cycle that culminates in death. It has been estimated that malnutrition is a contributing factor in 60 percent of all infant and child deaths in the developing world.

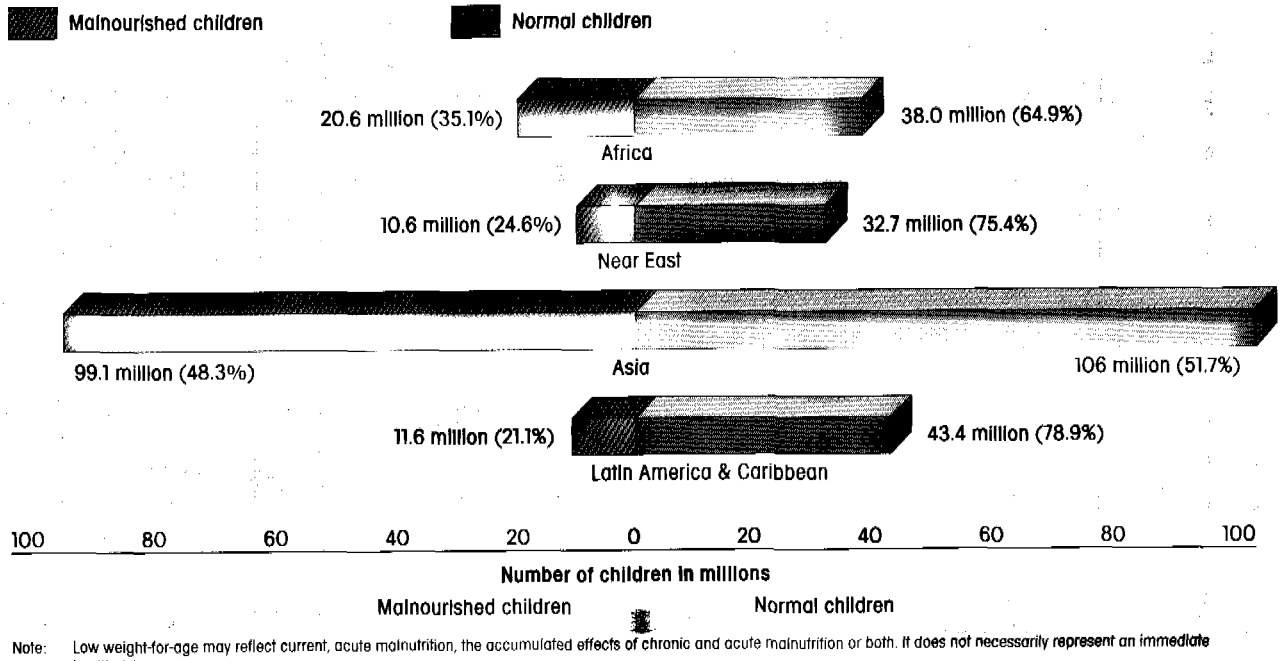
THE GLOBAL MAGNITUDE OF MALNUTRITION

The world has made significant progress in the battle against hunger over the last two decades. Many countries that were once periodic victims of famine have now become net food exporters. India is an example of such a country (see the section on Food Availability). This progress is reflected in a general decline in infant and child mortality during this period, but much remains to be done. In the developing world today, it is estimated that nearly 40 percent of all children under 5 suffer from acute or chronic protein-calorie malnutrition. In absolute numbers, this translates into 141 million children in 1980. Figure 6-D shows the estimated regional prevalence of this condition among children. More than one-third of African children fall below 80 percent of their expected weight-for-age, as do almost half of children in the Asian region. The estimated prevalence is lower in Latin America and the Near East at 21 and 24 percent respectively. Because of Asia's large population size and high proportions of

Figure 6-D

Estimates of Childhood Malnutrition in Developing Regions, 1980

Number and Percent of Children Age 6 to 60 Months
Above and Below 80 Percent of the Median Standard Weight-for-Age



Note: Low weight-for-age may reflect current, acute malnutrition, the accumulated effects of chronic and acute malnutrition or both. It does not necessarily represent an immediate health risk.

Source: Adapted from Haaga, J., C. Kenrick, K. Test, J. Mason, "An Estimate of the Prevalence of Child Malnutrition in Developing Countries," World Health Statistics Quarterly, Table 38, Geneva, Switzerland, 1985.

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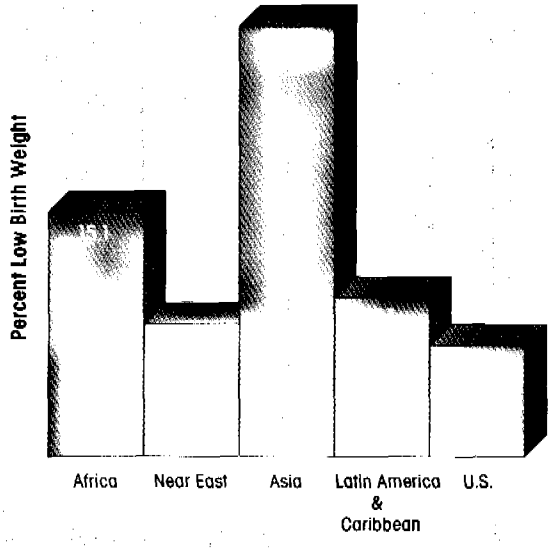
Figure 6-E

Percent Low Birth Weight
U.S. and Developing Regions, 1982



Source: Adapted from World Health Organization, "The Incidence of Low Birth Weight: An Update," Weekly Epidemiologic Record, 59(27): 205-212, Geneva, Switzerland, 1984.

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underweight children, some 70 percent of the world's malnourished children are found in this region.

The high global prevalence of malnutrition is especially astonishing in view of the fact that the estimates were made from data based around 1980, when the world was relatively free of famine. These children are the victims of the persistent diseases and sometimes subtle nutritional deprivation that act under "normal" conditions of poverty. Such severe and deadly forms of protein-calorie malnutrition as marasmus and kwashiorkor are in fact relatively rare if highly visible extremes of a much more pervasive problem.

As a closely related precursor of protein-calorie malnutrition, low birth weight follows the same geographic pattern. In figure 6-E, the regional percentage of all births under 2,500 grams (5.5 pounds) is shown for 1982. The problem is severest in Asia where an estimated 27 percent of infants born in 1982 were below this weight. In India, which accounts for more than half of births in this region, excluding China, 30 percent of newborns were critically underweight, as were fully half of infants in Bangladesh. African countries report between 10 and 20 percent underweight births, with an average of 15 percent. By contrast, fewer than 7 percent of all infants born in the United States weighed less than 2,500 grams. This tiny proportion of newborns nonetheless accounted for two-thirds of U.S. deaths in the first month of life and 20 percent of infant deaths from 28 days to the end of the first year.

Each year more than a half-million children become blind for lack of vitamin A; two-thirds die within weeks of losing their sight. Another 6 to 7 million children are believed to suffer from milder forms of vitamin A deficiency, which has been identified as a significant public health problem in 21 developing countries.

Iron deficiency anemia most often affects women of childbearing age and young children. Pregnant women are the most susceptible. Although this is true for both developed and developing countries, anemia in the developing world is 4 to 5 times more frequent. Frequent infections and deficient diets consign more than half of developing country children to the draining effects of anemia. More than 60 percent of pregnant women are affected in Asia and Africa. This reflects the greater iron requirements of women in general and especially of pregnant women, whose needs are likely to be increased in developing countries by iron-poor diets and parasitic infections.

THE ROAD TO HEALTH

The ultimate resolution of the problem of global malnutrition lies in a people's ability to feed themselves. Short-term relief efforts play a lifesaving role during extreme cycles of famine, but food scarcity issues can only be permanently resolved through long-term economic development.

In this context, however, it is important to recognize that simple measures to improve health and feeding practices can be expected to have a significant impact on malnutrition and child survival while long-term development is proceeding.

Improved Health and Nutrition During Pregnancy

Prevention of low birth weight is the first step on the road to health. A number of possible courses of action can reduce the risk of low birth weight. Both reducing heavy workloads during pregnancy and providing dietary supplements to women at high risk act to diminish the nutritional strains of pregnancy. The strong association between high-risk fertility and low birth weight underscores the importance of family planning in preventing low birth weight and improving maternal and child health.

Breastfeeding

The nutritional value, anti-infective properties, and birth-spacing effects of breastfeeding make it one of the most powerful forces for enhancing child survival. Nutritionally, breastmilk provides the optimal balance and quantity of essential nutrients to infants up to 6 months of age. Even

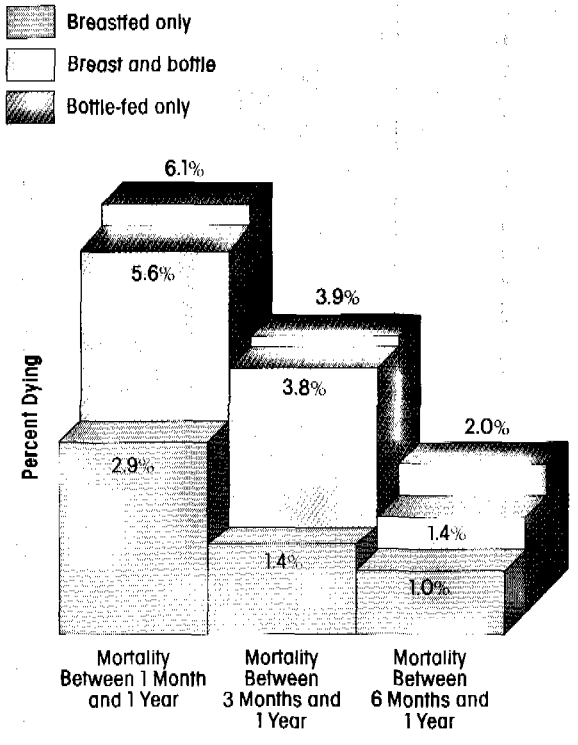
after supplementation with other food has begun, breastmilk can continue to be an important source of calories, protein, and micronutrients through the second year of life. Alternative feeding methods can by contrast only approximate the nutritional completeness of mothers' milk, and cannot impart the additional benefits that breastfeeding brings to both mother and child.

Breastfeeding and Disease: Breastmilk has an ideal nutritional balance and also contains anti-infective properties that help protect the child from early exposure to a disease-ridden environment. Breastmilk is sterile and passes directly from mother to child, virtually eliminating the possibility of contamination. This point is far from trivial in areas where food- and water-borne diseases are a major cause of sickness and death. Moreover, breastmilk contains maternal antibodies, enzymes, and other chemical properties that actively resist infection. Numerous studies have found that breastfed infants experience lower levels of mortality and fewer episodes of gastrointestinal and respiratory illness than infants in the same environment who are only partially breastfed or not breastfed at all. Figure 6-F shows that in rural Chile, exclusively breastfed infants experienced half the mortality of bottle-fed infants, while mortality of infants who were both breastfed and bottle-fed ranged in between. Regardless of the time period examined during the first year, mortality rates for infants who were exclusively bottle-fed were twice those of exclusively breastfed infants. The anti-infective properties of breastmilk clearly play a crucial role in enhancing child survival in a hostile disease environment.

Birth Spacing: An additional benefit of breastfeeding in the context of child survival is the important contraceptive effect it has on the mother, improving the chances of survival for both the newborn and the child that follows. Breastfeeding prolongs the anovulatory period that follows childbirth during which a woman is naturally protected against a succeeding pregnancy. The extent of contraceptive effect depends on the frequency, duration, and intensity of breastfeeding. Women who breastfeed regularly from the time of giving birth can extend this protective interval over 1 to 2 years. In many parts of the developing world, breastfeeding has a greater impact than any other contraceptive method in promoting healthful birth-spacing. The importance of birth-spacing to child survival is examined in detail in the section on high-risk fertility.

Figure 6-F

Mortality for 3 Different Time Periods During First Year of Life By Source of Milk: Rural Chile



Source: Adapted from Plank, S., M. Milanesi, "Infant Feeding and Infant Mortality in Rural Chile," Bulletin of the World Health Organization, 48: 201-210, Geneva, Switzerland, 1973.

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Breastfeeding Promotion

In many areas of the developing world, prolonged breastfeeding continues to be the rule. Its prevalence is generally highest in poorer, rural areas. Within the last 10 years, there has been a dramatic resurgence in rates of breastfeeding in the developed world as awareness of its natural benefits has grown. Among women in developing countries, however, the trend has been away from breastfeeding, particularly in urban areas. Given the high fertility and poor health conditions that still characterize these areas, a decline in breastfeeding poses a serious threat to improvements in child survival. It is estimated, for example, that if breastfeeding patterns in Bangladesh were to fall to U.S. levels, infant mortality there would double.

The promotion of breastfeeding to counter this trend has become an important aspect of child survival programs. These generally take three forms: information and support programs in the community, training programs for health professionals, and efforts to change hospital practices to encourage new mothers to begin breastfeeding. Information programs have enlisted the support of the media and the medical profession to get the message of breastfeeding's unique benefits across. In modern hospital settings, the decision to breastfeed is often influenced by hospital practices and the advice of health professionals in the first few days following birth. Women who are allowed to room-in with their newborns appear to be more likely to start

breastfeeding, which both fosters intimacy between mother and child and increases the likelihood that the mother will continue to breastfeed. Figure 6-G shows the results of an intensive breastfeeding promotion program in Costa Rica. Rural hospitals that instituted a rooming-in policy witnessed a significant rise in the number of mothers breastfeeding at birth and during the child's first year. When rooming-in and other activities were undertaken to encourage breastfeeding, another hospital program recorded a 75 percent drop in neonatal mortality rates over 5 years, mostly from a decrease in diarrhea deaths.

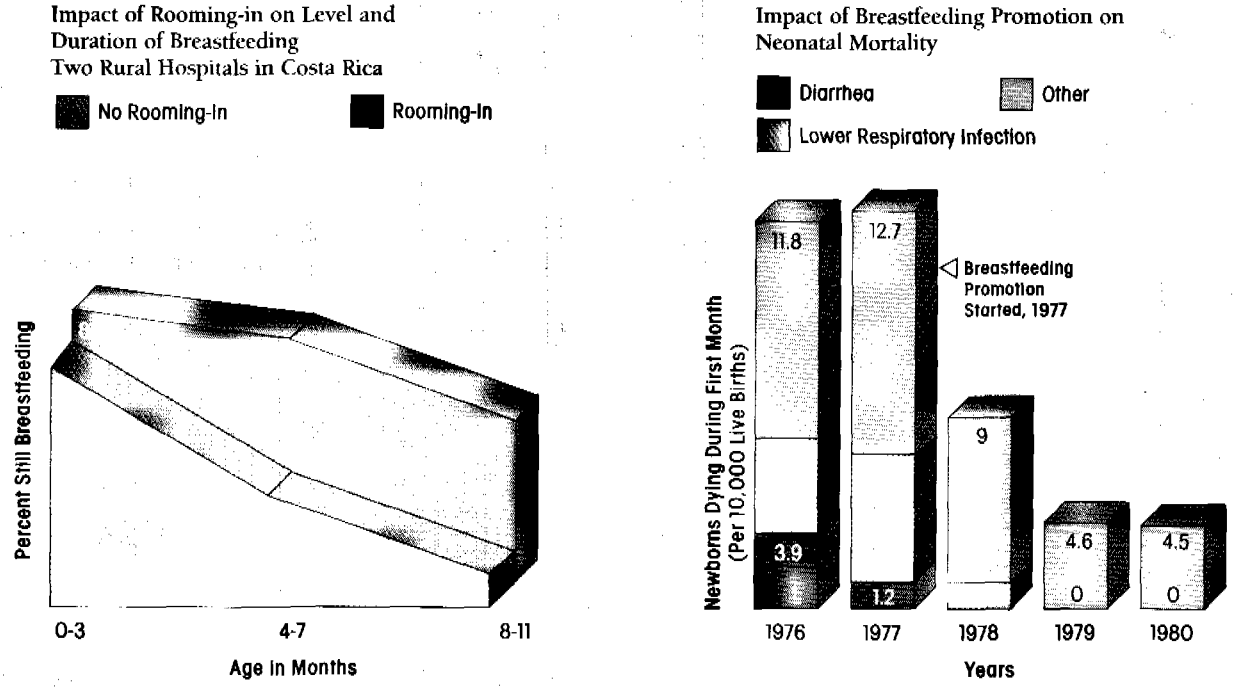
Improved Weaning Practices

The promotion of careful weaning practices is another important health intervention. The extent of risk incurred in the weaning transition depends on when it begins and how abruptly it ends. Gradual weaning is safest for the child. As he grows accustomed to a supplemental diet, he still enjoys a level of disease protection from breastmilk and receives the benefits of an important source of proteins, calories, and vitamins. In fact, breastmilk may provide the major source of such essential nutrients as iron and vitamin A when they are lacking from weaning foods. In a hostile disease environment, early and abrupt weaning has serious health implications for the child. Sudden cessation of breastfeeding can occur if the child becomes sick or the mother becomes pregnant again. Deprived of a gradual transition, the child must adjust to a new diet, increased exposure to disease, and loss of immune protection all at once. The younger the child, the more dangerous such abrupt weaning becomes.

Healthy weaning means insuring that the child's new diet contains the nutrients necessary to sustain normal growth and development. Efforts to ensure healthy weaning vary from providing direct food supplements to pre-school children to simple education and the promotion of low-cost, locally available weaning foods. A single vitamin A capsule costs as little as 2 cents and can protect a child against blindness and probably other illness for a full 6 months. In the case of micronutrients like iron and iodine, programs at the national level to fortify common foods sold in markets provide more comprehensive protection.

Figure 6-G

Impact of Breastfeeding Promotion
Two Examples from Costa Rica



Source: Mata, L., et al., "Promotion of Breast-Feeding, Health, and Growth among Hospital-Born Neonates, and among Infants of a Rural Area of Costa Rica," Diarrhea and Malnutrition, L.C. Chen, N.S. Scrimshaw (ed.) Tokyo, Japan: Plenum Press, 1983, pp. 177-203.

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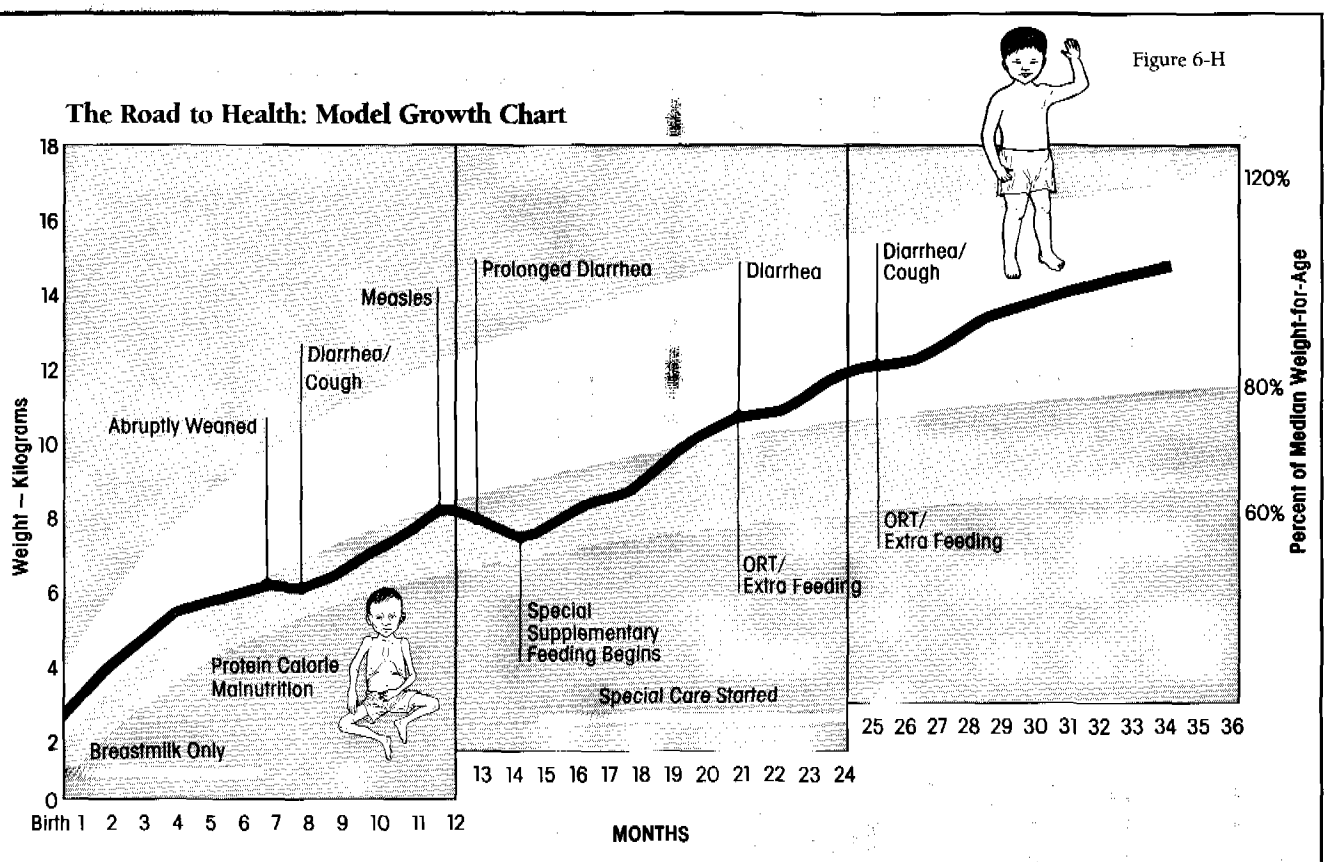
Figure 6-H



This child is breastfed from birth and starts normal growth. But his weaning begins late and ends abruptly. When measles strikes, followed by a prolonged case of diarrhea, weight loss becomes critical. Brought into a clinic with protein calorie malnutrition, the child starts a special program, receiving dietary supplements and immunization, while his mother learns simple techniques for ORT and disease prevention. Even with occasional infections, the child's growth rebounds and within a year he is back on the road to health.

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Feeding During Illness

Repeated illness need not result in serious growth lags and malnutrition. The importance of continued feeding through disease episodes must be stressed, especially when the conventional wisdom calls for withholding food. Even when feeding is continuous, a child can lose weight from serious or prolonged infection. Extra feeding is essential to fuel a child's "catch-up growth" during the recovery period.

Growth Monitoring

Growth monitoring is one of the cornerstones of global strategies to improve child survival. When periodic measurements of weight are recorded on a growth chart over time, the chart provides a progress report of a child's growth and development from birth. The "road to health" charted by the upper and lower lines in figure 6-H describes the normal range of weights for healthy children from birth to age 5. A child who enjoys steady weight gain and can stay between these lines has greatly improved his chances for survival over those of a child who slips below the lower limit into malnutrition. The chart is a sensitive indicator of pauses or lags in growth over time. Regular measurements can alert parents to the dangers of undernutrition and the need for additional feeding.

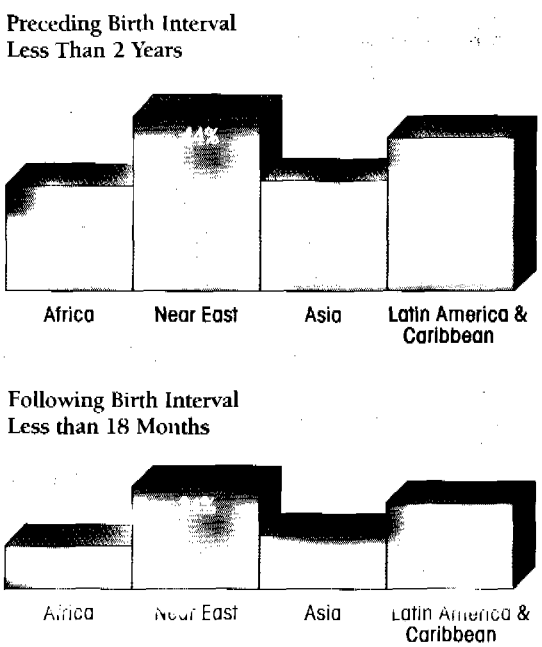
VII. HIGH-RISK FERTILITY BEHAVIOR

PROFILE

Three aspects of childbearing have an important effect on child survival beyond the risks posed by malnutrition, infection, and lack of health care. They are the mother's age at birth, the number of children she has previously borne, and the length of time between births. Of these factors, the birth interval appears to have the greatest impact on child survival. A child who is born soon after another child, or whose birth is rapidly followed by another birth, has a much greater chance of dying. Many children are placed in double jeopardy by being born between two short intervals. Short intervals are 2 years or less, a time period that gives a mother at most little more than a year to breastfeed, to recover from the physical and nutritional strains of pregnancy and breastfeeding, and to prepare for the next child. The shorter the interval the greater the risk to the child. By the same token, when 1, 2, or 3 years are added to the interval, the child's survival chances tend to rise accordingly.

Figure 7-A

Percent of Births Close to Another Birth



Note: Values are the unweighted average percent of surveyed countries in a given region.

Source: Hobcraft, J., J.W. McDonald and S.O. Rutstein, "Child-Spacing Effects on Infant and Early Child Mortality," Population Index, 49(4): 585-618, table 2, Princeton University, N.J., 1983.

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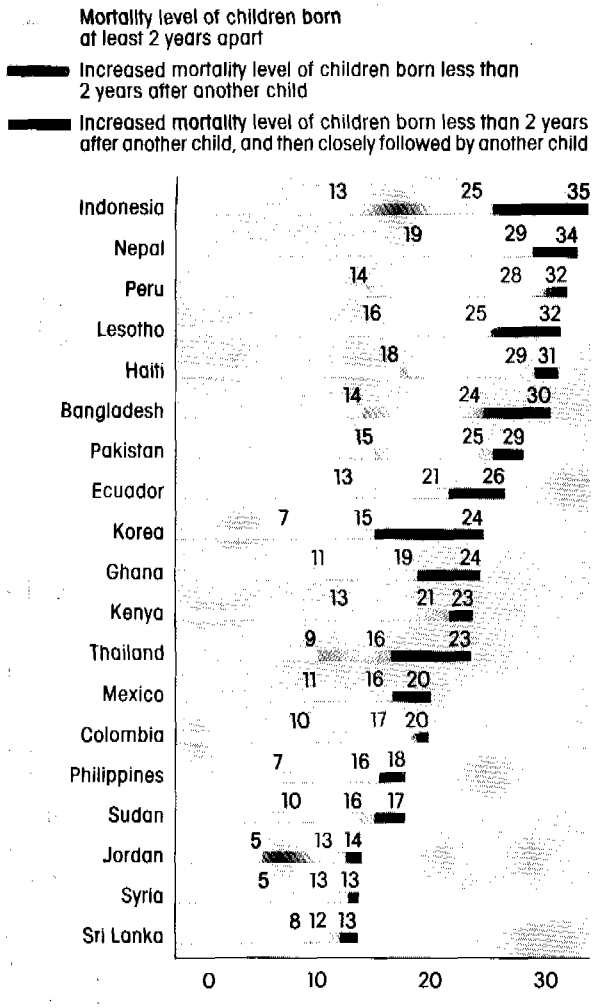
Figure 7-B

Percent of Children Who Die Before Age 5, When Births are Spaced at Least 2 Years Apart, and When a Preceding and/or Following Birth Occurs Within 2 Years



Source: Hobcraft, J., J.W. McDonald and S.O. Rutstein, "Child-Spacing Effects on Infant and Early Child Mortality," Population Index, 49(4): 585-618, Table 9, Princeton University, N.J., 1983.

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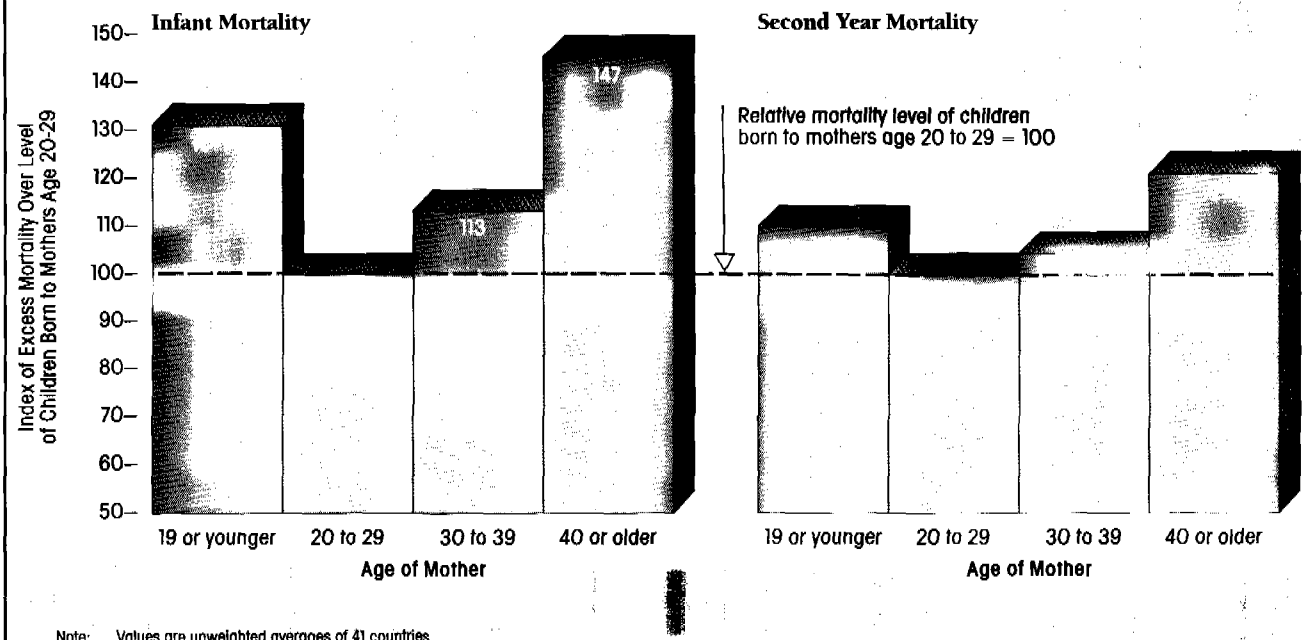
Figure 7-C

Relative Mortality Levels of Children Born to Mothers of Different Ages



Note: Values are unweighted averages of 41 countries.

Source: Rutstein, S.O., "Infant and Child Mortality: Levels, Trends and Demographic Differentials," Revised Edition, World Fertility Survey Comparative Studies No. 43, Table 12, International Statistical Institute, Voorburg, Netherlands, 1984.

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IMPACT ON CHILD SURVIVAL

Time Between Two Births

Short birth intervals are a universal health risk. Children born in quick succession are at greater risk of dying in every region of the world, in both urban and rural areas, and in countries at all levels of mortality. Moreover, close birth-spacing increases mortality in families at all socioeconomic levels, even those in which the parents are wealthy and well-educated. The adverse effects of close spacing afflict children born to women of all ages, and children of all birth orders. Children of every circumstance are disadvantaged by being born less than two years apart. Sustaining a longer interval between births provides a simple preventive measure against a major hazard.

Short intervals between births affect many children. By not spacing births, a woman reduces the survival chances of both her young infant and her next child. It is common in many developing countries for women to bear children in rapid succession, and where fertility is high, most children will have both an older and a younger sibling. Figure 7-A shows regional proportions of children who are born soon after another child, and whose arrival is quickly followed by the birth of yet another child. In some countries nearly half of children are born less than 2 years after an older sibling, and one-fourth do not reach their first birthday before their mother becomes pregnant again. Many of these children find themselves in double jeopardy when they arrive between two close births. In looking at the dangers of close spacing, and the numbers of children subject to such risk, it is possible to estimate the number of deaths attributable to this cause. During 1986 approximately 2 million children under 5 will die because of hazards associated with rapid childbearing. It is estimated that, on average, 1 in 5 infant deaths could be averted by longer intervals between births.

Maternal depletion: The detrimental effect of inadequate intervals between births has a number of causes. Because women who bear children rapidly do not have adequate time to recover from the demands of a prior pregnancy and breastfeeding, they become nutritionally and physically exhausted. Maternal depletion syndrome, as this exhaustion is called, may cause the birth of premature, underweight infants and result in inadequate breastmilk, both of which are major health risks.

Premature and abrupt cessation of breastfeeding: The onset of another pregnancy soon after the birth of a child is likely to cause him to be weaned long before he should. Studies have shown that abrupt and premature cessation

of breastfeeding is a major risk to the health of young children, particularly when it coincides with a pregnancy.

Competition: Children close in age are placed in competition with each other for the same maternal and familial resources. Individual parental time and attention are necessarily lessened, and family resources, including food, must be stretched further. Competition for family resources appears to be more critical among 2-,3-, and 4-year-olds than among children under two. This is seen in the fact that only beyond age 1 is excess mortality lessened when a close sibling dies.

Maternal mortality: Women who bear children in close succession are deprived of time needed to recover from the demands of pregnancy, labor, and breastfeeding. Exhaustion and higher rates of complications increase their risk of death and jeopardize the survival chances of their children.

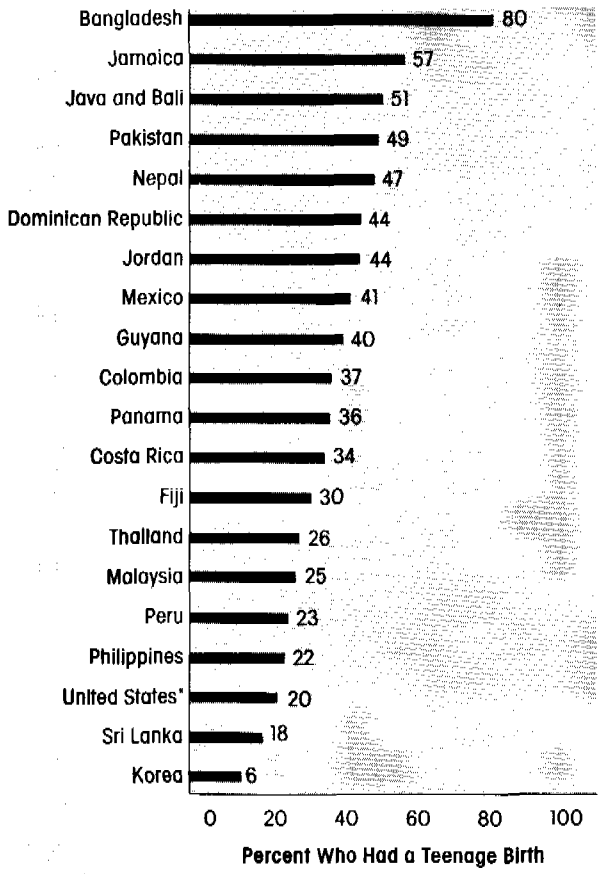
Related risks: A number of factors intervene to prevent clear understanding of why a short interval between births is such an impediment to survival. For example, some households may have conditions that affect all children—a common cause that reduces their survival chances. The death of a child may spur an early new pregnancy to replace the lost child. The newly born child, arriving after a short interval, is then likely to be exposed to the same factors that killed the first child. Women who breastfeed all of their children briefly (for such reasons as disinterest or the need to work) place each child at a disadvantage, and resume ovulation sooner than those who continue to breastfeed. Brief breastfeeding duration both decreases survival chances and shortens the interval to the next conception. Although death rates are higher for children of teenage mothers, who are highly likely to have closely spaced births, high child mortality is correlated with short birth intervals in all age groups.

Magnitude of the risk: In studies of data collected by the World Fertility Surveys (WFS), the mortality of children born at least 2 years apart is compared with that of children born in more rapid succession. In every country mortality rates are higher for children with a close prior birth; in half of the countries infant mortality rates are more than double for these children, irrespective of whether a subsequent birth follows. If births are spaced as closely as 3 births within 2 years, first-month mortality triples in more than half of the countries. The effect of a close prior birth continues beyond age 1, though with lessened severity.

When a child's birth is quickly followed by another birth, the risk of death during age 1 is often doubled, and the risk of death during ages 2, 3 and 4 often increases by 50 percent. Figure 7-B shows mortality from birth to age 5 for well-spaced children and increased mortality associated with short prior intervals, and associated with both short prior and subsequent intervals. On average, the mortality of children born soon after another child is 80 percent higher, and the mortality of children born between two short intervals more than doubles.

Figure 7-D

Percent of Women Age 20-24 Who Had at Least One Birth as a Teenager



* Percent of women exact age 20

Sources: Casterline, J.B. and J. Trussel, "Age at First Birth," World Fertility Survey Comparative Studies No. 15, Table 3, International Statistical Institute, Voorburg, Netherlands, 1980. 1984 Cohort Fertility Tables, Division of Natality Statistics, National Center for Health Statistics.

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Age of Mother at Birth

Children born to mothers in either very young or very old reproductive age groups are less likely to survive. Teenage mothers are often biologically, emotionally, socially, and economically ill-prepared for childbearing. Mothers in their late 30s and 40s, especially those who began childbearing at an early age, may be less able to withstand the stresses of pregnancy, delivery, and breastfeeding. The effect of mother's age is most important during the first year of life. Beyond infancy the effect diminishes; during ages 1 to 5, levels of excess mortality decline. Figure 7-C illustrates

the generally observed relationship between mother's age and the survival of her children. Figure 7-D shows the proportion of women who bear a child as a teenager in selected countries. Although older age has been assumed to be a major determinant of child survival, some WFS data suggest that the combination of many births and too-short intervals may be the more important factor.

Number of Children a Woman has Borne Previously

Firstborn children and those who follow many brothers and sisters exhibit high mortality, as illustrated in figure 7-E. Compared with children born second or third, excess mortality of firstborns is acute soon after birth, but after age 1, firstborns are no longer at a disadvantage. Mortality of children of high birth orders is high at all ages. These children may suffer from competition from siblings, are more likely to be cared for by someone other than their mother (usually an older sister), and their births are more likely to have been considered unwanted. Though the association between high fertility and low socioeconomic status amplifies the disadvantage, being born at a high order is a mortality disadvantage at all levels of parental wealth and education.

THE ROAD TO HEALTH

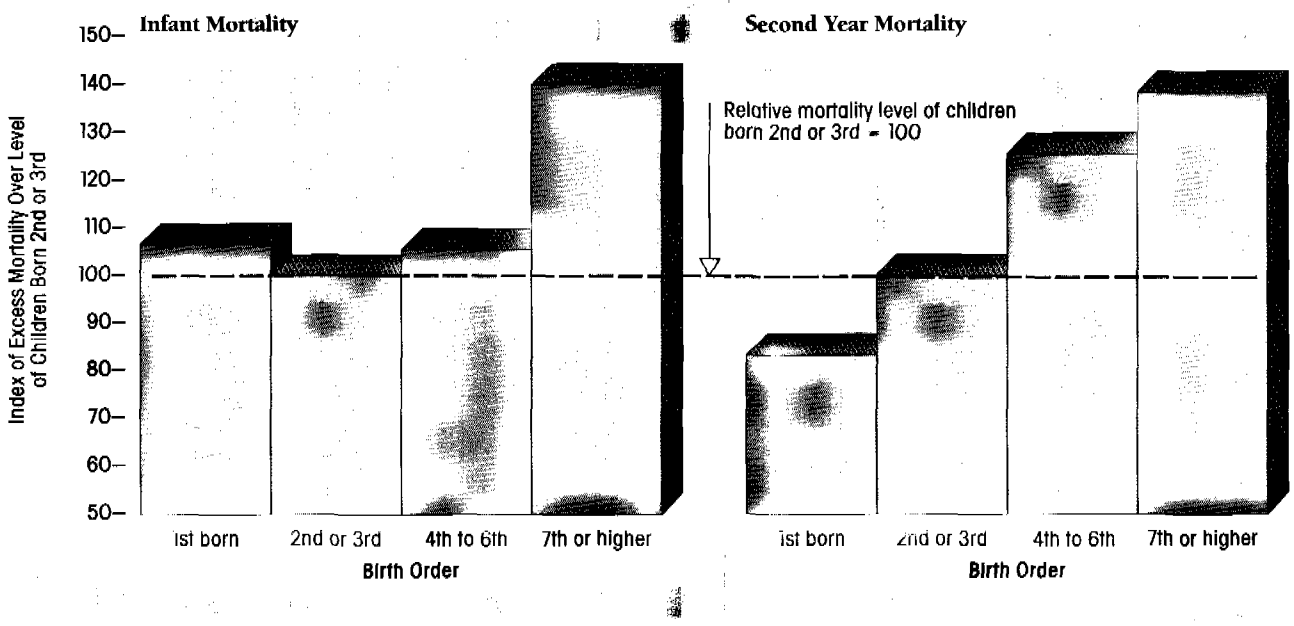
Children who are closely spaced, have numerous siblings, or are born to mothers in the youngest and oldest childbearing ages are at a significantly increased risk of dying. Differences in risk, particularly when births are closely spaced, can be enormous. The global death toll from high-risk fertility among children under age 5 will probably exceed 2 million during 1986 alone.

Fertility behavior is deeply rooted in the cultural, economic, and political fabric of a nation. Changes in the number of children parents desire, and in the belief that births cannot or should not be planned, imply major changes in family relations, the status of women, expectation of life for children, and the outlook that certain aspects of life are predetermined. Contraceptive technology exists that can enable couples to effectively plan births. It is not technology that is lacking, but global access to this technology, as well as national, familial, and individual motivation to use it. Although information and education programs can encourage family planning, without effective distribution and a reliable source of supplies, efforts and enthusiasm can be undermined.

Surveys of fertility and contraceptive use in developing

Figure 7-E

Relative Mortality Levels of Children by Birth Order



Note: Values are unweighted averages of 41 countries.

Source: Rutstein, Shea O., "Infant and Child Mortality: Levels, Trends and Demographic Differentials," Revised Edition, World Fertility Survey Comparative Studies No. 43, Table 14, International Statistical Institute, Voorburg, Netherlands, 1984.

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Table 7-A

Percent of Married Women Age 15-44 Who Do Not Want to Become Pregnant and Who Know About and Use Contraception

Region, country, and year of survey	Percent who do not want a birth during the next year	Percent who do not want any more births	Percent who use		Percent who know		Percent knowing a source for any modern method
			Traditional method	Modern method	Only traditional methods	At least one modern method	
AFRICA							
Benin 1981-82	70*	8	19	1	27	13	–
Botswana 1984	76	31	10	19	1	80	57
Cameroon 1978	–	–	2	1	6	28	–
Ghana 1979-80	65*	11	4	6	9	61	–
Ivory Coast 1980-81	41*	4	3	1	66	18	–
Kenya 1984 +	77*	35	7	10	1	83	43
Lesotho 1977	–	14	3	3	5	61	–
Mauritania 1981	54*	14	1	0	2	6	–
Nigeria 1981-82	33*	4	4	1	12	20	–
Senegal (rural) 1982	78	7	1	0	21	59	–
Sudan (north) 1978-79	–	18	1	4	1	50	–
Zimbabwe 1984	76	22	12	28	2	89	46
NEAR EAST							
Egypt 1980	74*	53	1	23	0	90	–
Jordan 1983	86	42	5	21	0	100	–
Morocco 1983-84	–	41	5	22	0	92	–
Syria 1978	–	36	5	15	1	78	–
Tunisia 1983	86	67	7	35	0	98	78
Yemen, Arab Rep 1979	27*	19	0	1	0	24	–
ASIA							
Bangladesh 1979-80	71*	48	4	9	0	96	46
Fiji 1974	84*	51	6	36	0	100	–
Java and Bali 1976	–	42	4	24	1	79	–
Korea, Rep. of 1979	81*	76	11	43	0	100	97
Malaysia 1974	90*	43	10	26	2	92	–
Nepal 1981	55	42	0	7	0	52	15
Pakistan 1975	–	42	1	4	0	75	–
Philippines 1978	–	58	21	17	0	95	–
Sri Lanka 1982	91	65	25	32	0	100	77
Thailand 1981	89	66	3	56	0	100	89
LATIN AMERICA & CARIBBEAN							
Barbados 1980-81	–	52	2	45	0	99	70
Bolivia 1983	89	74	15	11	6	51	38
Brazil (northeast) 1980	90	58	8	29	0	99	–
Brazil (southern) 1981	87	49	14	52	0	100	–
Colombia 1980	84	69	8	43	0	96	89
Costa Rica 1981	84	53	9	57	0	100	99
Dominican Republic 1983	88	72	4	43	0	99	69
Ecuador 1979	91	59	8	27	1	90	–
El Salvador 1978	93	53	2	32	0	99	–
Guatemala 1983	79	40	4	21	0	83	–
Guyana 1975	–	62	3	32	0	95	–
Haiti 1983	78	59	3	4	0	86	55
Honduras 1981	92	76	3	24	0	93	67
Jamaica 1983	97	54	3	49	0	100	94
Mexico 1979	88#	65	6	34	0	90	78
Panama 1979-80	90	63	5	57	0	99	–
Paraguay 1979	84*	31	13	25	1	95	–
Peru 1981	92*	74	25	18	6	78	65
Trinidad & Tobago 1977	–	56	6	49	0	99	–
Venezuela 1977	–	57	12	38	1	98	–

Percents not wanting a birth are adjusted to exclude the percent undecided or not stated. Traditional methods include douche, withdrawal, rhythm, abstinence, "other." Modern methods include voluntary sterilization, oral contraceptives, intrauterine devices (IUDs), condoms, injectables, and vaginal methods (spermicides, diaphragms and caps). Women knowing at least one modern method includes women who also know traditional methods.

* only fecund married women are included

\+ for married women aged 15-49, "use" statistics are for ever-married women, "source" statistic is for all women

\# percents not wanting a birth are for 1978

Sources: "Fertility and Family Planning Surveys," Population Reports, series M, No. 8, Population Information Program, Johns Hopkins University, Baltimore, Md. September-October 1985. tables 3, 6, 7, 9. "Kenya Contraceptive Prevalence Survey," Central Bureau of Statistics, Ministry of Planning and National Development, Nairobi, Kenya, 1984.

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countries indicate that most women who want another child do not want the birth within the next year. Most women know that well-spaced children are healthier. In a WHO study of 42,000 women in Latin America, North Africa, and Asia, more than 90 percent of respondents said that short birth intervals harm child health; in Zimbabwe children born too close together are said to "burn" each other. Table 7-A shows the proportions of women who do not want a birth during the next year, who want no more births at all, and who know about and use contraception. These patterns suggest that when contraception is emphasized as a spacing tool, it may be more widely adopted.

One indicator of the unmet need for contraception is the proportion of married women of reproductive age who acknowledge not wanting a child in the immediate future yet use no form of contraception. In most countries surveyed, more than 75 percent of women did not want a birth during the next year. Nonetheless, from a fourth to in some areas nearly all of these women were using no contraceptive method whatever, abstinence-based methods included. By this indicator, the unmet need for contraception is greatest in Africa, where in most countries surveyed it exceeds 80 percent. The level of unmet need also exceeds 80 percent in Bangladesh, Nepal and Haiti, and ranges from 24 to 71 percent in the rest of Asia and Latin America.

If a family's goal is to have as many surviving children as possible, high levels of fertility will be preferred, even though their children's survival chances are jeopardized. A terrible price is paid for this means of achieving desired family size. Yet it must be recognized that changes in goals and philosophy are required if deaths from high-risk fertility are to be significantly reduced. Healthful spacing of births and bearing children at healthful ages have such tremendous positive effects on child survival that marshalling the political and social will necessary to initiate these changes deserves the consideration of all.

Socioeconomic Factors and Child Survival

Education and Literacy
Availability of Modern Health Services
Income Per Capita and
Government Expenditures
Food Availability
Water Supply and Sanitation Facilities

VIII. EDUCATION AND LITERACY

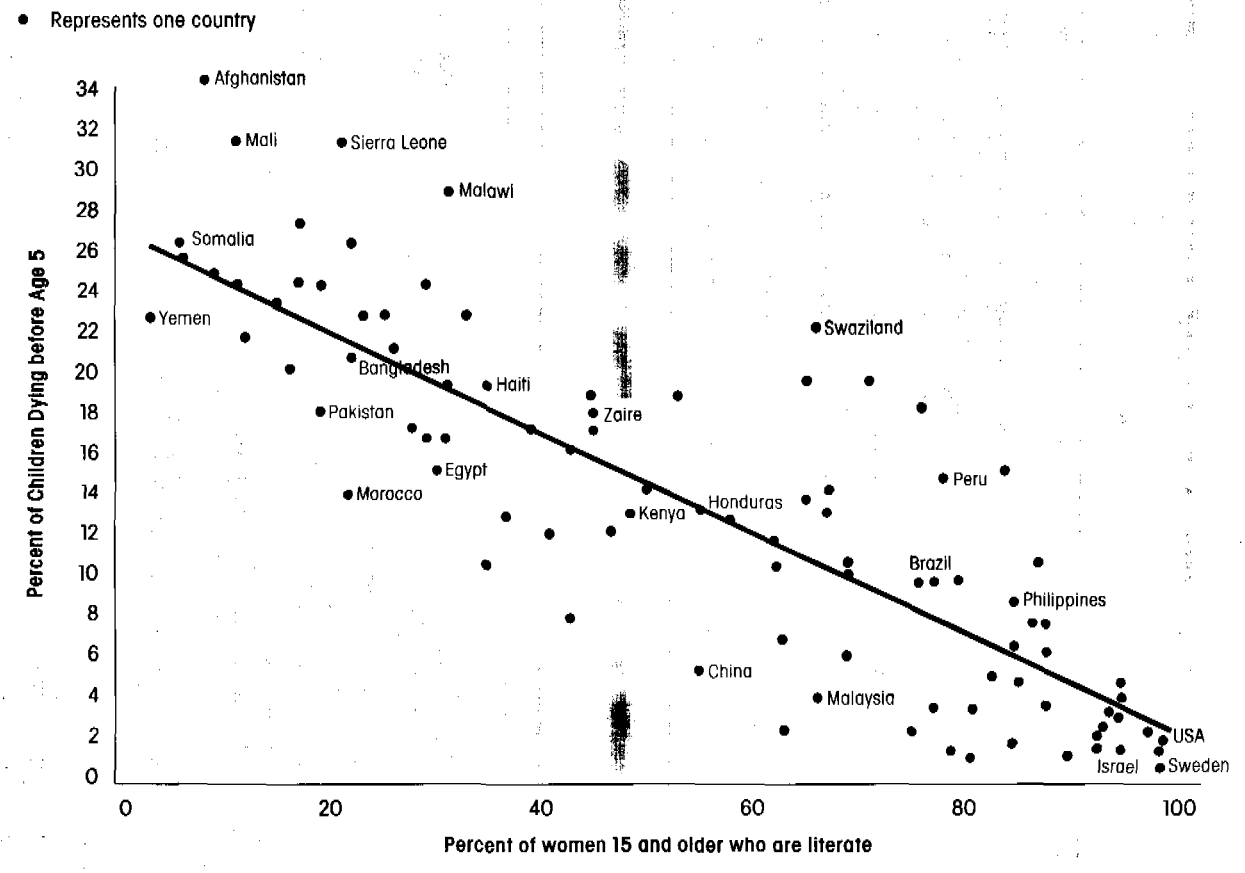
PROFILE

The lowest mortality rates are found where large proportions of the population are literate and where educational attainment is high. Because countries with high levels of education are also more likely to provide such benefits as clinics, hospitals, immunization programs, and clean water systems, education is sometimes viewed as an indicator of the presence of these other facilities. Education, however, provides a major health benefit in and of itself. Mortality levels are more closely related to national levels of literacy than to levels and distribution of income. The global association between female literacy and child mortality is depicted in figure 8-A. Each point represents a country, and shows that more children survive to age 5 in countries where more women can read and write.

Within countries, a child's risk of death is associated with the education of his parents. The impact of parents' educational attainment on child survival is greatest in countries where death rates are high. When education is commonplace and mortality is low, everyone benefits from decreased exposure to infectious diseases and the better health and sanitation practices of neighbors. Educational attainment also appears to be more important in areas where government expenditures on health facilities are low.

Figure 8-A

Pattern of Association Between Percent of Women Literate and Percent of Children Dying Before Age 5



Source: UNICEF and UNESCO. (Data are included in Tables 2 and 9 of Appendix 1.)

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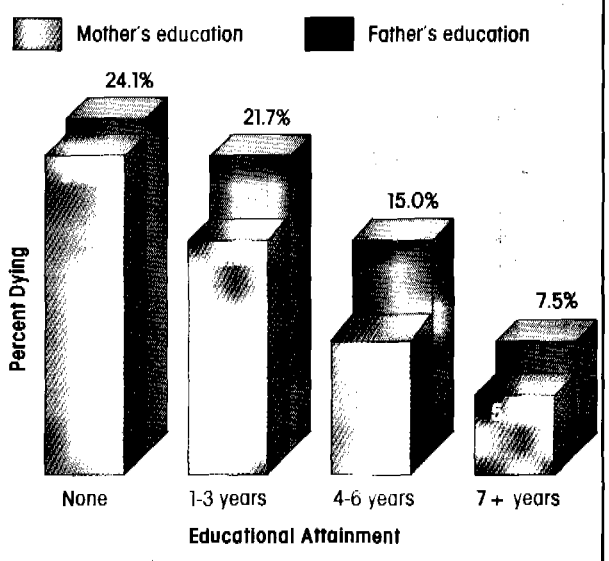
Figure 8-B

Mortality of Children Age 1-4 According to the Educational Attainment of their Mother or Father, Peru 1977-78



Source: Hobcraft, J., J.W. McDonald and S.O. Rutstein, "Socio-economic Factors in Infant and Child Mortality: A Cross-National Comparison," Population Studies, 38(2): Table 6, 1984.

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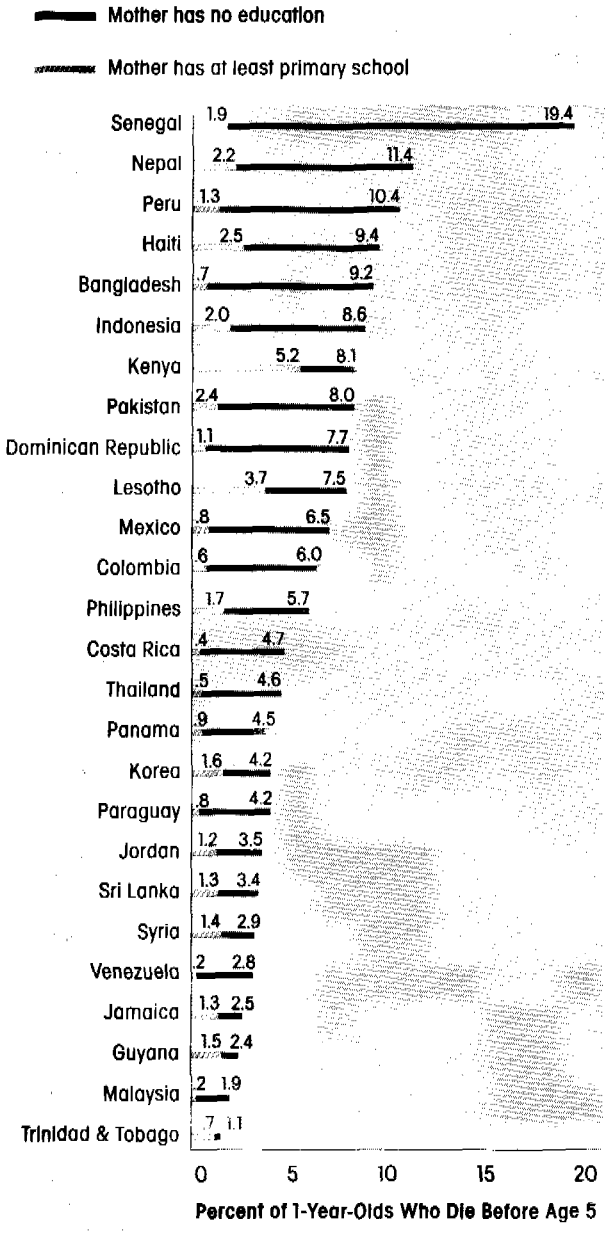
Figure 8-C

Mortality of Children From Age 1-5 of Mothers with No Education, and of Mothers With at Least Primary School Education



Source: Hobcraft, J., J.W. McDonald and S.O. Rutstein, "Socio-economic Factors in Infant and Child Mortality: A Cross-National Comparison," Population Studies, 38(2): Table 6, 1984.

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Although a child is more likely to survive if both parents are educated, his mother's educational attainment appears to be of greater benefit (figure 8-B). Studies indicate that for every year of maternal education, infant and toddler mortality is reduced by .6 percent, and for every year of paternal education, mortality is reduced by an additional .3 percent.

The importance of parental education to child survival appears to increase from infancy to age 5. Data from World Fertility Surveys on mortality among infants and children of varying socioeconomic status in 28 developing countries found the highest infant death rates to be approximately double the lowest rates. By contrast, the highest death rates of older children were often four times higher than the lowest rates. From birth to age 5, parental education emerges as more important to survival than father's occupation, mother's work status, or mother's urban or rural residence. Figure 8-C shows the difference in mortality of children age 1 through 4 of uneducated and primary school educated mothers.

Further, studies have shown that children of educated and literate parents exhibit consistently better levels of nutrition than do children of less educated and illiterate parents. This is true even when income levels are the same.

IMPACT ON CHILD SURVIVAL

Education can help persons mobilize resources for a healthier community and maximize their effective use. Schooling imparts useful skills and knowledge, and establishes new attitudes.

Literacy: Parents who can read and write have greater access to information. A literate mother who can read the instructions on a packet of oral rehydration salts is more likely to administer them correctly. She can better understand posters that offer child-care advice. The ability to write enables her to record her children's vaccinations, and to monitor their growth in height and weight.

Skills in using institutions: Women who have attended school have had experience with an institution beyond the family, and may be more likely to approach, and have skills in using, clinics and other medical institutions. They may be less shy and more articulate in asking questions of health professionals. These women may also be more likely to perceive such services as a right, and to insist that their children be given attention.

Grasping new ideas: Education improves the ability to deal with new ideas, and to accept concepts that appear contrary to common sense. The process of taking a child to a stranger, who, by sticking a needle in him, makes him howl and break out in a fever is difficult to perceive as a health benefit. A child suffering from diarrhea appears to have an excess of water, not to need more. Education is the bridge to understanding that vaccination and oral rehydration are lifesaving procedures that must be undertaken if a child is to survive.

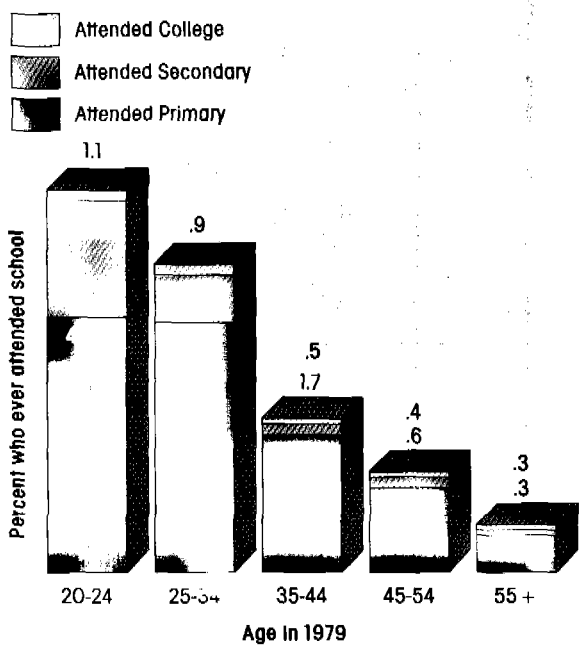
Learning self-reliance: Educated parents are less likely to be fatalistic about their children's health—to instead take more active, personal responsibility for their care. Schooling may also lessen reliance on the opinions of elders, giving educated family members the freedom to follow a more independent course in efforts to improve their well-being.

Changing perspectives on health: Schooling can change mothers' perspectives on child care and health by encouraging the provision of resources to their children. Although education generally improves attitudes toward health, it can sometimes have negative effects, as when breastfeeding, by being presented as old-fashioned, is discouraged.

Greater productivity: Educated parents tend to be better off economically. When they earn higher wages, they can buy more and better food, and obtain better medical care. Educated parents may also be more productive at home, e.g., in effectively preparing and storing food.

Figure 8-D

Percent of Adult Women Who Ever Attended School, Distributed by Highest Level Ever Attended, Kenya 1979



Source: United Nations Demographic Yearbook 1983, Tables 26 and 38, United Nations, New York, N.Y. 1985.

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THE ROAD TO HEALTH

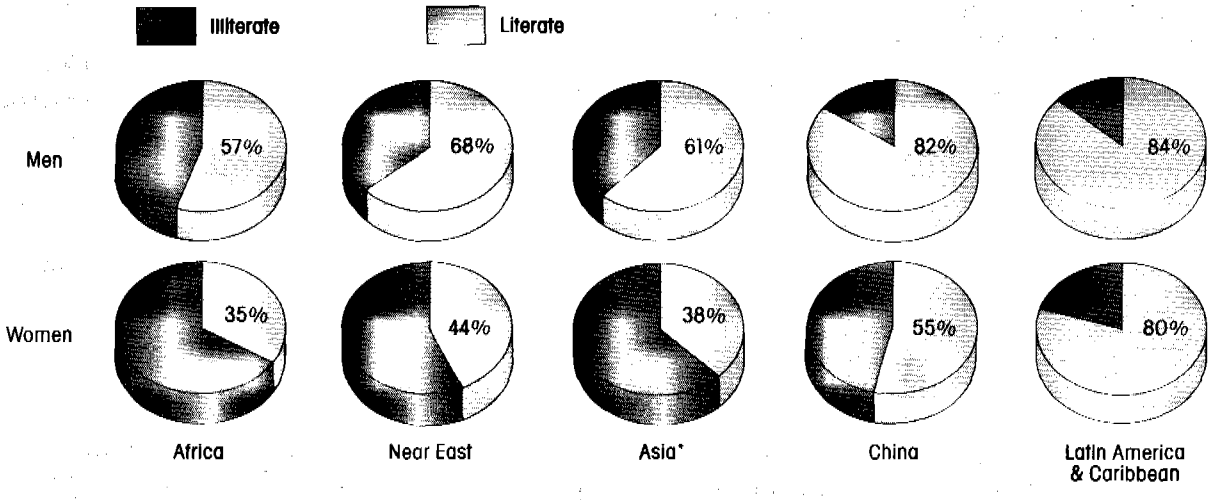
Health and education have many characteristics in common: as human capital investments embodied by individuals, both are valuable in the long run; both are the joint outcome of public efforts and individual decisions; and both, in addition to being of intrinsic value, act to increase economic activity and earnings.

Education is a critical element in improving child survival. Educated parents are more skilled in child care, and better able to mobilize limited resources to improve health. Moreover, each additional year of parental education, particularly maternal education, is beneficial to the survival of a family's children, and this education increases in importance to the child between birth and age 5.

Unfortunately, the benefits of maternal education have had little impact because until recently few women were able to attend school. The educational attainment of younger women will be significantly higher, based on cur-

Figure 8-E

Percent of Men and Women Who Can Read and Write



* Excluding China

Source: UNESCO (Data are included in Table 9 of Appendix I.)

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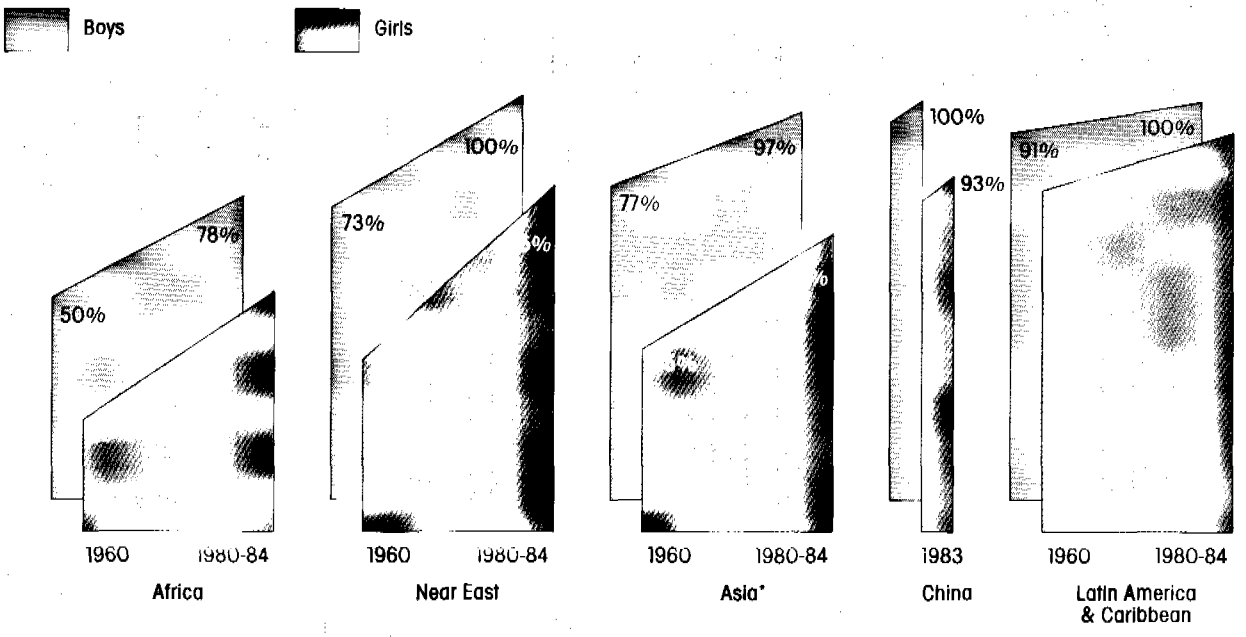
Figure 8-F

Percent of Boys and Girls Who Attended Primary School in 1960 and 1980-84



*Excluding China

Note: Gross enrollment ratio exceeds 100 percent when persons of other age groups are attending school; percents for boys in 1980-84 in the Near East and China, and for boys and girls in 1980-84 in Latin America & Caribbean are truncated to 100 percent.

Source: UNESCO (Data are included in Table 9 of Appendix I.)

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rent levels of enrollment. An example of progress in the enrollment of women is shown for Kenya in figure 8-D. Only about one-third of women are literate in all developing regions except Latin America and the Caribbean. Proportions of literate men and women are shown in figure 8-E. Though enrollment has increased for girls, it still lags behind enrollment of boys. Differing educational opportunities for boys and girls and the progress made in this area over the past 2 decades are shown in figure 8-F. Primary enrollment is approaching 100 percent for boys in all regions except Africa; girls are almost 100 percent enrolled in China, Latin America, and the Caribbean.

Fewer than half of children who go to primary school go on to secondary school. The gap between male and female enrollment in secondary school is even wider. Only 11 percent of African, 35 percent of Near Eastern, 28 percent of Asian, and 51 percent of Latin American/Caribbean girls are enrolled in secondary school.

The need for increased education is clear, as is the need for a major commitment to prioritize education for women. Although progress is being made, further strides are needed to reach 100 percent enrollment of boys and girls. Because female education is such an important benefit to children, the argument can be made that education of girls should be given greater emphasis. Secondary education, which further broadens the base of understanding about disease and health, becomes an essential goal once high levels of primary education are achieved. In areas where a large proportion of adult women have never gone to school, adult literacy programs offer an important alternative.

IX. AVAILABILITY OF MODERN HEALTH SERVICES

PROFILE

The development of relatively simple, effective, and inexpensive health technologies has opened the doors for the child survival revolution to spread to all parts of the world. High rates of childhood mortality and morbidity nonetheless persist. A large gap remains between what can be done given current resources and knowledge and what has actually been achieved. The impediment to child survival in this case is not disease or malnutrition, but a lack of available health services to address local health needs. The challenge is to design, implement, and manage appropriate systems that ensure that these critical technologies can be put to work when and where they are needed.

IMPACT ON CHILD SURVIVAL

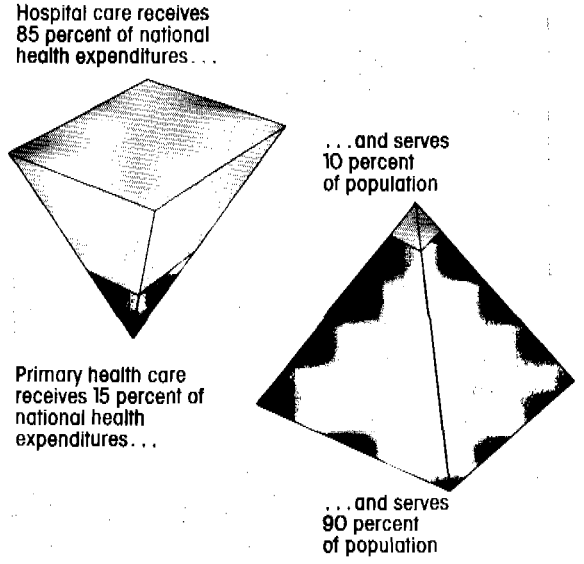
The clinical effectiveness of the major child health technologies has been proven. For every disease prevented, every birth spaced, every illness or injury treated, a life may be saved. But the impact of these health services at the national level varies considerably. The ultimate outcome of efforts to improve health is subject to the economic, social, and political forces that affect the distribution of critical health services and how they are used. The level of economic development clearly has an important influence on the resources that can be devoted to health care. But when economic resources are limited, the impact of health services depends on their ability to reach the areas of greatest need and to address the basic health needs of the broad population. The availability, accessibility, and appropriateness of health services are closely related to one another, and are important determinants of child survival.

Availability

The simple presence of health facilities, supplies, and personnel in a country does not in itself guarantee a strong positive impact on child survival. With few exceptions, health systems in developing countries have been modeled after those in industrialized nations, which emphasize curative care in sophisticated hospital settings. The cost of maintaining the facilities, equipment, supplies, and highly trained personnel needed to run such institutions tends to quickly absorb most of the national resources devoted to health (see figure 9-A). The World Bank has estimated that on average two-thirds of government health expenditures in developing countries go to teaching hospitals and medical training. Investments in advanced medical care typically come at the expense of simpler preventive and promotive services that have the potential to make a much greater impact on health. As a result, while some health services are technically "available" in these countries, health care is effectively nonexistent for those who cannot reach the hospitals or afford their services.

Figure 9-A

Health Expenditures and Population Served:
Expenditures for Primary Health Care and Hospital Care in Ghana



Source: Adapted from UNICEF, The State of the World's Children 1985, Oxford University Press, New York, 1985. Figure 20 from "A Primary Health Care Strategy for Ghana," April 1978, Ministry of Health, Accra, Ghana.

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Accessibility

The accessibility and appropriateness of health services are closely related factors that can have a decisive influence on health care. Accessibility is a critical factor that has different meanings in different settings. It is not only measured in terms of distance, but also in terms of affordability of services and the absence of social and cultural barriers to their use. Figure 9-B depicts a model of health center utilization in a rural developing country location. In areas where transportation is poor, the use of health facilities drops off sharply beyond a 3 to 5 kilometer (2 to 3 mile) distance. In another context, people may be discouraged from using local health services because they are too expensive, too inconvenient, or too intimidating. The design of "accessible"

services must take all of these potential factors into consideration in each new area.

The private sector is playing an increasingly important role in improving access to health services in developing countries. Consistent with the primary health care approach, the provision of supplies and services through commercial channels can expand the reach of simple but powerful health technologies such as ORT, immunization, and contraceptive methods beyond the clinic and hospital setting. The idea is not new. Chloroquine treatment for malaria, for example, has been commercially available throughout endemic regions for many years. More recently, social marketing to advertise and sell ORT packets and contraceptive methods at reduced cost is proving effective in a number of developing countries. These programs are designed to reach people who, for whatever reason, cannot or choose not to use clinic services. Through the private sector, simple health technologies could become available as dependably as, for example, soft drinks are today, even in the most remote locations. Distribution of supplies and services on this scale would be a major step toward achieving the goals of the child survival revolution.

Appropriateness

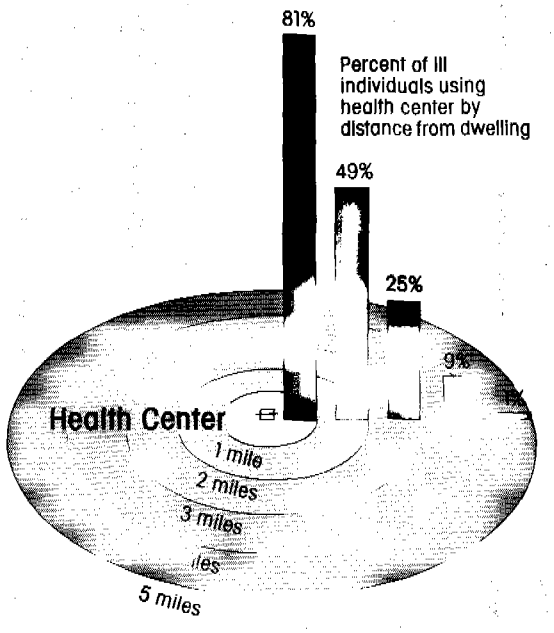
Appropriate health care might be defined as the kind of health care, within available resources, that most effectively addresses the prevailing health conditions of a population. What is or is not appropriate health care is best determined based on local health conditions and the resources that can be allocated. Considerations include choice and distribution of services offered, type of personnel and training necessary, and the balance of preventive and curative services. The overwhelming emphasis on curative measures that often comes with the Western model of health care is questionable in areas where so many die from preventable causes. The approach is both more expensive, requiring highly trained personnel, costly equipment, and relatively elaborate facilities, and tends to limit the range of available services to those areas that can support the logistical and financial requirements of such institutions. In developing countries, this almost invariably means urban areas. While urban populations and their health needs are growing rapidly, most of the world's people and the worst health conditions are still found outside the cities.

Use of Services

The crucial link between providing health services and improving health is public acceptance and motivation to use the services provided. Demand for services is often taken for granted where health conditions are poor, but cannot be assumed. Modern health treatments such as immunization or ORT may compete with traditional health practices, or with fatalistic views of disease that discourage parents or other caregivers from taking action. Before people will adopt effective measures for child survival, they must first be made aware that alternative treatments exist, and that they are, in fact, better. Secondly, they must be willing to invest their time and effort in the process, and to entrust their children's lives to unfamiliar practices and practitioners, no small demand in itself.

Figure 9-B

Utilization of Health Services According to Travel Distance: A Theoretical Model



Source: Reinke, W.A., Mathematical Models of Basic Health Care, 1979.

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Both public and private sectors have important roles to play in increasing awareness and use of existing health services. As has been noted, social marketing techniques can enhance the role of the private sector in expanding the reach of simple health technologies beyond clinic settings. These techniques can also help to increase awareness of these life-saving measures and bridge the gap between the availability of health services and their use.

A community's willingness to take advantage of health services depends to a great extent on the social and cultural context into which they are introduced. Since mothers are the primary child care providers in virtually all cultures, their attitudes and practices are likely to be a critical factor in the optimal use of health services for children. It is not surprising, then, that the level of female literacy is a key factor not only in the adoption of modern health care but in child survival in general.

The experience of Kerala State in India provides a good example of what can be achieved when the three issues of availability, accessibility, and appropriateness of health care are effectively addressed through the public sector. The state has achieved high health standards despite its extremely low level of economic development. Within India, it is paradoxically the poorest state in terms of per capita income levels, and the most advanced in terms of life expectancy and infant survival. One of Kerala's distinguishing features is its political commitment to provide basic health services to all, including the poorest and traditionally most underserved portion of the population. As a result, a minimum level of health care that includes both preventive and curative services has been made widely accessible. Perhaps most remarkable is Kerala's high utilization rate of these services. In terms of outpatient visits to clinics and babies born in health facilities, Kerala stands well above neighboring states with comparable health systems. This achievement appears to be linked to the traditionally high literacy rates in Kerala, especially among women. They are not only more open to the notion of modern health care for their children, they demand it. The state's high standards for equitable health care are believed to be a tangible reflection of this demand.

Kerala's example also points out that improvements in health are rarely isolated—that they are likely to be accompanied by other aspects of development. In the case of Kerala, social rather than economic development has made the difference. Education has played a major role, as has the government's commitment to secure health as a goal in its own right.

THE ROAD TO HEALTH

Primary Health Care

The primary health care approach provides a solid foundation for addressing the health needs of developing areas by using the means at hand. It is at the heart of current efforts to make better use of today's limited health resources, and has been adopted and endorsed by all of the major international organizations concerned with health, including the World Health Organization, UNICEF, and the United States Agency for International Development. Primary health care is the basis of an international drive to improve health for all by the year 2000, with special emphasis on reducing the toll of illness and death among children.

Primary health care is particularly well-suited to solving the problems of availability, accessibility, and appropriateness in developing countries. It entails a comprehensive approach to health that is designed to shift the traditional emphasis from a few specialized institutions to the areas of greatest need — the local communities. The concept is simple: a country's greatest resource for health is the potential for its people to take care of themselves. A health system that is community-based can combine education and community participation with the provision of essential health services. When health services are weighed in the local context, efforts to make them appropriate for local needs and accessible to everyone become an integral part of the planning process.

The success of community based health services ultimately rests on the approval and active participation of the local community. Primary health care includes activities in each of the major categories—preventive, curative, promotive, and rehabilitative. They are limited only by what is economically and culturally feasible on the local level. Although the design of services for each community will vary according to local health needs, a list of essential services provides a common framework for a primary health care system:

- education concerning prevailing health problems and the methods of preventing and controlling them;
- promotion of food supply and proper nutrition;
- maternal and child health care, including family planning;
- immunization against the major infectious diseases;
- prevention and control of locally endemic diseases;
- appropriate treatment of common diseases and injuries;
- provision of essential drugs; and
- basic sanitation and an adequate supply of safe water.

One of the most important aspects of the primary health care approach is that it recognizes that improvements in health are an integral part of development, not simply a byproduct of it. This has been confirmed in Costa Rica, Sri Lanka, China, and India's Kerala State. In each country, success meant reaching out to provide health services to those most often excluded. And in each country, children have been found to benefit the most when health conditions improve.

X. INCOME PER CAPITA AND GOVERNMENT EXPENDITURES

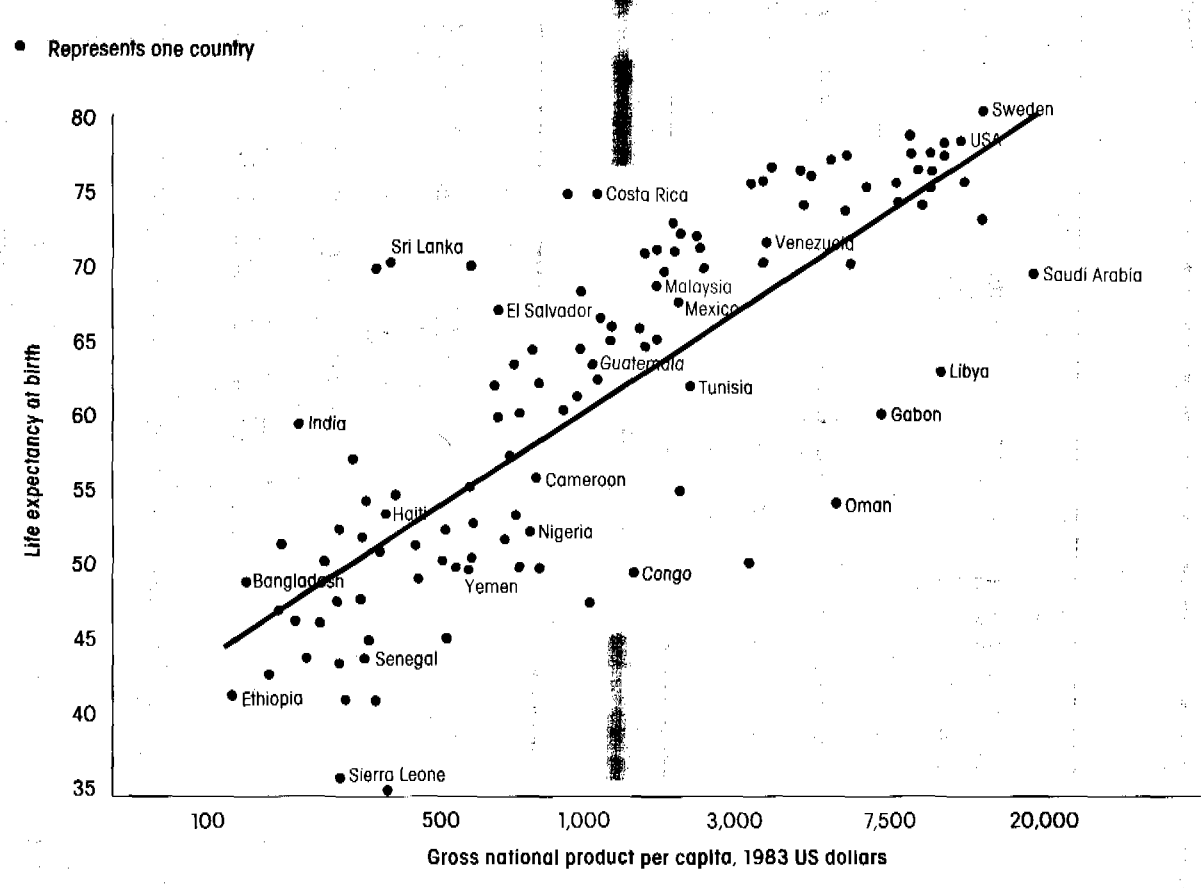
PROFILE

The generally positive relationship between economic development and health status is reflected in a country's levels of per capita gross national product (GNP) and life expectancy. Life expectancy in high-income countries such as Sweden and the United States is 30 to 40 years greater than in low-income countries such as Ethiopia and Bangladesh (see figure 10-A), where infant and child mortality persists at high levels. Health gains in developed countries have been achieved and sustained in association with increased economic development, specifically through more plentiful and nutritious food, improved housing, water and sanitation systems, and expanded education and medical facilities.

Yet although health improvements appear to accompany economic development, experience has shown that this is not necessarily the case, and in many developing countries, most notably those in SubSaharan Africa, economic development has proceeded slowly, if at all. Moreover, the experience of most developing countries shows that the benefits of economic development are unevenly distributed among the population. Typically, urban areas that

Figure 10-A

Pattern of Association Between Gross National Product Per Capita and Life Expectancy (using a log scale for GNP)



Source: United Nations Population Division and World Bank Atlas (Data are included in Tables 5 and 10 of Appendix 1.)

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become pockets of intense industrial or commercial activity reap the greatest benefits, while rural areas remain neglected. This is particularly true of the distribution of health care services in much of the developing world. Thus, while a country's per capita income level may be increasing, large segments of its population may experience no improvement in their standard of living. This has alarming implications for infant and child health in areas where most individuals have no access to essential life-promoting amenities. This pattern can be seen, for example, in several high-income countries in the Near East, which continue to show high mortality rates despite their aggregate wealth.

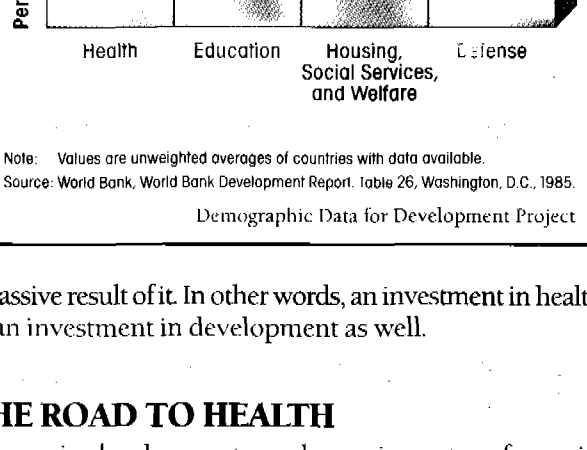
Increases in GNP also do not necessarily translate into increased government expenditures in the health sector; they may in fact have the opposite effect. In many developing countries, spending on defense has increased dramatically in recent years, while expenditures on health have remained constant or declined. As shown in figure 10-B, the average developing country government devotes less than 6 percent of its expenditures to health; levels of spending on defense, education, and housing, social services and welfare respectively are twice this amount. Correcting this imbalance may require redefinition of security issues and recognition by national leaders of the long-term economic and social benefits of increased health expenditures.

It is also important to note that significant improvements in health are possible without high levels of economic development. Even in the poorest countries, there is commonly a small segment of the population that enjoys high life expectancy and high health standards. Several societies, notably Sri Lanka, China, and Kerala State in India, have added 15 to 20 years to life expectancy at annual per capita income levels of around $300. In the Latin American region, Costa Rica has attained mortality rates that approach those of developed countries, at a small fraction of their GNP levels. A number of factors have contributed to these accomplishments, but each success has been marked by political and popular commitments to health and education for all, emphasis on adequate nutrition and health care for even the most under-privileged, and a commitment to the ideal of popular participation in public affairs.

Finally, health and development will continue to proceed hand in hand. Poverty and poor health powerfully reinforce each other. Hence improvements in health are an important contributor to economic development, not simply a passive result of it. In other words, an investment in health is an investment in development as well.

Figure 10-B

Percent of Government Expenditures Developing Countries Spend on Health, Education, Housing, Social Services and Welfare, and Defense



Note: Values are unweighted averages of countries with data available.
Source: World Bank, World Bank Development Report. Table 26, Washington, D.C., 1985.

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THE ROAD TO HEALTH

Economic development can be an important factor in securing better health for children. But it is neither a requisite nor a guarantee of health gains. The extent to which economic development improves child survival depends on the extent to which it improves the standard of living and health conditions for the most disadvantaged segments of the population. Sustained political commitment to equitable distribution of services among the population and increased public expenditures on health and related sectors can translate increases in per capita GNP into improvements in child survival.

XI. FOOD AVAILABILITY

PROFILE

From a child's perspective, hunger is a simple fact. It means not having enough to eat, and is the same for hungry children no matter where they live. Yet a shortage of food on the national or community level may not be the dominant factor when malnutrition strikes. Indeed, hunger and malnutrition occur in areas where the overall food supply is abundant. The accessibility of food and the equity of its distribution among a population are important determinants of health conditions in countries throughout the world.

IMPACT ON CHILD SURVIVAL

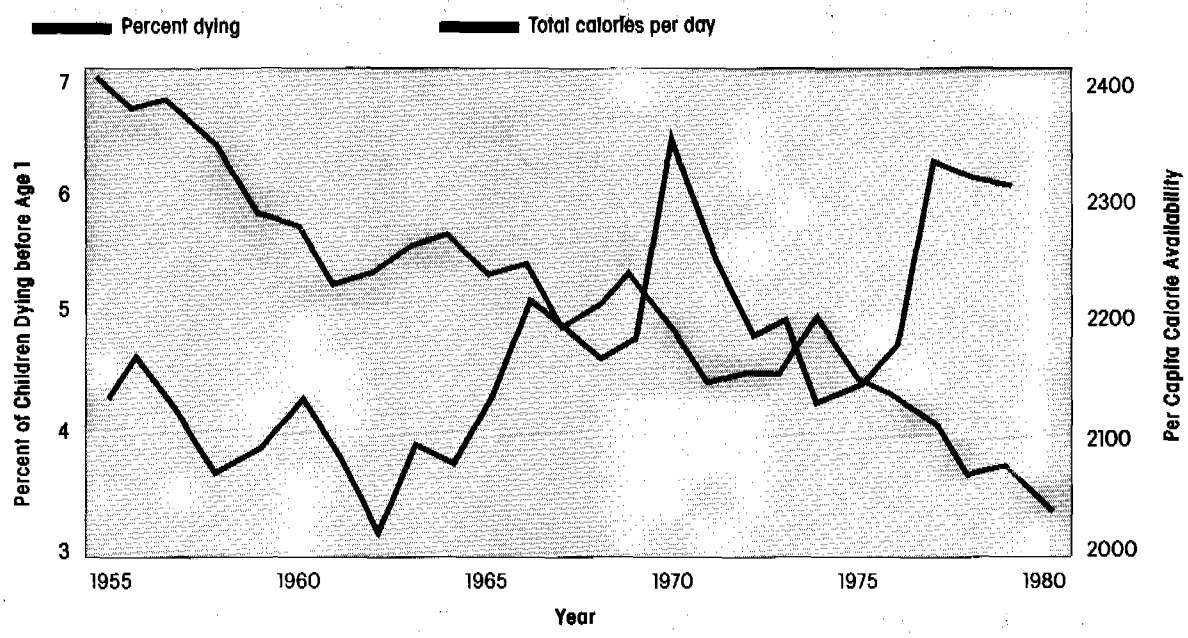
On an individual level, malnutrition results from the combined effects of disease and inadequate diet. The latter can occur as a consequence of arbitrary feeding practices as well as from deficient resources. Hence the problem of child malnutrition in the world today cannot be addressed without recognizing the potential for improvement within current food resources through simple health and education measures.

Nonetheless, the overall food supply remains the ultimate limiting factor in the malnutrition equation. Below a certain level, all the health interventions in the world cannot spare a child from malnutrition and poor health. Improvements in the general level of nutrition in western Europe and the United States are credited with bringing about significant declines in mortality during the 19th century, well before the advent of modern medical technologies. These improvements were the result of increased production of food and better diets, but of equal importance were the relative decline in food prices that made food more accessible, and better transportation and storage facilities that dampened the effects of localized crop failures and sporadic food shortages.

Children are always at highest risk of malnutrition because of the extra demands placed on them by physical growth and frequent infection. As a result, fluctuations in

Figure 11-A

Percent of Children Dying Before Age 1 and Per Capita Calorie Availability: Sri Lanka, 1950-80



Source: Fernando, D., 1985 "Health Statistics in Sri Lanka 1921-80" in Good Health at Low Cost, S. Halstead, J. Walsh and K. Warren (eds.). The Rockefeller Foundation: New York, 1985.

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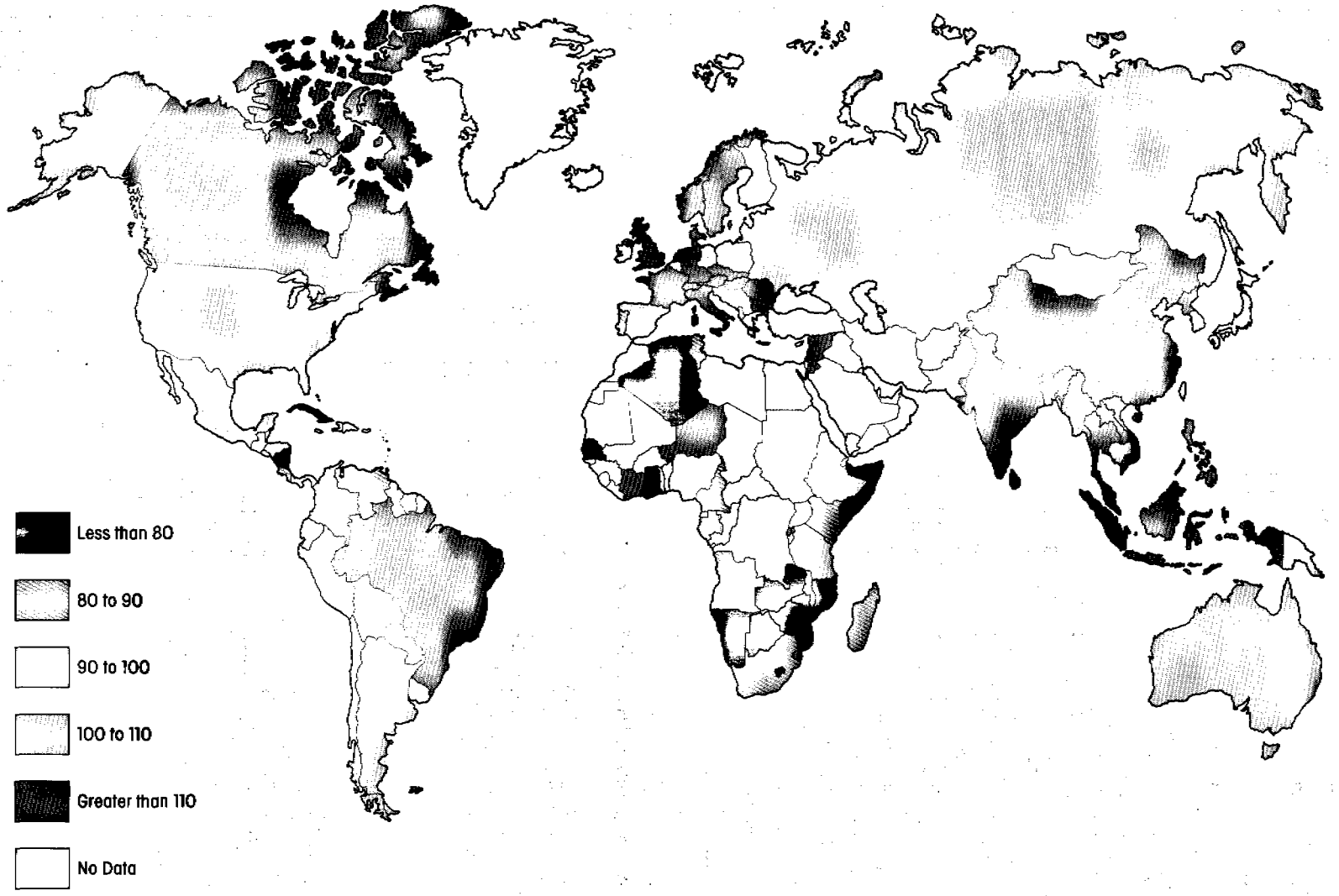
Map 11-A

1982-84 Per Capita Food Production as a Percent of 1969-71 Production



Source: World Bank (Data are included in Table 8 of Appendix 1.)

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the overall food supply are reflected in the level of child mortality. The pattern of food availability and infant mortality in Sri Lanka, as shown in figure 11-A, suggests a direct relationship. Each increase in total caloric energy supply per capita is followed by a decrease in the infant mortality rate, often with a 1-year lag time. When energy availability decreased, in most cases the infant mortality rate experienced an increase over a 1- to 2-year period.

Global Food Supply

During the last two decades, food availability has increased for the world as a whole, despite rapid population growth and short-term fluctuations caused by famine and war. The trend can be seen in map 11-A, in which the average index of food production for 1982-84 is expressed as a percent of per capita food production around 1970. The most remarkable advances have been achieved in South East Asia, once the focus of global malnutrition. India, which suffered periodic famines well into this century, is now a net food exporter. Although malnutrition still exists in many areas of Asia, the trend is toward increasing food self-sufficiency and better nutrition for the broad population. Many countries in the Near East and Latin America and the Caribbean have also enjoyed net gains in available food calories per capita by comparison to 10 or 20 years ago. The major exception to these positive regional trends is Africa. For all but a handful of countries in SubSaharan Africa, the rate of food production has not kept pace with population growth. Many factors have contributed to this stagnation, including political instability, the worldwide economic recessions of the 1970s and 1980s, some of the highest population growth rates ever observed, and, most recently, the catastrophic drought that has affected much of Sub-Saharan Africa. As a result, there is less available food per capita in Africa as a whole today than there was 20 years ago.

THE ROAD TO HEALTH

On the one hand, resolution of the problem of malnutrition in the developing world is linked to long-term growth in the availability of food, as it was in the history of western industrialized countries. Yet on the other hand, the experience of several countries in the developing world has shown that malnutrition can be greatly reduced even within present constraints on total food supply and economic development. In their recent study "Good Health at Low Cost," the Rockefeller Foundation details the model efforts of selected developing countries to reduce mortality and improve health. The subject areas are China, Sri Lanka, Costa Rica, and Kerala State in India. All four have achieved rates of mortality and life expectancy that approach developed country levels while remaining within developing country levels of GNP. The countries represented differ widely in levels of development, types of economic system, and forms of government. But their success at improving health within developing economy constraints contains common elements that can be applied elsewhere. These five basic elements are:

- strong commitment to health as a social goal,
- social welfare orientation to development,
- widespread participation in the political process,
- equality of health services coverage for all social groups, and
- linking health programs with general economic development.

In all four areas, efforts to raise general nutritional standards were only one part of a broad campaign to improve living conditions through education, health, and various other development initiatives. Each program directly or indirectly contributed to the success of the others. Together they made a significant impact on health conditions where singly they might have failed.

Making basic food supplies accessible to those in need and distributing them equitably have been key elements of nutrition programs in all four of the examples. Each area has developed its own approach toward achieving these goals. China has utilized its planned economy to institute a two-pronged strategy to promote food self-sufficiency among production groups while providing safeguards for periods during which food production falls short. Kerala and Sri Lanka have traditionally relied on subsidies and rationing plans that provide up to 20 percent of total calorie intake for low-income households. The system has been effective in reaching low-income families who might otherwise be hard-pressed to feed themselves. Costa Rica has taken yet another approach, using the primary health care system to target groups at high risk of malnutrition and provide them with supplemental foods. This effort includes school lunch programs, supplements for pregnant women and children threatened with malnutrition, and general food assistance programs.

Finally, all four have demonstrated the political will to support health and nutrition initiatives despite their cost. These programs represent a substantial investment: before Sri Lanka was hit by an economic crisis and forced to cut back, the rationing coupon system for rice and other essential foods accounted for up to 24 percent of its total government budget. Kerala State invested 17 percent of its state budget on its subsidy and rationing plan. The investment and effort required to plan, implement, and manage the programs was in all cases substantial. But in terms of absolute dollars, the gains in health and nutrition were achieved at relatively modest cost.

XII. WATER SUPPLY AND SANITATION FACILITIES

PROFILE

Clean water is a critical factor in maintaining good health and preventing illness. A "safe" water supply includes treated surface waters or untreated but uncontaminated water such as that from protected boreholes, springs, and sanitary wells. Reasonable access in an urban area is provided by a public fountain or stand post located not more than 200 meters from a residence. In rural areas access is deemed reasonable when members of a household do not have to devote a disproportionate part of the day to fetching the family's water. Though daily water requirements vary by body weight, health status, clothing, activity, and climate, the average adult male needs a daily minimum of 2 to 2.5 liters for drinking, and an additional 20 to 40 liters for personal and domestic hygiene.

Today, only half of the population of developing countries (excluding China) has access to safe water, and only a third has access to sanitation facilities. Among regions, Africa has the smallest portion of the population served. Within countries, the worst conditions are found in rural areas, even though in these areas the availability of space and materials may make the construction of sanitation facilities (e.g., pit latrines) relatively simple. Regional access of urban and rural populations to safe water and sanitation facilities is shown in figure 12-A. In recognition of the dire status of water supplies and sanitation facilities in the developing world, the United Nations declared 1981-1990 as the International Water Supply and Sanitation Decade. This decade is dedicated to speeding the construction of new water supply and excreta disposal facilities, and to maximizing the probability that they will be correctly operated, maintained, and used. At mid-decade the goal of universal access by 1990 remains distant.

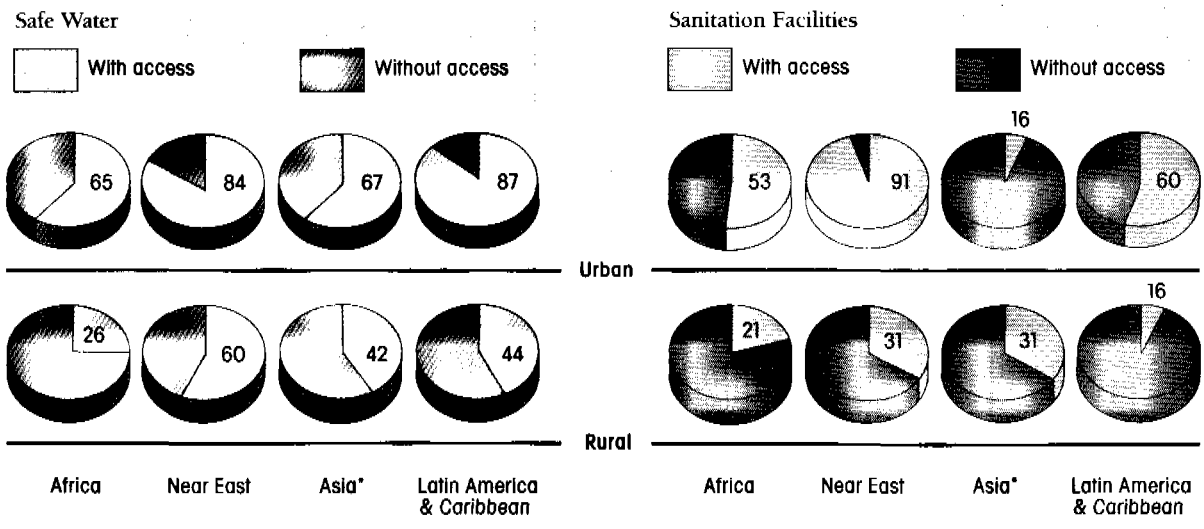
WATER

Water Quality: Water affects health in four major ways. First, water can carry pathogens which, when ingested in sufficient quantity, can infect the drinker and cause microbiological diseases (e.g., cholera and typhoid). Water may also carry toxic substances such as industrial wastes.

Second, water is important for cleanliness, especially for flushing away feces and urine. Hand-washing is an important personal health measure. Washing, domestically and in personal hygiene, reduces the incidence of diarrheal diseases, skin diseases such as yaws, eye diseases such as trachoma (a leading cause of preventable blindness), and

Figure 12-A

Percent of Population with Access to Safe Water and Sanitation Facilities



*Excludes China

Note: Regional estimates are averages for countries with data available. Regional estimates in the U.N. source document differ slightly; Asia, percent with urban sanitation facilities is 48%.

Source: United Nations, General Assembly, Economic and Social Council (Data are included in Table 10 of Appendix I).

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ectoparasitic diseases such as louse-borne typhus.

Third, water can be a critical link for diseases that depend on transmission by animals or insects that spend some or all of their lives in water. Malaria, which is transmitted by mosquitoes, is a prominent example.

Fourth, farming, and the process of collecting water from streams and lakes, may expose persons to diseases through skin penetration. An example is schistosomiasis, caused by parasitic worms.

Diarrheal diseases are often a consequence of unclean water. For a single pathogen, the higher the ingested dose, the greater the risk of severe diarrhea and death. Studies of water supply and excreta disposal improvement projects often reveal greater declines in incidence of severe diarrhea and mortality than in incidence of mild diarrhea, which in some cases does not decline significantly. Improvement in nutritional anthropometric status—height and weight—is also seen when water quality and waste disposal are improved. The median reduction in diarrheal morbidity obtained from 44 studies of water and sanitation improvement is shown in table 12-A.

Table 12-A

Reduction in Diarrheal Morbidity Rates Attributed to Improvements in Water Supply or Excreta Disposal

	Median percent reduction
Water quality improvement	16
Water availability improvement	25
Water quality and availability improvement	37
Excreta disposal improvement	22

Source: Esrey, S.A., R.G. Feacham and J.M. Hughes, Interventions for the Control of Diarrheal Diseases among Young Children: Improving Water Supplies and Excreta Disposal Facilities, WHO Bulletin 63(4), Table 2, 1985.

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Water Availability: Where families lack a running tap in the house and water must be drawn and stored for use, the risk of pollution rises because containers may be contaminated and because water is allowed to stagnate, generally without refrigeration. When infant formula nutrients are added to water collected in this manner, pathogens flourish. Households that lack safe water experience greater infant and child mortality when children are not breastfed.

When washing of hands and utensils, which reduces contamination by fecal matter, depends on water that must be drawn and stored, frequent, abundant use is necessarily limited and risk of infection rises.

Women and children are particularly affected by the availability of water because it is usually the woman's task to fetch water. The greater the distance to water, often a matter of miles requiring hours of walking each day, the less time a woman has for child care and other domestic chores, and the more calories she must expend. A woman who travels over hilly terrain may use from 15 to 27 percent of her caloric intake in fetching water. In urban areas, water often needs to be purchased, which places a heavy burden on meager household incomes.

SANITATION FACILITIES

Because so many of the major infectious agents of disease are shed by infected persons via feces and urine, hygienic disposal of waste is vitally important. Use of toilets can reduce fecal contamination of houses, yards, and neighborhoods. It can also reduce contamination of crops and drinking water supplies. Hygienic disposal of feces of children who are too young to use a toilet is of particular importance.

THE ROAD TO HEALTH

Greater access to inexpensive, abundant, and clean water and to effective sanitation facilities is a pressing need in developing nations. The lack of these systems exacts a heavy toll on health, as well as on time and money. Creative alternatives to current methods of providing water are needed to overcome the often prohibitive costs and problems of conventional construction and maintenance. Encouragement is needed to identify and use uncontaminated sources (e.g., wells from protected aquifers), treat raw surface water (e.g., with chlorination), protect watersheds, and increase water quality surveillance. Excreta destruction and removal, or at least isolation from water supplies, is needed.

Education in the correct utilization of water and sanitation facilities should be an integral part of providing facilities. When the mother of a family is literate, she is more likely to understand the reasons for adopting improvements in excreta disposal, and to take the actions necessary to limit disease transmission from this source. Understanding of the link between disease and water, and the importance of washing and using toilets, cannot be taken for granted, even in the developed world.

Summary Chart

Child Survival Summary Chart

MAJOR IMPEDIMENTS TO CHILD SURVIVAL	SELECTED INGREDIENTS OF THE ROAD TO HEALTH
DIARRHEAL DISEASE	• Oral Rehydration Therapy (ORT): — Administration of oral rehydration solution — Continued feeding — Referral when appropriate • Breastfeeding • Hygienic practices in household (e.g., handwashing, hygienic handling and storage of food and water) • Improved water and sanitation supplies • Immunization
VACCINE-PREVENTABLE DISEASES	
Diphtheria, Measles, Pertussis (Whooping Cough), Polio, Tuberculosis	• Immunization by age 1 • Adequate nutrition • Less crowded living conditions
Tetanus	• Immunization by age 1 • Hygienic treatment of wounds and injuries
Neonatal Tetanus	• Immunization of women of childbearing age • Hygienic conditions and practices at birth (especially sterile treatment of umbilical cord) • Assistance at birth by trained birth attendants
ACUTE RESPIRATORY INFECTION	• Immunization for vaccine-preventable diseases • Curative drug therapy • Adequate nutrition • Improved housing conditions (e.g., less crowding) • Health education for parents and other caregivers to recognize and seek treatment for severe respiratory infection • Expanded availability of services for the treatment of acute respiratory infections
MALARIA	• Environmental control of mosquito vector (e.g., limiting breeding sites) • Chemical control of mosquito vector (e.g., spraying with insecticides) • Limiting malaria transmission through preventive action (e.g., use of screens and bed nets) • Anti-malarial drugs • Possible vaccine in next decade • Education on the patterns and prevention of malaria
MALNUTRITION	• Improved maternal health and nutrition during pregnancy • Breastfeeding • Improved weaning practices (e.g., timely initiation, adequate duration, and maintenance of a balanced diet through weaning) • Improved child feeding practices (e.g., meeting the protein, energy, and micronutrient needs of a growing child) • Feeding during illness • Growth monitoring
HIGH-RISK FERTILITY	• Lengthening birth intervals • Shifting childbearing away from very young and very old reproductive ages • Avoiding very high parity • Breastfeeding • Provision of family planning services: — Wide and reliable distribution of contraceptive methods — Information and education on use and benefits of family planning

SOCIOECONOMIC FACTORS AND CHILD SURVIVAL	SELECTED INGREDIENTS OF THE ROAD TO HEALTH
EDUCATION AND LITERACY	• Priority on primary and literacy education, especially for girls • Increase percentage of girls receiving secondary education • Literacy programs for nonliterate adult women
AVAILABILITY OF MODERN HEALTH SERVICES	• Provision of health services that are reliably available, accessible to all, and appropriate for local health conditions • Balance between preventive and curative services • Emphasis on the primary health care approach. The main tenets of this approach are: — Education concerning prevailing health problems and the methods of preventing and controlling them — Promotion of food supply and proper nutrition — Maternal and child health care, including family planning — Immunization against the major infectious diseases — Prevention and control of locally endemic diseases — Appropriate treatment of common diseases and injuries — Provision of essential drugs — An adequate supply of safe water and basic sanitation
INCOME PER CAPITA AND GOVERNMENT EXPENDITURES	• Long-term development with the equitable distribution of economic resources • Reduction of financial barriers to access to health care • Commitment to wide participation in the provision and use of health services
FOOD AVAILABILITY	• Efficient distribution and use of existing food resources • Long-term growth in food availability • Distribution of food supplies to those in greatest need (e.g., supplements for mothers and children in high-risk groups, food rationing, food subsidy programs)
WATER SUPPLY AND SANITATION FACILITIES	• Education in use of sanitation facilities • Education in importance of safe water • Reduction of time and money required to obtain water • Reduction of the need for home storage of water • Promotion of washing for personal and domestic hygiene • Efficient management of existing water resources: — Identification and use of uncontaminated sources — Treatment of raw surface water — Protection of watersheds — Increased water quality surveillance — Destruction/removal of excreta — Isolation of excreta from water supplies

Selected Bibliography

Selected Bibliography: Diarrheal Disease

Black, R.E., et al., "Handwashing to Prevent Diarrhea in Day-Care Centers," *American Journal of Epidemiology* 113(4): 445-451, 1981.

Black, R.E., "Diarrheal Diseases and Child Morbidity and Mortality," Child Survival: Strategies for Research, *Population and Development Review,* Supplement to Vol. 10, L.C. Chen, H. Mosely (ed.) (New York: The Population Council, 1984).

Black, R.E., K.H. Brown, S.Becker, "Malnutrition is a Determining Factor in Diarrheal Duration, but not Incidence, among Young Children in a Longitudianl Study in Rural Bangladesh," The American Journal of Clinical Nutrition, 37:87-94, January, 1984.

Brown, K.H., W.C. MacLean, "Nutritional Management of Acute Diarrhea: An Appraisal of the Alternatives," Pediatrics, 73(2): 119-125, February, 1984.

Chen, L.C., M. Rahman, A.M. Sarder, "Epidemiology and Causes of Death among Children in a Rural Area of Bangladesh," *International Journal of Epidemiology,* 9(1): 25-33, 1980.

Chen, L.C., "Interactions of Diarrhea and Malnutrition: Mechanisms and Interventions," Diarrhea and Malnutrition, L.C. Chen and N.S. Scrimshaw (ed.) (Tokyo, Japan: Plenum Press, 1983), pp. 3-19.

De Zoysa, I., R.G. Feachem, "Interventions for the Control of Diarrhoeal Diseases among Young Children: Chemoprophylaxis," *Bulletin of the World Health Organization,* 63(2): 295-315, Geneva, Switzerland, 1985.

Esrey, S.A., R.G. Feachem, J.M. Hughes, "Interventions for the Control of Diarrhoeal Diseases among Young Children: Improving Water Supplies and Excreta Disposal Facilities," *Bulletin of the World Health Organization,* 63(4): 757-772, Geneva, Switzerland, 1985.

Feachem, R.G., "Interventions for the Control of Diarrhoeal Diseases among Young Children: Supplementary Feeding Programs," *Bulletin of the World Health Organization,* 61(6): 967-979, Geneva, Switzerland, 1983.

Feachem, R.G., " Interventions for the Control of Diarrhoeal Diseases among Young Children: Promotion of Personal and Domestic Hygiene," *Bulletin of the World Health Organization,* 62(3): 467-476, Geneva, Switzerland, 1984.

Feachem, R.G., R.C. Hogan, M.H. Merson, "Diarrhoeal Disease Control: Reviews of Potential Interventions," *Bulletin of the World Health Organization,* 61(4): 637-640, Geneva, Switzerland, 1983.

Feachem, R.G., M. A. Koblinsky, "Interventions for the Control of Diarrhoeal Diseases among Young Children: Promotion of Breastfeeding," *Bulletin of the World Health Organization,* 62(2): 271-291, Geneva, Switzerland, 1984.

Feachem, R.G., M.A. Koblinsky, "Interventions for the Control of Diarrhoeal Diseases among Young Children: Measles Immunization," *Bulletin of the World Health Organization,* 62: 641-652, Geneva, Switzerland, 1984.

Koster, F.T., G.C. Curlin, K.M.A. Aziz, A. Haque, "Synergistic Impact of Measles and Diarrhoea on Nutrition and Mortality in Bangladesh," *Bulletin of the World Health Organization,* 59(6): 901-908, Geneva, Switzerland, 1981.

Monto, A.S., J.S. Koopman, "The Tecumseh Study. XI. Occurrence of Acute Enteric Illness in the Community," *American Journal of Epidemiology,* 112(3): 323-333, 1980.

Nagaty, A., "Oral Rehydration Cuts Child Mortality From Diarrhea in Half," *Diarrhea Control Newsletter,* 1: 10-11, 1983.

Parker, R.L., W. Rinehart, P.T. Piotrow, L. Doucette, "Oral Rehydration Therapy (ORT) for Childhood Diarrhea," Population Reports, series L, No.2, Population Information Program, The Johns Hopkins University, Baltimore, Md., 1985.

Rowland, M.G.M., "Epidemiology of Childhood Diarrhea in The Gambia," Diarrhea and Malnutrition, L.C. Chen, N.S. Scrimshaw (ed.) (Tokyo, Japan: Plenum Press, 1983), pp. 87-97.

Sahni, S., R.K. Chandra, "Malnutrition and Susceptibility to Diarrhea: With Special Reference to the Antiinfective Properties of Breast Milk," Diarrhea and Malnutrition, L.C. Chen, N.S. Scrimshaw (ed.) (Tokyo, Japan: Plenum Press, 1983), pp. 99-109.

Snyder, J.D., M.H. Merson, "The Magnitude of the Global Problem of Acute Diarrhoeal Disease: A Review of Active Surveillance Data," *Bulletin of the World Health Organization,* 60(4): 605-613, Geneva, Switzerland, 1982.

World Health Organization Scientific Working Group, "Parasite-Related Diarrhoeas." *Bulletin of the World Health Organization,* 58(6): 819-830, Geneva, Switzerland, 1980.

World Health Organization, "CDD Morbidity, Mortality, and Treatment Survey Results," Program for Control of Diarrhoeal Diseases, Geneva, Switzerland,. 1985.

World Health Organization, "Fourth Programme Report for Control of Diarrhoeal Diseases 1983-1984," Program for Control of Diarrhoeal Diseases, Geneva, Switzerland, 1985.

World Health Organization, "ORA Use and Access in 1983," Program for Control of Diarrhoeal Diseases, Geneva, Switzerland, 1985.

World Health Organization, "CDD Estimates of ORS Access and ORS/ORT Use in 1984," Program for Control of Diarrhoeal Diseases, Geneva, Switzerland, 1985.

Selected Bibliography: Vaccine-Preventable Diseases

Cook, R., "Pertussis in Developing Countries: Possibilities and Problems of Control through Immunization," The Third International Symposium on Pertussis, C.R. Manclark and J.C. Hill (ed.) (Washington, D.C.: Dept. of Health, Education and Welfare, Public Health Service, National Institutes of Health, 1979).

Foster, S.O., "Immunizable and Respiratory Diseases and Child Mortality," Child Survival: Strategies for Research, *Population and Development Review*, Supplement to Vol. 10, L.C. Chen, H. Mosely (ed.) (New York: The Population Council, 1984).

Henderson, R.H., "Vaccine Preventable Diseases of Children: The Problem," in Protecting the World's Children: Vaccines and Immunization, A Bellagio Conference (New York: The Rockefeller Foundation, 1984).

Koster, F.T., G.C. Curlin, K.M.A. Aziz, A. Hague, "Synergistic Impact of Measles and Diarrhea on Nutrition and Mortality in Bangladesh," *Bulletin of the World Health Organization*, 59(6): 901-908, Geneva, Switzerland, 1981.

LaForce, F.M., M.S. Lichnevski, J. Keja, R.H. Henderson, "Clinical Survey Techniques to Estimate Prevalence and Annual Incidence of Poliomyelitis in Developing Countries," *Bulletin of the World Health Organization*, 58(4): 609-620, Geneva, Switzerland, 1980.

Sherris, J.D., R. Blackburn, S.H. Moore, S. Mehta, "Immunizing the World's Children," *Population Reports*, Series L, No. 5, Population Information Program, The Johns Hopkins University, Baltimore, Md. March-April, 1986.

Stansfield, J.P., A. Galazka, "Neonatal Tetanus in the World Today," *Bulletin of the World Health Organization*, 62(4): 647-669, Geneva, Switzerland, 1984.

World Health Organization, "Expanded Program on Immunization: Global Status Report," *Weekly Epidemiological Record*, 60(34): 261-268, Geneva, Switzerland, 1985.

World Health Organization, "The WHO's Expanded Programme on Immunization: A Global Overview 1985," *World Health Statistics Quarterly*, 38: 232-252 Geneva, Switzerland, (1986).

Selected Bibliography: Acute Respiratory Infection

Foster, S.O., "Immunizable and Respiratory Diseases and Child Mortality," Child Survival: Strategies for Research, *Population and Development Review*, Supplement to Vol. 10, L.C. Chen, H. Mosely (ed.) (New York: The Population Council, 1984).

Leowski, J., "Worldwide Mortality from Acute Respiratory Infections in Children Under 5 Years of Age," Submitted for publication, *World Health Statistics Quarterly*, Geneva, Switzerland, 1986.

Miller, D.L., "Issues for the Future of ARI Control," Acute Respiratory Infections in Childhood, Proceedings of an International Workshop, Sydney, Australia (1984), R. Douglas, E. Kerby-Eaton (ed.) (Adelaide, Australia: University of Adelaide, 1985).

Parker, R.L., "Primary Health Care Interventions for Acute Respiratory Illness in Children," Paper presented at a Seminar on ARI, FKMUI, Jakarta, Indonesia, 11 February, 1985.

Pio, A., et al., "The Magnitude of the Problem of Acute Respiratory Infections," Acute Respiratory Infections in Childhood, Proceedings of an International Workshop, Sydney, Australia (1984), R. Douglas, E. Kerby-Eaton (ed.) (Adelaide, Australia: University of Adelaide, 1985).

Riley, I., "The Aetiology of Acute Respiratory Infections in Children in Developing Countries," Acute Respiratory Infections in Childhood, Proceedings of an International Workshop, Sydney, Australia (1984), R. Douglas, E. Kerby-Eaton (ed.) (Adelaide, Australia: University of Adelaide, 1985).

Sommer, A., G. Hussaini, I. Tarwotjo, "Increased Mortality in Children with Mild Vitamin A Deficiency," *The Lancet*, 10: 585-588, September, 1983.

Sommer, A., J. Katz, I. Tarwotjo, "Increased Risk of Respiratory Disease and Diarrhea in Children with Pre-existing Mild Vitamin A Deficiency," *American Journal of Clinical Nutrition*, 40, 1984.

Tupasi, T.E., "Nutrition and Acute Respiratory Infection," Acute Respiratory Infections in Childhood, Proceedings of an International Workshop, Sydney, Australia (1984), R. Douglas, E. Kerby-Eaton (ed.) (Adelaide, Australia: University of Adelaide, 1985).

World Health Organization, "A Programme for Controlling Acute Respiratory Infections in Children: Memorandum from a WHO Meeting," *Bulletin of the World Health Organization*, 62(1): 47-58, Geneva, Switzerland, 1984.

Selected Bibliography: Malaria

Brabin, B.J., "An Analysis of Malaria in Pregnancy in Africa," *Bulletin of the World Health Organization*, 61(6): 1005-1016, Geneva, Switzerland, 1983

Bradley, D., A. Keymer, "Parasitic Diseases: Measurement and Mortality Impact," Child Survival: Strategies for Research, *Population and Development Review*, Supplement to Vol. 10, L.C. Chen, H. Mosely (ed.) (New York: The Population Council, 1984).

Ghana Health Assessment Project Team, "A Quantitative Method of Assessing the Health Impact of Different Diseases in Less Developed Countries," *International Journal of Epidemiology*, 10(1): 73-80, 1981.

Miller, L.H., "Malaria," Tropical and Geographical Medicine, K.S. Warren, A.A. Mahmoud (ed.) (New York: McGraw-Hill, 1984).

Payne, D., B. Grab, R.E. Fontaine, J.H.G. Hempel, "Impact of Control Measures on Malaria Transmission and General Mortality," *Bulletin of the World Health Organization*, 54: 369-377, Geneva, Switzerland, 1976.

Pawlowski, Z.S., "Implications of Parasite-Nutrition Interactions from a World Perspective," From the Symposium Nutrition and Parasitic Infection presented by the American Institute of Nutrition, New Orleans, Louisiana, April 16, 1982, Federation Proceedings 43(2): 256-260, February, 1984.

World Health Organization, "Recent Progress in the Development of Malaria Vaccines: Memorandum from a WHO Meeting," Memorandum from the Scientific Working Group in the Immunology of Malaria, held in Geneva on 26-28 March 1984, *Bulletin of the World Health Organization*, 62(5): 715-726, Geneva, Switzerland, 1984.

World Health Organization, Tropical Disease Research, Seventh Programme Report, 1985.

World Health Organization, "World Malaria Situation 1983," World Health Statistics Quarterly, 38: 193-231, Geneva, Switzerland, 1985.

World Health Organization, "World Malaria Situation 1984," World Health Statistics Quarterly, 39, Geneva, Switzerland, 1986.

Selected Bibliography: Malnutrition

Cameron, M., Y. Hofvander, Manual on Feeding Infants and Young Children, Oxford University Press, Delhi, 1983.

Chen, L.C., A. Chowdhury, S.L. Huffman, "Anthropometric Assessment of Energy-protein Malnutrition and Subsequent Risk of Mortality among Preschool Aged Children," *American Journal of Clinical Nutrition*, 33: 1836-1845, 1980.

Chen, L.C., N.S. Scrimshaw (ed.), Diarrhea and Malnutrition, United Nations University, Tokyo, Japan, 1983.

Chen, L.C., H. Mosely (ed.), Child Survival: Strategies for Research, *Population and Development Review*, Supplement to Vol. 10, 1984.

Douglas R., E. Kerby-Eaton (ed.), Acute Respiratory Infections in Childhood: Proceedings of an International Workshop, University of Adelaide, Adelaide, Australia, 1984.

Friede, A.M., S. Becker, P.H. Rhodes, "The Comparison of Infant Mortality Rates When Birthweight Distribution Differs," (Unpublished article), Centers for Disease Control, Atlanta, Ga.

Haaga, J., C. Kenrick, K. Test, J. Mason, "An Estimate of the Prevalence of Child Malnutrition in Developing Countries," *World Health Statistics Quarterly*, 38, Geneva, Switzerland, 1985.

Institute of Medicine, "Preventing Low Birthweight: Summary," Committee to Study the Prevention of Low Birthweight, National Academy Press, Washington, D.C., 1985.

Keller, W., C.M. Fillmore, "Prevalence of Protein-Energy Malnutrition," *World Health Statistics Quarterly*, 36(2), Geneva, Switzerland, 1983.

Kielmann, A.A., C. McCord "Weight-for-Age as an Index of Risk of Death in Children," *Lancet*, June 10, 1978.

Mata, L., et al., "Promotion of Breast-Feeding, Health, and Growth among Hospital-Born Neonates, and among Infants of a Rural Area of Costa Rica," Diarrhea and Malnutrition, L.C. Chen, N.S. Scrimshaw (ed.) (Tokyo, Japan: Plenum Press), pp. 177-203.

Prosterman, R.L., "The Decline in Hunger-Related Deaths," Hunger Project Papers 1, San Francisco, Ca., 1984.

Puffer, R.R., C.V. Serano, (ed.) Patterns of Mortality in Childhood, Pan American Health Organization, Scientific Publication 262, Washington, D.C, 1973.

Rowland, M.G.M., "Epidemiology of Childhood Diarrhea in The Gambia," Diarrhea and Malnutrition, L.C. Chen, N.S. Scrimshaw (ed.) (Tokyo, Japan: Plenum Press, 1983), pp. 87-97.

Royston, E., "The Prevalence of Nutritional Anaemia in Women: A Critical Review of Available Information," *World Health Statistics Quarterly*, 35(2), Geneva, Switzerland, 1982.

Scrimshaw, N.S., C.E. Taylor, J.E. Gordon, "Interactions of Nutrition and Infection," World Health Organization, Monograph Series No. 57, Geneva, Switzerland, 1968.

Sommer, A., Nutritional Blindness, Oxford University Press, New York, 1982.

Sommer, A., G. Hussaini, I. Tarwotjo, D. Susanto, "Increased Mortality in Children with Mild Vitamin A Deficiency," *Lancet*, September 10, 1983.

Sommer, A., J. Katz, I. Tarwotjo, "Increased Risk of Respiratory Disease and Diarrhea in Children with Preexisting Mild Vitamin A Deficiency," *The American Journal of Clinical Nutrition*, November, 1984.

World Health Organization, "The Incidence of Low Birth Weight: A Critical Review of Available Information," *World Health Statistics Quarterly*, 33(3): 197-224, Geneva, Switzerland, 1982.

World Health Organization, "The Prevalence and Duration of Breast-Feeding: A Critical Review of Available Information," *World Health Statistics Quarterly*, 35(2): 92-116, Geneva, Switzerland, 1982.

World Health Organization, "The Prevalence of Anaemia in the World," *World Health Statistics Quarterly*, 38: 289-301, Geneva, Switzerland, 1985.

World Health Organization, "The Epidemiology of Perinatal Mortality," *World Health Statistics Quarterly*, 38: 302-316, Geneva, Switzerland, 1985.

World Health Organization, "The Incidence of Low Birth Weight: An Update," *Weekly Epidemiologic Record*, 59, 27: 205-212, Geneva, Switzerland, 1984.

World Health Organization, "Vitamin A: Let there be sight," *In Point of Fact*, 29, WHO, Geneva, Switzerland, 1985.

Selected Bibliography: High-Risk Fertility Behavior

Casterline, J.B., J. Trussel. "Age at First Birth," World Fertility Survey Comparative Studies No. 15, International Statistical Institute, Voorburg, Netherlands, 1980.

Gubhaju, B.B., "The Effect of Previous Child Death on Infant and Child Mortality in Rural Nepal," *Studies in Family Planning*, 16(4): 231-236, The Population Council, New York, July/August, 1985

Hobcraft, J.N., J.W. McDonald, S.O. Rutstein, "Child-Spacing Effects on Infant and Early Child Mortality," *Population Index*, 49(4): 585-618, Princeton University, N.J., 1983.

Hobcraft, J.N., J.W. McDonald, S.O. Rutstein, "Demographic Determinants of Infant and Early Child Mortality: A Comparative Analysis," *Population Studies*, 39: 363-385, 1985.

London, K.A., et al., "Fertility and Family Planning Surveys: An Update," *Population Reports*, series M, No. 8, Population Information Program, The Johns Hopkins University, Baltimore, Md., September-October 1985.

Maine, D., "Family Planning: Its Impact on the Health of Women and Children," Center for Population and Family Health, Columbia University, New York, 1981.

Maine, D., et al., "Effects of Fertility Change on Maternal and Child Survival: Prospects for Subsaharan Africa," report prepared for the Policy and Research Division, Population, Health and Nutrition Department, The World Bank, Washington, D.C., 1985.

Maine, D., R. McNamara, "Birth Spacing and Child Survival," Center for Population and Family Health, Columbia University, New York, 1985.

McCann, M.F., et al., "Breast-Feeding, Fertility, and Family Planning," *Population Reports*, series J, No. 24, Population Information Program, The Johns Hopkins University, Baltimore, Md., November-December 1981.

Omran, A.R., A.G. Johnston, Family Planning for Health in Africa. Carolina Population Center, Chapel Hill, N.C., 1984.

Rinehart, W., A. Kols, S.H. Moore, "Healthier Mothers and Children Through Family Planning," *Population Reports*, series J, No. 27, Population Information Program, The Johns Hopkins University, Baltimore, Md., May-June 1984.

Rutstein, S.O., "Infant and Child Mortality: Levels, Trends and Demographic Differentials," Revised Edition, World Fertility Survey Comparative Studies No. 43, International Statistical Institute, Voorburg, Netherlands, 1984.

Trussell, J., A.R. Pebley, "The Potential Impact of Changes in Fertility on Infant, Child and Maternal Mortality," World Bank Staff Working Papers No. 698, Population and Development Series Number 23, The World Bank, Washington, D.C., 1984.

Selected Bibliography: Education and Literacy

Caldwell, J.C., "Education as a Factor in Mortality Decline, An Examination of Nigerian Data," *Population Studies*, 33(3): 395-413, 1979.

Caldwell, J.C., P. McDonald, "Influence of Maternal Education on Infant and Child Mortality: Levels and Causes, "International Population Conference, 2: 79-95, Manila, 1981.

Cochrane, S.H., D.J. O'Hara, J. Leslie, "The Effects of Education on Health," World Bank Staff Working Papers No. 405, The World Bank, Washington, D.C., 1980.

Cochrane, S.H., J. Leslie, D.J. O'Hara, "Parental Education and Child Health: Intracountry Evidence," *Health Policy and Education*, 2: 213-250, Elsevier Scientific Publishing Company, Amsterdam, 1982.

Cochrane, S.H., "The Effect of Education on Mortality: A Quick Review of the Evidence," World Bank Paper, The World Bank, Washington, D.C., 1985.

Gbolahan, A.O., "Effects of Women's Education on Postpartum Practices and Fertility in Urban Nigeria," *Studies in Family Planning*, 16(6): 321-331, The Population Council, New York, November/December, 1985.

Hobcraft, J.N., J.W. McDonald, S.O. Rutstein, "Socio-economic Factors in Infant and Child Mortality: A Cross-national Comparison," *Population Studies* 38(2): 193-223, 1984.

Selected Bibliography: Availability of Modern Health Services

Golladay, F., "Health," A Sector Policy Paper, The World Bank, Second Edition. Washington, D.C., February, 1980.

Gunatilleke, G., "Health and Development in Sri Lanka: An Overview," Good Health at Low Cost, S.B. Halstead, J.A. Walsh, K.S. Warren, (ed.) (New York: The Rockefeller Foundation, 1985).

Mosely, H., "Child Survival: Research and Policy," Child Survival: Strategies for Research, *Population and Development Review,* Supplement to Vol. 10, L.C. Chen, H. Mosely (ed.) (New York: The Population Council, 1984).

Nag, M., "The Impact of Social and Economic Development on Mortality: Comparative Study of Kerala and West Bengal," Good Health at Low Cost, S.B. Halstead, J.A. Walsh, K.S. Warren, (ed.) (New York: The Rockefeller Foundation, 1985).

Rohde, J.E., "Why the Other Half Dies: The Science and Politics of Child Mortality in the Third World," A Child Survival and Development Revolution, P.E. Mandl (ed.) (Switzerland: UNICEF, 1983).

Selected Bibliography: Income Per Capita and Government Expenditures

Hobcraft, J.N., J.W. McDonald, S.O. Rutstein, "Socio-economic Factors in Infant and Child Mortality: A Cross-National Comparison," *Population Studies*, 38(2): 193-223 1984.

Preston, S. H., Mortality Patterns in National Populations. Academic Press. New York. 1976.

World Bank. World Bank Development Report. Washington, DC. 1985.

Halstead, S.B., J.A. Walsh, K.S. Warren, (eds.) Good Health at Low Cost. Conference Report, the Rockefeller Foundation. New York, N.Y. 1985.

Selected Bibliography: Food Availability

Foege, W.H., "Remarks," Good Health at Low Cost, S.B. Halstead, J.A. Walsh, K.S. Warren, (ed.) (New York: The Rockefeller Foundation, 1985).

Martorell, R., Sharma, R., "Trends in Nutrition, Food Supply and Infant Mortality Rates," Good Health at Low Cost, S.B. Halstead, J.A. Walsh, K.S. Warren, (ed.) (New York: The Rockefeller Foundation, 1985).

Mosely, H., "Health, Nutrition, and Mortality in Bangladesh," Research in Human Capital and Development, 1: 77-94, JAI Press, Inc., 1979.

Reutlinger, S., J. Pellekaan, "Poverty and Hunger: Issues and Options for Food Security in Developing Countries," World Bank Policy Study, The World Bank, Washington, D.C., 1986.

Selected Bibliography: Water Supply and Sanitation Facilities

Blum, D., R.G. Feachem, "Measuring the Impact of Water Supply and Sanitation Investments on Diarrheal Diseases: Problems of Methodology." *International Journal of Epidemiology*, 12(3): 357-365, 1983.

Briscoe, J., "Water Supply and Health in Developing Countries: Selective Primary Health Care Revisited," *American Journal of Public Health*, 74(9): 1009-1013, 1984.

Briscoe, J., "Evaluating Water Supply and Other Health Programs: Short-Run vs Long-Run Mortality Effects," *Public Health* London, 99: 142-145, 1985.

Briscoe, J., R.G. Feachem, M.M. Rahaman, "Measuring the Impact of Water Supply and Sanitation Investments on Diarrhoeal Diseases: Problems of Methodology," World Health Organization, Geneva, 71 pp., 1985.

Esrey, S.A., R.G. Feachem, J.M. Hughes, "Interventions for the Control of Diarrhoeal Diseases Among Young Children: Improving Water Supplies and Excreta Disposal Facilities," *Research Bulletin of the World Health Organization*, 63(4), Geneva, Switzerland, 757-772, 1983.

Feachem, R.G., et al., "Health Aspects of Excreta and Sullage Management—A State of the Art Review," World Bank, Washington D.C., 318 pp., 1981.

International Bank for Reconstruction and Development. "Measurement of the Health Benefits of Investments in Water Supply," Report of an Expert Panel to the International Bank for Reconstruction and Development, PUN Report No. 20, 12 pp., 1976.

McJunkin, F.E., "Water and Human Health," Agency for International Development, Washington D.C., 134 pp., 1982.

National Research Council, "Drinking Water and Health," 4 vols., Washington D.C., 939 pp., 1977; 393 pp., 1980; 415 pp., 1980, and 299 pp., 1982.

United Nations, "Progress on the Attainment of the Goals of the International Drinking Water Supply and Sanitation Decade, Report of the Secretary General," General Assembly, Economic and Social Council, A/40/108/E/1985/49, 1985.

World Health Organization, "Maximizing Benefits to Health, An Appraisal Methodology for Water Supply and Sanitation Projects," Geneva, 44 pp., 1983.

Appendices

Child Survival Statistics
Methodology of Projections
Definitions and Sources of Data
Countries and Regions

Table 1: Numbers of Infants and Children Age 1–4 if 1980-85 Mortality Levels Continue (in Thousands)

	Infants				Age 1–4			
	1985	1990	1995	2000	1985	1990	1995	2000
Africa	**19,606.3**	**22,661.0**	**25,950.6**	**28,046.1**	**65,904.8**	**76,517.2**	**88,109.9**	**101,624.7**
Angola	369.6	419.9	474.0	507.6	1,213.6	1,380.0	1,567.6	1,777.7
Benin	186.9	216.0	248.1	268.9	626.5	726.6	837.4	971.0
Botswana	50.9	59.6	69.1	75.6	179.9	212.6	246.3	290.4
Burkina Faso	296.4	334.9	376.3	403.0	971.5	1,101.4	1,239.7	1,406.6
Burundi	199.6	223.2	247.7	261.8	677.5	757.0	848.7	939.3
Cameroon, U. Rep. of	389.0	442.4	501.4	539.7	1,339.3	1,525.1	1,732.3	1,983.4
Central African Republic	102.9	114.9	127.7	135.8	343.0	383.6	427.5	478.3
Chad	199.3	223.3	247.8	262.8	662.2	745.7	831.1	926.2
Congo	72.2	82.1	92.5	99.0	255.2	291.2	330.4	373.8
Ethiopia	1,924.7	2,173.5	2,443.0	2,616.4	6,294.5	7,126.3	8,027.5	9,105.8
Gabon	37.4	44.9	50.7	51.9	123.5	149.8	181.1	188.9
Gambia	27.3	30.1	32.8	34.5	92.9	102.6	112.5	123.2
Ghana	588.4	689.5	800.7	876.0	2,002.4	2,365.5	2,746.4	3,239.9
Guinea	252.1	281.5	311.3	330.2	821.9	924.3	1,023.9	1,141.4
Guinea-Bissau	32.6	35.9	39.1	41.1	109.2	121.1	132.4	144.8
Ivory Coast	406.7	478.3	552.4	597.8	1,379.5	1,636.8	1,909.7	2,208.6
Kenya	1,047.3	1,266.0	1,509.4	1,663.0	3,590.4	4,354.9	5,256.6	6,282.4
Lesotho	57.9	64.8	71.9	76.5	204.1	229.3	255.2	285.5
Liberia	95.7	111.2	129.8	142.8	316.0	366.0	426.2	507.9
Madagascar	416.6	476.6	541.1	581.7	1,491.8	1,711.8	1,954.0	2,231.9
Malawi	326.1	378.5	429.7	460.1	1,029.2	1,209.0	1,387.2	1,572.9
Mali	355.4	405.2	458.7	493.4	1,116.4	1,279.1	1,451.2	1,659.0
Mauritania	85.0	97.6	110.0	117.7	279.8	325.5	368.6	417.3
Mauritius	24.7	23.8	22.5	21.8	99.2	97.1	91.9	86.3
Mozambique	559.5	639.5	719.5	767.9	1,814.4	2,089.9	2,370.4	2,671.7
Namibia	63.8	73.1	83.0	89.2	215.8	248.2	283.2	323.5
Niger	279.1	321.8	368.7	399.3	911.8	1,054.3	1,211.5	1,402.9
Nigeria	4,389.6	5,195.9	6,087.0	6,664.6	14,617.3	17,383.7	20,489.8	24,208.5
Reunion	10.9	11.4	11.6	11.5	42.0	45.1	46.3	45.9
Rwanda	281.5	326.4	378.8	411.8	930.8	1,073.2	1,255.5	1,464.0
Senegal	268.6	305.0	343.4	367.8	886.0	1,011.5	1,142.1	1,296.1
Sierra Leone	149.0	161.0	172.8	180.3	480.8	522.5	560.8	606.4
Somalia	195.7	219.4	244.9	262.8	641.0	724.4	803.5	914.7
South Africa	1,158.6	1,274.6	1,372.8	1,425.5	4,209.3	4,683.9	5,093.4	5,458.4
Sudan	888.4	982.4	1,069.0	1,117.2	3,039.3	3,386.0	3,718.8	4,032.3
Swaziland	27.7	32.1	36.9	40.1	91.9	106.7	123.0	143.3
Tanzania	1,034.2	1,231.4	1,453.8	1,599.6	3,436.2	4,104.7	4,874.3	5,811.1
Togo	123.1	141.8	161.9	174.6	420.4	486.6	558.1	641.6
Uganda	711.7	838.2	978.0	1,070.4	2,382.3	2,821.6	3,303.4	3,900.0
Zaire	1,238.4	1,427.2	1,634.9	1,766.1	4,209.6	4,856.0	5,597.2	6,450.4
Zambia	297.1	349.6	409.5	449.4	1,025.9	1,210.5	1,420.8	1,686.4
Zimbabwe	384.6	456.2	536.1	588.9	1,330.4	1,586.3	1,871.6	2,224.8
Near East	**8,822.3**	**9,370.7**	**9,644.**	**9,746.7**	**,934.7**	**4,619.4**	**25,996.6**	**36,678.1**
Algeria	848.6	928.1	939.4	916.7	3,014.9	3,415.5	3,613.3	3,454.9
Cyprus	12.9	12.0	11.4	11.2	53.2	49.7	46.2	44.9
Egypt	1,517.1	1,512.5	1,493.4	1,493.1	5,607.5	5,675.6	5,545.9	5,544.2
Iran, Islamic Rep. of	1,622.5	1,721.5	1,740.5	1,729.9	5,720.0	6,244.7	6,426.7	6,354.7
Iraq	633.4	689.0	745.1	778.4	2,326.9	2,535.2	2,754.3	2,984.8
Israel	93.1	94.3	96.4	97.0	370.8	371.1	382.4	387.2
Jordan	151.1	187.9	226.6	249.8	526.3	663.4	816.6	977.1
Kuwait	64.0	70.6	74.4	74.9	240.8	270.0	294.3	298.2
Lebanon	76.4	80.1	82.9	82.9	294.1	306.0	326.2	326.0
Libyan Arab Jamahiriya	149.1	172.5	195.3	207.5	517.2	601.2	694.7	776.3
Morocco	704.7	692.2	651.5	624.1	2,628.6	2,659.9	2,525.9	2,334.9
Oman	50.9	57.1	62.3	65.6	173.0	198.4	216.5	238.4
Saudi Arabia	446.6	522.8	602.7	651.7	1,591.9	1,874.8	2,183.6	2,521.2
Syrian Arab Rep.	455.9	524.2	574.4	596.0	1,637.3	1,927.5	2,166.2	2,318.1
Tunisia	210.4	211.4	203.9	198.7	787.1	815.6	790.7	754.1
Turkey	1,364.0	1,420.0	1,410.2	1,397.2	5,024.3	5,415.8	5,415.9	5,325.4
United Arab Emirates	34.0	34.7	35.0	36.2	130.8	139.0	134.3	143.0
Yemen, Democratic	90.4	103.3	115.0	120.3	298.4	342.5	391.4	425.7
Yemen	297.4	336.5	383.9	415.3	991.8	1,113.3	1,271.5	1,469.1

	Infants				Age 1–4			
	1985	1990	1995	2000	1985	1990	1995	2000
Asia (without China)	**43,953.1**	**44,297.8**	**44,340.7**	**43,845.0**	**162,899.0**	**163,209.5**	**166,033.4**	**162,600.8**
Afghanistan	726.3	813.3	877.4	887.4	2,233.7	2,500.0	2,828.6	2,888.4
Bangladesh	3,977.3	4,202.1	4,347.5	4,391.9	13,837.7	14,737.2	15,466.8	15,757.3
Bhutan	48.3	50.7	52.0	52.8	166.9	178.6	183.7	188.5
Burma	1,039.0	1,070.6	1,078.3	1,074.7	3,929.7	4,097.9	4,171.0	4,146.1
East Timor	26.4	26.5	24.8	23.1	89.8	93.0	90.6	79.6
Fiji	19.6	18.2	16.7	16.3	79.6	77.0	67.6	64.8
Hong Kong	90.3	94.8	92.5	89.4	345.8	378.6	379.8	357.0
India	21,017.3	20,693.3	20,501.0	20,149.3	78,494.9	76,059.7	76,585.5	74,195.8
Indonesia	4,753.1	4,691.7	4,620.3	4,507.0	18,050.6	17,595.5	17,707.5	16,920.0
Kampuchea	282.0	278.6	246.8	220.9	977.0	1,019.8	952.2	777.7
Korea, Dem. Rep. of	586.8	616.8	629.8	635.3	2,247.8	2,412.0	2,476.1	2,515.9
Korea, Rep. of	923.7	950.0	894.4	864.9	3,498.2	3,882.4	3,641.8	3,425.1
Laos People's Dem. Rep.	149.2	156.0	160.0	160.7	531.6	559.2	582.6	587.1
Malaysia	438.2	429.6	412.6	395.2	1,750.7	1,716.5	1,691.2	1,563.4
Melanesia	163.6	170.5	177.4	181.3	625.9	652.5	680.4	708.2
Micronesia	11.6	11.6	11.7	11.7	45.0	45.7	45.7	45.9
Mongolia	64.0	70.8	76.5	78.8	237.5	263.7	291.9	308.0
Nepal	604.2	644.3	684.8	703.3	2,093.8	2,219.1	2,391.1	2,511.0
Papua New Guinea	123.3	129.6	137.0	141.1	462.1	482.4	511.9	541.0
Pakistan	3,796.9	3,969.8	3,967.2	3,930.6	13,395.1	14,425.9	14,595.0	14,349.0
Philippines	1,665.4	1,719.9	1,735.0	1,722.7	6,318.5	6,578.5	6,751.1	6,663.8
Polynesia	17.4	17.3	16.9	16.6	69.1	69.5	68.1	65.8
Singapore	42.3	42.7	41.3	39.8	166.9	171.6	170.1	158.6
Sri Lanka	411.9	378.3	350.9	342.4	1,688.1	1,567.6	1,413.5	1,351.2
Thailand	1,271.5	1,252.7	1,347.3	1,384.0	5,215.8	4,702.9	5,177.9	5,439.7
Viet Nam	1,703.4	1,797.8	1,840.8	1,823.8	6,347.3	6,722.7	7,112.0	6,992.0
China	19,096.9	19,708.2	20,412.8	20,802.2	74,085.0	76,071.6	79,030.7	81,818.6
Latin America & Caribbean	**11,696.4**	**12,186.0**	**12,454.9**	**12,574.2**	**44,104.0**	**46,511.0**	**47,776.5**	**48,577.4**
Argentina	705.8	710.5	706.1	707.6	2,769.2	2,832.6	2,792.9	2,803.4
Bolivia	252.0	280.5	310.5	329.5	861.7	961.7	1,067.5	1,190.2
Brazil	3,780.8	3,884.7	3,905.2	3,904.1	14,303.6	14,919.7	15,070.2	15,062.6
Chile	262.1	271.0	271.3	269.2	1,017.6	1,072.1	1,086.4	1,070.5
Colombia	825.9	851.0	853.0	851.0	3,143.1	3,303.5	3,327.7	3,313.8
Costa Rica	74.9	77.9	78.6	78.7	289.5	308.6	312.4	313.3
Cuba	171.9	188.4	193.7	192.1	646.7	730.2	777.2	765.6
Dominican Republic	187.9	193.4	192.1	189.4	709.5	744.4	750.6	731.0
Ecuador	317.8	349.7	376.5	390.1	1,163.8	1,293.7	1,409.7	1,504.9
El Salvador	204.5	224.9	248.1	263.3	749.9	823.4	907.6	1,012.2
Guatemala	312.8	343.7	374.8	393.2	1,129.1	1,244.6	1,364.6	1,490.2
Guyana	24.6	23.4	22.3	21.7	99.7	95.2	90.0	85.7
Haiti	245.6	275.8	309.1	330.6	841.0	944.9	1,060.8	1,200.3
Honduras	170.1	184.0	210.2	231.3	626.3	656.4	733.4	874.6
Jamaica	62.1	60.4	57.0	55.4	247.4	248.2	231.8	220.2
Mexico	2,447.6	2,525.5	2,555.1	2,555.2	9,352.7	9,747.4	9,957.1	9,958.1
Nicaragua	131.9	145.9	157.6	163.8	474.6	531.9	581.1	623.7
Panama	57.9	60.7	61.9	61.9	222.9	236.6	244.9	245.2
Paraguay	123.5	134.0	141.4	145.1	460.7	508.6	541.6	567.9
Peru	650.0	681.1	693.2	694.7	2,350.7	2,504.7	2,578.7	2,589.5
Puerto Rico	72.3	73.9	73.1	72.0	282.5	295.0	294.8	287.2
Trinidad and Tobago	28.6	28.5	27.3	26.5	112.5	115.6	111.6	105.3
Uruguay	56.3	56.5	56.8	57.0	223.3	224.1	224.8	226.5
Venezuela	529.5	559.5	580.2	590.8	2,025.7	2,167.7	2,259.0	2,335.4
Less Developed	**103,175.1**	**108,222.7**	**112,803.3**	**115,014.2**	**378,927.5**	**396,928.8**	**416,946.2**	**431,299.7**
More Developed	**17,652.4**	**17,666.0**	**17,581.0**	**17,517.5**	**70,260.1**	**70,595.5**	**70,326.1**	**69,861.6**
Sweden	89.5	83.4	82.4	81.4	378.5	334.2	332.5	325.3
Japan	1,527.9	1,527.3	1,622.3	1,699.1	6,202.8	5,948.4	6,230.8	6,783.0
United States	3,719.1	3,797.2	3,799.8	3,764.4	14,647.9	15,071.1	15,287.7	15,027.8
World Total	**120,827.5**	**125,888.7**	**130,384.3**	**132,531.7**	**449,187.6**	**467,524.3**	**487,272.3**	**501,161.3**

Table 2: Percent and Numbers of Children Dying Before Age 1 and Age 5 if 1980-85 Mortality Levels Continue

	1980-85 mortality, percent of children dying		Annual number of infant and child deaths if 1980-85 mortality levels continue (in thousands)							
			Infants				Age 1–4			
	Before age 1	Before age 5	1985	1990	1995	2000	1985	1990	1995	2000
Africa	**11.9**	**19.7**	**2,538.8**	**2,928.0**	**3,346.8**	**3,613.7**	**1,555.4**	**1,783.9**	**2,050.4**	**2,362.6**
Angola	14.9	25.0	60.9	69.2	78.1	83.6	39.0	44.3	50.4	57.1
Benin	12.0	20.0	24.4	28.2	32.4	35.1	30.7	17.5	20.1	23.3
Botswana	7.6	10.5	4.1	4.8	5.6	6.1	1.4	1.7	2.0	2.3
Burkina Faso	15.0	25.5	49.5	55.9	62.8	67.3	32.3	36.7	41.3	46.8
Burundi	12.4	21.0	27.0	30.2	33.5	35.4	17.7	19.7	22.1	24.5
Cameroon, U. Rep. of	10.3	17.0	43.1	49.0	55.5	59.7	26.1	29.8	33.8	38.7
Central African Republic	14.2	24.0	16.1	18.0	20.0	21.3	10.5	11.8	13.1	14.7
Chad	14.3	24.0	31.4	35.2	39.1	41.4	20.2	22.7	25.3	28.2
Congo	8.1	13.0	6.2	7.1	8.0	8.5	3.5	4.0	4.5	5.1
Ethiopia	15.5	26.0	332.0	374.9	421.4	451.3	211.8	239.8	270.1	306.4
Gabon	11.2	18.6	4.5	5.4	6.1	6.3	2.7	3.3	4.0	4.2
Gambia	17.4	23.2	5.4	5.9	6.5	6.8	1.7	1.9	2.1	2.3
Ghana	9.8	16.0	61.9	72.5	84.2	92.1	35.8	42.2	49.0	57.9
Guinea	15.9	27.0	44.8	50.1	55.4	58.7	29.5	33.1	36.7	40.9
Guinea-Bissau	14.3	24.0	5.1	5.7	6.2	6.5	3.3	3.7	4.0	4.4
Ivory Coast	11.0	16.5	48.2	56.7	65.5	70.9	22.2	26.3	30.7	35.5
Kenya	8.0	13.0	89.2	107.8	128.5	141.6	50.2	60.9	73.5	87.8
Lesotho	11.1	15.0	6.9	7.8	8.6	9.2	2.3	2.6	2.9	3.2
Liberia	13.2	22.5	13.9	16.1	18.9	20.7	9.0	10.4	12.2	14.5
Madagascar	6.7	10.5	29.4	33.6	38.2	41.0	15.6	17.9	20.4	23.3
Malawi	16.3	28.5	59.7	69.3	78.7	84.3	41.0	48.2	55.3	62.7
Mali	18.0	31.0	72.4	82.5	93.4	100.5	49.2	56.3	63.9	73.0
Mauritania	13.7	23.0	12.8	14.7	16.6	17.8	8.0	9.4	10.6	12.0
Mauritius	2.8	3.6	0.7	0.7	0.7	0.6	0.2	0.2	0.2	0.2
Mozambique	15.3	26.0	95.6	109.2	122.9	131.1	61.8	71.2	80.8	91.0
Namibia	11.6	19.3	8.0	9.2	10.4	11.2	5.0	5.7	6.5	7.5
Niger	14.6	24.5	45.0	51.9	59.4	64.4	28.5	33.0	37.9	43.9
Nigeria	11.4	19.0	542.1	641.6	751.7	823.0	330.0	392.4	462.6	546.5
Reunion	1.3	1.7	0.1	0.2	0.2	0.2	0.0[a]	0.0[a]	0.0[a]	0.0[a]
Rwanda	13.2	22.5	40.7	47.2	54.8	59.5	26.7	30.8	36.0	42.0
Senegal	14.2	24.0	42.2	47.9	53.9	57.7	27.1	31.0	35.0	39.7
Sierra Leone	18.0	31.0	30.3	32.8	35.2	36.7	21.2	23.0	24.7	26.7
Somalia	15.5	26.0	33.8	37.8	42.3	45.3	21.6	24.4	27.0	30.8
South Africa	8.3	11.0	102.5	112.8	121.5	126.2	31.2	34.8	37.8	40.5
Sudan	11.8	20.0	113.4	125.4	136.5	142.7	75.1	83.7	91.9	99.6
Swaziland	12.9	21.9	3.9	4.5	5.2	5.7	2.5	2.9	3.4	3.9
Tanzania	11.5	19.0	128.4	152.9	180.6	198.7	77.0	92.0	109.2	130.2
Togo	10.2	17.0	13.5	15.6	17.8	19.2	8.3	9.6	11.0	12.7
Uganda	11.2	18.5	86.0	101.3	118.2	129.3	51.6	61.1	71.6	84.5
Zaire	10.7	18.0	143.0	164.8	188.8	203.9	90.2	104.1	119.9	138.2
Zambia	8.8	14.0	27.9	32.9	38.5	42.3	15.1	17.8	20.9	24.8
Zimbabwe	8.0	13.0	32.7	38.8	45.6	50.1	18.6	22.2	26.2	31.1
Near East	**9.3**	**13.4**	**876.9**	**927.9**	**950.9**	**958.8**	**369.3**	**398.6**	**413.3**	**420.4**
Algeria	8.8	13.0	79.6	87.0	88.1	86.0	35.8	40.5	42.9	41.0
Cyprus	1.7	1.9	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0
Egypt	10.0	15.0	162.6	162.2	160.1	160.1	80.7	81.6	79.8	79.7
Iran, Islamic Rep. of	11.5	17.0	201.9	214.2	216.6	215.3	92.7	101.2	104.1	103.0
Iraq	7.7	10.5	51.7	56.3	60.8	63.6	18.0	19.6	21.3	23.0
Israel	1.4	1.6	1.3	1.4	1.4	1.4	0.2	0.2	0.2	0.2
Jordan	5.4	7.0	8.5	10.6	12.8	14.1	2.2	2.8	3.5	4.2
Kuwait	2.3	2.7	1.5	1.7	1.7	1.8	0.2	0.3	0.3	0.3
Lebanon	4.8	6.0	3.8	4.0	4.1	4.1	0.9	1.0	1.0	1.0
Libyan Arab Jamahiriya	9.7	14.0	15.4	17.8	20.2	21.4	6.4	7.5	8.6	9.7
Morocco	9.7	14.0	72.7	71.4	67.2	64.4	32.7	33.1	31.4	29.0
Oman	11.7	18.5	6.5	7.2	7.9	8.3	3.5	4.0	4.4	4.8
Saudi Arabia	6.6	9.0	31.1	36.4	41.9	45.3	10.4	12.2	14.2	16.4
Syrian Arab Rep.	5.9	8.0	28.1	32.3	35.4	36.8	9.3	11.0	12.4	13.2
Tunisia	8.5	12.0	19.1	19.2	18.5	18.0	7.7	7.9	7.7	7.3
Turkey	9.2	11.5	134.0	139.5	138.6	137.3	32.2	34.7	34.7	34.2
United Arab Emirates	3.8	4.7	1.3	1.4	1.4	1.4	0.3	0.3	0.3	0.3
Yemen, Democratic	13.5	22.5	13.4	15.3	17.0	17.8	8.3	9.6	10.9	11.9
Yemen	13.5	22.5	44.1	49.8	56.9	61.5	27.7	31.1	35.5	41.1

	1980-85 mortality, percent of children dying		Annual number of infant and child deaths if 1980-85 mortality levels continue (in thousands)							
			Infants				Age 1–4			
	Before age 1	Before age 5	1985	1990	1995	2000	1985	1990	1995	2000
Asia (without China)	**10.1**	**15.4**	**4,782.0**	**4,831.4**	**4,845.0**	**4,793.4**	**2,470.2**	**2,488.8**	**2,545.0**	**2,497.4**
Afghanistan	19.4	34.0	161.4	180.7	194.9	197.2	115.1	128.8	145.7	148.8
Bangladesh	12.8	20.5	557.0	588.5	608.9	615.1	323.6	344.6	361.7	368.5
Bhutan	13.9	21.5	7.4	7.7	7.9	8.1	3.9	4.2	4.3	4.4
Burma	7.0	9.5	76.8	79.1	79.7	79.4	26.9	28.0	28.5	28.4
East Timor	18.3	27.3	5.5	5.5	5.2	4.8	2.7	2.8	2.7	2.4
Fiji	3.1	3.6	0.6	0.6	0.5	0.5	0.1	0.1	0.1	0.1
Hong Kong	1.0	1.2	0.9	0.9	0.9	0.9	0.2	0.2	0.2	0.2
India	11.0	16.5	2,499.1	2,460.5	2,437.7	2,395.9	1,258.7	1,219.7	1,228.1	1,189.8
Indonesia	8.4	13.5	426.4	420.9	414.5	404.3	258.9	252.3	253.9	242.6
Kampuchea	16.0	24.0	50.4	49.8	44.1	39.5	24.8	25.9	24.2	19.8
Korea, Dem. Rep. of	3.0	3.9	17.9	18.8	19.2	19.3	5.4	5.8	6.0	6.1
Korea, Rep. of	3.0	3.9	28.1	28.9	27.2	26.3	8.5	9.4	8.8	8.3
Laos People's Dem. Rep.	12.3	18.0	19.9	20.8	21.3	21.4	9.1	9.6	10.0	10.1
Malaysia	3.0	4.1	13.5	13.3	12.8	12.2	5.0	4.9	4.8	4.4
Melanesia	6.6	7.6	11.3	11.8	12.3	12.5	1.7	1.8	1.9	2.0
Micronesia	3.6	5.6	0.4	0.4	0.4	0.4	0.2	0.2	0.2	0.2
Mongolia	5.3	7.0	3.5	3.9	4.2	4.4	1.1	1.2	1.3	1.4
Nepal	13.9	21.5	92.2	98.4	104.6	107.4	49.3	52.2	56.2	59.1
Papua New Guinea	7.4	10.5	9.7	10.2	10.8	11.1	3.9	4.1	4.3	4.6
Pakistan	12.0	18.0	494.8	517.4	517.0	512.3	239.1	257.5	260.5	256.1
Philippines	5.1	8.5	87.8	90.7	91.5	90.8	58.6	61.0	62.6	61.8
Polynesia	3.0	3.5	0.5	0.5	0.5	0.5	0.1	0.1	0.1	0.1
Singapore	1.0	1.3	0.4	0.4	0.4	0.4	0.1	0.1	0.1	0.1
Sri Lanka	3.9	5.0	16.8	15.4	14.3	13.9	4.7	4.4	3.9	3.8
Thailand	4.8	6.0	62.8	61.9	66.6	68.4	17.2	15.5	17.1	18.0
Viet Nam	7.6	10.5	136.6	144.2	147.6	146.3	51.3	54.3	57.4	56.5
China	3.9	5.5	776.9	801.8	830.4	846.3	305.0	313.2	325.4	336.9
Latin America & Caribbean	**6.3**	**8.8**	**770.8**	**806.8**	**830.2**	**841.9**	**298.2**	**317.1**	**329.9**	**340.7**
Argentina	3.6	4.2	26.2	26.4	26.2	26.3	4.3	4.4	4.3	4.4
Bolivia	12.4	19.5	34.2	38.0	42.1	44.7	18.3	20.5	22.7	25.3
Brazil	7.1	9.5	282.0	289.7	291.3	291.2	95.3	99.4	100.4	100.4
Chile	2.3	2.8	6.2	6.4	6.4	6.4	1.3	1.3	1.3	1.3
Colombia	5.0	7.5	43.0	44.3	44.4	44.3	21.0	22.1	22.3	22.2
Costa Rica	2.0	2.4	1.5	1.6	1.6	1.6	0.3	0.3	0.3	0.3
Cuba	1.7	2.0	2.9	3.2	3.3	3.3	0.5	0.6	0.6	0.6
Dominican Republic	7.5	9.5	14.8	15.2	15.1	14.9	4.0	4.2	4.2	4.1
Ecuador	7.0	9.5	23.3	25.7	27.6	28.6	8.1	9.0	9.8	10.5
El Salvador	7.0	10.0	15.1	16.6	18.3	19.5	6.2	6.8	7.5	8.3
Guatemala	7.0	12.0	23.2	25.5	27.8	29.2	15.6	17.2	18.9	20.6
Guyana	3.6	4.5	0.9	0.9	0.8	0.8	0.2	0.2	0.2	0.2
Haiti	12.8	19.0	34.3	38.5	43.1	46.1	15.7	17.7	19.9	22.5
Honduras	8.2	12.5	14.7	15.9	18.2	20.0	7.6	8.0	9.0	10.7
Jamaica	2.1	2.7	1.3	1.3	1.2	1.2	0.4	0.4	0.4	0.3
Mexico	5.3	7.5	135.5	139.8	141.5	141.5	55.1	57.4	58.6	58.6
Nicaragua	7.6	11.5	10.7	11.8	12.8	13.3	5.1	5.7	6.2	6.7
Panama	2.6	3.7	1.5	1.6	1.6	1.6	0.7	0.7	0.7	0.7
Paraguay	4.5	6.5	5.8	6.3	6.6	6.8	2.4	2.7	2.9	3.0
Peru	9.9	14.5	68.6	71.9	73.2	73.3	31.3	33.3	34.3	34.5
Puerto Rico	1.7	1.9	1.2	1.2	1.2	1.2	0.2	0.2	0.2	0.2
Trinidad and Tobago	2.4	2.8	0.7	0.7	0.7	0.6	0.1	0.1	0.1	0.1
Uruguay	3.0	3.4	1.7	1.7	1.7	1.8	0.2	0.2	0.2	0.2
Venezuela	3.9	4.7	21.2	22.4	23.2	23.7	4.4	4.7	4.9	5.0
Less Developed	**8.8**	**13.5**	**9,745.3**	**10,295.9**	**10,803.3**	**11,054.0**	**4,998.2**	**5,301.6**	**5,664.0**	**5,958.0**
More Developed	**1.6**	**1.8**	**287.1**	**287.4**	**286.0**	**284.9**	**42.0**	**42.2**	**42.1**	**41.8**
Sweden	0.7	0.8	0.6	0.6	0.6	0.6	0.1	0.1	0.1	0.1
Japan	0.6	0.9	10.0	10.0	10.6	11.1	3.9	3.8	4.0	4.3
United States	1.1	1.3	42.2	43.1	43.2	42.8	6.5	6.7	6.8	6.7
World Total	**7.8**	**11.8**	**10,032.4**	**10,583.2**	**11,089.3**	**11,338.9**	**5,040.2**	**5,343.8**	**5,706.0**	**5,999.8**

Notes appear on page 96

Table 3: Numbers of Infants and Children Age 1–4 if Mortality Levels are Reduced To Reach Year 2000 Goals (in Thousands)

	Infants				Age 1–4			
	1985	1990	1995	2000	1985	1990	1995	2000
Africa	**19,606.3**	**22,935.0**	**26,548.3**	**29,000.5**	**65,904.8**	**78,987.7**	**94,087.1**	**112,124.5**
Angola	369.6	426.5	489.0	529.5	1,213.6	1,438.9	1,702.7	2,006.1
Benin	186.9	219.2	254.1	278.7	626.5	751.4	899.9	1,082.7
Botswana	50.9	60.0	70.1	77.3	179.9	215.8	254.0	304.3
Burkina Faso	296.4	340.3	388.5	420.9	971.5	1,150.1	1,350.5	1,594.0
Burundi	199.6	226.7	254.2	272.0	677.5	787.9	916.9	1,056.0
Cameroon, U. Rep. of	389.0	445.8	509.3	553.5	1,339.3	1,564.6	1,829.4	2,154.6
Central African Republic	102.9	116.6	131.4	141.0	343.0	398.6	461.3	534.6
Chad	199.3	226.6	255.0	273.1	662.2	775.0	897.0	1,035.6
Congo	72.2	82.6	93.8	101.1	255.2	296.7	343.8	397.1
Ethiopia	1,924.7	2,211.1	2,527.4	2,740.7	6,294.5	7,455.5	8,777.2	10,375.4
Gabon	37.4	45.4	51.7	53.5	123.5	154.3	192.9	208.1
Gambia	27.3	30.7	34.2	36.6	92.9	107.0	122.1	138.9
Ghana	588.4	694.0	812.2	896.5	2,002.4	2,421.6	2,887.2	3,495.3
Guinea	252.1	286.6	322.6	346.9	821.9	970.0	1,126.4	1,312.2
Guinea-Bissau	32.6	36.4	40.3	42.7	109.2	125.9	142.8	161.9
Ivory Coast	406.7	483.3	562.9	615.7	1,379.5	1,679.5	2,016.6	2,398.3
Kenya	1,047.3	1,274.2	1,530.3	1,699.6	3,590.4	4,436.8	5,469.8	6,674.0
Lesotho	57.9	65.5	73.3	78.8	204.1	234.7	268.0	307.3
Liberia	95.7	112.5	133.0	147.4	316.0	378.4	453.9	559.6
Madagascar	416.6	479.5	548.0	593.4	1,491.8	1,737.4	2,016.7	2,341.8
Malawi	326.1	385.8	446.2	484.7	1,029.2	1,274.3	1,539.1	1,830.8
Mali	355.4	414.6	479.9	525.6	1,116.4	1,360.4	1,638.6	1,980.7
Mauritania	85.0	98.9	112.9	121.8	279.8	337.2	395.3	462.4
Mauritius	24.7	23.9	22.7	22.0	99.2	97.5	92.8	87.7
Mozambique	559.5	650.3	743.9	803.6	1,814.4	2,185.9	2,590.7	3,042.3
Namibia	63.8	74.0	84.8	92.2	215.8	256.2	303.0	358.4
Niger	279.1	326.7	379.9	415.7	911.8	1,097.5	1,311.8	1,575.8
Nigeria	4,389.6	5,258.6	6,216.3	6,882.4	14,617.3	17,927.8	21,886.6	26,754.6
Reunion	10.9	11.5	11.6	11.6	42.0	45.2	46.6	46.2
Rwanda	281.5	330.4	387.8	424.8	930.8	1,109.7	1,337.1	1,612.9
Senegal	268.6	309.4	353.3	382.0	886.0	1,051.1	1,232.5	1,448.8
Sierra Leone	149.0	164.7	180.8	192.1	480.8	555.8	633.2	724.0
Somalia	195.7	223.2	253.4	275.3	641.0	757.8	878.5	1,042.3
South Africa	1,158.6	1,282.9	1,392.0	1,457.4	4,209.3	4,756.8	5,259.9	5,730.3
Sudan	888.4	995.8	1,093.7	1,156.4	3,039.3	3,500.1	3,993.1	4,491.8
Swaziland	27.7	32.5	37.8	41.3	91.9	110.1	130.5	157.1
Tanzania	1,034.2	1,246.6	1,485.1	1,652.5	3,436.2	4,233.6	5,207.5	6,423.9
Togo	123.1	142.9	164.4	179.0	420.4	499.1	589.2	696.7
Uganda	711.7	847.5	997.7	1,103.8	2,382.3	2,906.3	3,518.9	4,292.4
Zaire	1,238.4	1,440.4	1,664.0	1,815.8	4,209.6	4,993.7	5,942.2	7,063.3
Zambia	297.1	351.9	415.3	459.7	1,025.9	1,235.4	1,483.6	1,800.8
Zimbabwe	384.6	459.2	543.5	601.9	1,330.4	1,616.1	1,947.5	2,363.5
Near East	**8,822.3**	**9,443.2**	**9,795.1**	**9,985.1**	**31,934.7**	**35,378.2**	**37,573.0**	**39,081.9**
Algeria	848.6	934.1	952.7	937.6	3,014.9	3,488.3	3,767.5	3,676.2
Cyprus	12.9	12.1	11.5	11.3	53.2	49.9	46.5	45.2
Egypt	1,517.1	1,522.4	1,514.8	1,528.2	5,607.5	5,816.7	5,822.0	5,958.7
Iran, Islamic Rep. of	1,622.5	1,742.8	1,778.2	1,787.3	5,720.0	6,440.1	6,833.1	6,960.1
Iraq	633.4	693.4	755.3	795.3	2,326.9	2,576.9	2,844.9	3,132.1
Israel	93.1	94.5	96.7	97.6	370.8	371.9	384.2	389.8
Jordan	151.1	189.0	229.2	254.2	526.3	670.5	834.1	1,008.5
Kuwait	64.0	70.8	74.8	75.6	240.8	271.0	296.6	301.7
Lebanon	76.4	80.5	83.8	84.3	294.1	308.8	332.1	334.9
Libyan Arab Jamahiriya	149.1	173.6	198.1	212.3	517.2	615.0	726.7	830.0
Morocco	704.7	696.7	660.8	638.6	2,628.6	2,721.1	2,642.1	2,496.2
Oman	50.9	57.8	63.7	67.9	173.0	205.4	231.9	264.1
Saudi Arabia	446.6	525.9	610.4	664.7	1,591.9	1,901.3	2,245.4	2,628.1
Syrian Arab Rep.	455.9	527.2	581.3	607.1	1,637.3	1,951.5	2,220.2	2,404.8
Tunisia	210.4	212.8	206.7	203.1	787.1	831.2	821.0	797.4
Turkey	1,364.0	1,429.3	1,430.2	1,429.5	5,024.3	5,510.7	5,605.9	5,605.7
United Arab Emirates	34.0	34.9	35.3	36.7	130.8	139.9	136.2	146.0
Yemen, Democratic	90.4	104.6	117.9	124.4	298.4	354.8	419.6	472.3
Yemen	297.4	340.8	393.7	429.3	991.8	1,153.1	1,363.2	1,630.0

	Infants				Age 1–4			
	1985	1990	1995	2000	1985	1990	1995	2000
Asia (without China)	**43,953.1**	**44,733.7**	**45,166.2**	**45,084.7**	**162,899.0**	**167,521.3**	**174,903.1**	**175,699.4**
Afghanistan	726.3	834.8	923.8	954.9	2,233.7	2,694.4	3,276.5	3,588.0
Bangladesh	3,977.3	4,249.5	4,441.5	4,519.1	13,837.7	15,175.4	16,394.7	17,190.0
Bhutan	48.3	51.4	53.5	54.7	166.9	184.6	196.1	207.9
Burma	1,039.0	1,077.2	1,092.4	1,096.9	3,929.7	4,158.8	4,295.1	4,331.3
East Timor	26.4	27.2	26.0	24.7	89.8	98.2	100.9	93.3
Fiji	19.6	18.3	16.8	16.5	79.6	77.4	68.3	65.8
Hong Kong	90.3	94.9	92.7	89.8	345.8	379.3	381.0	358.7
India	21,017.3	20,909.2	20,896.1	20,755.8	78,494.9	78,307.2	81,148.0	80,849.2
Indonesia	4,753.1	4,722.3	4,685.1	4,608.2	18,050.6	17,996.7	18,515.8	18,079.6
Kampuchea	282.0	283.7	255.9	232.2	977.0	1,064.0	1,035.3	880.8
Korea, Dem. Rep. of	586.8	619.0	634.4	642.3	2,247.8	2,426.3	2,505.4	2,560.6
Korea, Rep. of	923.7	953.3	900.8	874.4	3,498.2	3,905.4	3,684.9	3,485.9
Laos People's Dem. Rep.	149.2	158.4	164.1	166.8	531.6	578.6	623.4	649.2
Malaysia	438.2	431.2	415.6	399.6	1,750.7	1,727.2	1,712.5	1,592.9
Melanesia	163.6	171.6	179.7	184.9	625.9	659.8	695.6	731.9
Micronesia	11.6	11.7	11.8	11.8	45.0	46.1	46.5	47.1
Mongolia	64.0	71.2	77.4	80.1	237.5	266.5	298.2	317.9
Nepal	604.2	653.1	703.4	728.7	2,093.8	2,293.9	2,553.4	2,769.7
Papua New Guinea	123.3	130.4	138.8	144.1	462.1	490.5	529.1	568.1
Pakistan	3,796.9	4,027.7	4,063.2	4,074.2	13,395.1	14,920.5	15,609.9	15,854.1
Philippines	1,665.4	1,728.9	1,753.8	1,751.6	6,318.5	6,670.2	6,939.5	6,942.8
Polynesia	17.4	17.4	17.0	16.8	69.1	69.8	68.8	66.8
Singapore	42.3	42.8	41.4	39.9	166.9	171.9	170.7	159.5
Sri Lanka	411.9	380.0	354.1	347.2	1,688.1	1,579.4	1,434.8	1,381.9
Thailand	1,271.5	1,259.1	1,361.3	1,406.2	5,215.8	4,745.7	5,272.1	5,588.1
Viet Nam	1,703.4	1,809.3	1,865.8	1,863.0	6,347.3	6,833.5	7,346.5	7,338.0
China	19,096.9	19,795.5	20,597.6	21,091.1	74,085.0	76,722.1	80,382.6	83,918.5
Latin America & Caribbean	**11,696.4**	**12,256.7**	**12,606.8**	**12,813.2**	**44,104.9**	**47,150.9**	**49,184.2**	**50,626.1**
Argentina	705.8	713.4	712.1	716.7	2,769.2	2,849.9	2,827.0	2,854.8
Bolivia	252.0	284.9	318.7	342.5	861.7	998.9	1,151.2	1,331.1
Brazil	3,780.8	3,908.9	3,956.6	3,985.1	14,303.6	15,141.3	15,518.1	15,734.4
Chile	262.1	271.8	272.9	271.6	1,017.6	1,076.4	1,095.2	1,083.5
Colombia	825.9	855.5	862.2	865.2	3,143.1	3,342.8	3,406.8	3,432.1
Costa Rica	74.9	78.1	79.0	79.3	289.5	309.7	314.6	316.7
Cuba	171.9	188.8	194.5	193.4	646.7	732.4	781.8	772.3
Dominican Republic	187.9	194.6	194.7	193.4	709.5	755.3	772.4	762.9
Ecuador	317.8	351.9	381.4	398.2	1,163.8	1,313.0	1,451.7	1,572.2
El Salvador	204.5	226.3	251.4	268.8	749.9	836.5	936.6	1,060.8
Guatemala	312.8	345.9	379.7	401.3	1,129.1	1,269.9	1,420.2	1,581.5
Guyana	24.6	23.5	22.4	22.0	99.7	95.9	91.2	87.4
Haiti	245.6	278.9	315.7	340.1	841.0	969.4	1,116.3	1,295.4
Honduras	170.1	185.2	213.1	236.4	626.3	669.9	763.6	928.7
Jamaica	62.1	60.6	57.3	55.8	247.4	249.2	233.6	222.7
Mexico	2,447.6	2,539.2	2,583.7	2,599.6	9,352.7	9,862.3	10,192.0	10,310.5
Nicaragua	131.9	146.8	159.8	167.4	474.6	541.8	602.8	658.7
Panama	57.9	60.9	62.3	62.5	222.9	238.0	247.7	249.4
Paraguay	123.5	134.6	142.8	147.3	460.7	513.7	552.7	585.2
Peru	650.0	685.5	703.1	711.0	2,350.7	2,564.6	2,702.1	2,775.5
Puerto Rico	72.3	74.0	73.4	72.5	282.5	295.8	296.4	289.6
Trinidad and Tobago	28.6	28.6	27.5	26.7	112.5	116.1	112.5	106.5
Uruguay	56.3	56.7	57.2	57.6	223.3	225.2	227.1	229.9
Venezuela	529.5	562.0	585.4	598.9	2,025.7	2,182.9	2,290.6	2,384.4
Less Developed	**103,175.1**	**109,164.1**	**114,714.1**	**117,974.6**	**378,927.5**	**405,760.3**	**436,049.9**	**461,450.4**
More Developed	**17,652.4**	**17,702.6**	**17,654.4**	**17,628.2**	**70,260.1**	**70,782.5**	**70,698.7**	**70,416.8**
Sweden	89.5	83.4	82.5	81.5	378.5	334.4	332.8	325.9
Japan	1,527.9	1,527.9	1,623.6	1,701.1	6,202.8	5,952.6	6,239.7	6,797.5
United States	3,719.1	3,802.8	3,811.2	3,781.4	14,647.9	15,098.4	15,343.2	15,109.5
World Total	**120,827.5**	**126,866.7**	**132,368.5**	**135,602.8**	**449,187.6**	**476,542.8**	**506,748.6**	**531,867.2**

Table 4: Year 2000 Goals for Reduced Infant and Child Mortality, and Numbers of Children Dying Before Age 1 and Age 5 if Mortality Levels are Reduced

	Year 2000 mortality goals, percent of children dying		Annual number of infant and child deaths if mortality levels are reduced (in thousands)							
			Infants				Age 1–4			
	Before age 1	Before age 5	1985	1990	1995	2000	1985	1990	1995	2000
Africa	**5.6**	**7.4**	**2,538.8**	**2,470.1**	**2,299.7**	**1,917.5**	**1,555.4**	**1,407.5**	**1,162.9**	**790.3**
Angola	7.5	10.5	60.9	59.1	55.3	47.1	39.0	35.7	30.1	21.8
Benin	5.0	6.5	24.4	23.3	21.3	17.0	30.7	13.5	10.9	6.8
Botswana	3.8	4.8	4.1	4.1	3.9	3.4	1.4	1.4	1.2	1.0
Burkina Faso	7.5	10.5	49.5	47.6	44.3	37.5	32.3	29.4	24.5	17.5
Burundi	5.0	6.5	27.0	24.9	21.7	16.7	17.7	15.2	11.8	6.9
Cameroon, U. Rep. of	5.0	6.5	43.1	41.5	38.7	32.6	26.1	23.3	18.8	12.5
Central African Republic	7.5	10.5	16.1	15.5	14.5	12.4	10.5	9.5	7.9	5.7
Chad	7.5	10.5	31.4	30.3	28.2	24.1	20.2	18.3	15.3	11.1
Congo	4.1	5.1	6.2	6.0	5.6	4.8	3.5	3.1	2.5	1.6
Ethiopia	7.5	10.5	332.0	318.1	293.6	246.0	211.8	192.6	160.6	114.4
Gabon	5.0	6.5	4.5	4.5	4.1	3.2	2.7	2.6	2.2	1.3
Gambia	7.5	10.5	5.4	4.9	4.3	3.4	1.7	1.6	1.5	1.3
Ghana	4.9	6.3	61.9	61.8	59.4	51.5	35.8	33.1	27.4	18.9
Guinea	7.5	10.5	44.8	42.3	38.1	31.3	29.5	26.5	21.5	14.8
Guinea-Bissau	7.5	10.5	5.1	4.9	4.4	3.8	3.3	3.0	2.4	1.7
Ivory Coast	5.0	6.5	48.2	47.6	44.5	36.8	22.2	21.0	18.0	13.0
Kenya	4.0	5.1	89.2	91.9	90.7	79.1	50.2	47.2	40.0	27.1
Lesotho	5.0	6.5	6.9	6.5	5.8	4.7	2.3	2.1	1.9	1.5
Liberia	7.5	10.5	13.9	14.1	14.0	12.8	9.0	8.4	7.4	5.9
Madagascar	3.3	4.1	29.4	28.7	27.0	22.9	15.6	13.8	11.0	7.0
Malawi	7.5	10.5	59.7	58.3	53.6	44.0	41.0	38.3	31.8	21.4
Mali	7.5	10.5	72.4	68.4	61.4	48.9	49.2	44.7	36.4	24.0
Mauritania	7.5	10.5	12.8	12.8	12.2	10.7	8.0	7.6	6.5	4.9
Mauritius	1.4	1.6	0.7	0.6	0.5	0.4	0.2	0.1	0.1	0.1
Mozambique	7.5	10.5	95.6	92.8	85.9	72.0	61.8	57.1	47.8	33.7
Namibia	5.0	6.5	8.0	7.6	6.9	5.6	5.0	4.5	3.5	2.2
Niger	7.5	10.5	45.0	44.5	42.5	36.8	28.5	26.6	22.8	17.0
Nigeria	5.0	6.5	542.1	535.6	503.1	414.8	330.0	305.0	251.6	164.3
Reunion	0.7	0.8	0.1	0.1	0.1	0.1	0.0[a]	0.0[a]	0.0[a]	0.0[a]
Rwanda	7.5	10.5	40.7	41.2	40.9	36.9	26.7	24.9	22.0	16.9
Senegal	7.5	10.5	42.2	41.2	38.9	33.7	27.1	25.0	21.1	15.5
Sierra Leone	7.5	10.5	30.3	27.2	23.1	17.9	21.2	18.3	14.1	8.8
Somalia	7.5	10.5	33.8	32.1	29.4	24.7	21.6	19.6	16.1	11.5
South Africa	4.2	5.2	102.5	96.2	85.8	70.5	31.2	28.8	24.6	19.0
Sudan	5.0	6.5	113.4	104.2	90.3	70.2	75.1	64.7	49.2	28.6
Swaziland	7.5	10.5	3.9	4.0	3.9	3.6	2.5	2.4	2.1	1.6
Tanzania	5.0	6.5	128.4	127.5	120.6	99.7	77.0	71.5	59.5	39.3
Togo	5.0	6.5	13.5	13.2	12.4	10.5	8.3	7.5	6.1	4.1
Uganda	5.0	6.5	86.0	84.8	79.7	66.2	51.6	47.6	39.2	25.9
Zaire	5.0	6.5	143.0	138.9	129.5	107.8	90.2	81.0	65.6	42.5
Zambia	4.4	5.6	27.9	28.0	27.2	23.6	15.1	13.9	11.5	7.9
Zimbabwe	4.0	5.1	32.7	33.1	32.2	28.0	18.6	17.2	14.3	9.6
Near East	**4.5**	**5.8**	**876.9**	**788.2**	**664.9**	**526.7**	**369.3**	**322.0**	**251.4**	**168.9**
Algeria	4.4	5.5	79.6	74.2	62.2	48.0	35.8	32.2	24.9	14.9
Cyprus	0.8	0.9	0.2	0.2	0.1	0.1	0.0[a]	0.0[a]	0.0[a]	0.0[a]
Egypt	5.0	6.5	162.6	138.3	113.0	89.4	80.7	65.6	47.9	31.2
Iran, Islamic Rep. of	5.0	6.5	201.9	178.6	144.6	107.9	92.7	80.8	61.2	37.8
Iraq	3.9	4.8	51.7	48.0	42.9	35.5	18.0	15.9	13.2	9.8
Israel	0.7	0.8	1.3	1.2	1.0	0.8	0.2	0.1	0.1	0.1
Jordan	2.7	3.2	8.5	9.1	9.0	7.9	2.2	2.3	2.1	1.6
Kuwait	1.2	1.3	1.5	1.4	1.2	1.0	0.2	0.2	0.2	0.2
Lebanon	2.4	2.8	3.8	3.4	2.9	2.3	0.9	0.8	0.6	0.4
Libyan Arab Jamahiriya	4.8	6.2	15.4	15.2	14.2	12.0	6.4	6.0	5.2	3.8
Morocco	4.8	6.2	72.7	60.9	47.4	36.0	32.7	26.6	18.9	11.4
Oman	5.0	6.5	6.5	6.0	5.2	4.1	3.5	3.1	2.4	1.6
Saudi Arabia	3.3	4.0	31.1	31.0	29.6	25.3	10.4	9.7	8.3	6.1
Syrian Arab Rep.	2.9	3.5	28.1	27.6	25.0	20.5	9.3	8.7	7.2	4.8
Tunisia	4.3	5.4	19.1	16.4	13.1	10.1	7.7	6.4	4.7	3.0
Turkey	4.6	5.8	134.0	119.0	97.8	76.7	32.2	30.2	25.6	20.4
United Arab Emirates	1.9	2.2	1.3	1.2	1.0	0.8	0.3	0.3	0.2	0.1
Yemen, Democratic	7.5	10.5	13.4	13.3	12.6	10.8	8.3	7.8	6.7	4.9
Yemen	7.5	10.5	44.1	43.3	42.0	37.4	27.7	25.3	21.9	16.9

	Year 2000 mortality goals, percent of children dying		Annual number of infant and child deaths if mortality levels are reduced (in thousands)							
			Infants				Age 1–4			
	Before age 1	Before age 5	1985	1990	1995	2000	1985	1990	1995	2000
Asia (without China)	**4.8**	**6.3**	**4,782.0**	**4,083.4**	**3,346.0**	**2,570.2**	**2,470.2**	**1,988.1**	**1,499.5**	**927.2**
Afghanistan	7.5	10.5	161.4	148.1	124.7	90.5	115.1	101.8	81.6	46.0
Bangladesh	7.5	10.5	557.0	516.7	460.3	389.9	323.6	285.1	234.3	170.1
Bhutan	7.5	10.5	7.4	6.7	5.8	4.8	3.9	3.5	2.8	2.1
Burma	3.5	4.3	76.8	67.5	56.2	44.4	26.9	22.5	17.1	11.1
East Timor	7.5	10.5	5.5	4.6	3.4	2.3	2.7	2.3	1.7	1.0
Fiji	1.5	1.7	0.6	0.5	0.4	0.3	0.1	0.1	0.1	0.0[a]
Hong Kong	0.5	0.6	0.9	0.8	0.6	0.5	0.2	0.2	0.1	0.1
India	5.0	6.5	2,499.1	2,065.1	1,654.1	1,240.6	1,258.7	973.2	721.2	437.6
Indonesia	4.2	5.3	426.4	359.0	292.6	226.0	258.9	195.5	137.9	74.0
Kampuchea	7.5	10.5	50.4	42.0	30.3	21.0	24.8	21.5	15.6	8.9
Korea, Dem. Rep. of	1.5	1.7	17.9	16.0	13.5	10.8	5.4	4.5	3.2	1.9
Korea, Rep. of	1.5	1.7	28.1	24.7	19.2	14.7	8.5	7.2	4.7	2.5
Laos People's Dem. Rep.	5.0	6.5	19.9	17.2	13.9	10.2	9.1	7.6	5.8	3.6
Malaysia	1.5	1.7	13.5	11.3	9.0	6.8	5.0	3.7	2.5	1.2
Melanesia	3.3	4.0	11.3	10.1	8.7	7.0	1.7	1.6	1.5	1.4
Micronesia	1.8	2.1	0.4	0.4	0.3	0.2	0.2	0.2	0.1	0.1
Mongolia	2.7	3.1	3.5	3.3	3.0	2.4	1.1	1.0	0.8	0.5
Nepal	7.5	10.5	92.2	85.1	76.3	63.9	49.3	43.3	36.6	27.5
Papua New Guinea	3.7	4.6	9.7	8.7	7.6	6.2	3.9	3.2	2.5	1.7
Pakistan	5.0	6.5	494.8	428.6	339.6	248.6	239.1	204.2	149.9	89.0
Philippines	2.5	3.0	87.8	77.3	64.6	50.8	58.6	45.9	31.3	15.1
Polynesia	1.5	1.7	0.5	0.5	0.4	0.3	0.1	0.1	0.1	0.0[a]
Singapore	0.5	0.6	0.4	0.4	0.3	0.2	0.1	0.1	0.1	0.0[a]
Sri Lanka	2.0	2.3	16.8	13.1	10.1	7.8	4.7	3.4	2.3	1.4
Thailand	2.4	2.8	62.8	52.8	47.0	38.2	17.2	12.5	10.3	7.1
Viet Nam	3.8	4.7	136.6	123.0	104.2	81.7	51.3	43.9	35.2	23.2
China	2.0	2.3	776.9	683.9	586.2	472.9	305.0	239.5	171.2	96.0
Latin America & Caribbea	**3.2**	**3.9**	**770.8**	**688.1**	**585.8**	**470.1**	**298.3**	**252.1**	**193.1**	**126.1**
Argentina	1.8	2.1	26.2	22.5	18.5	14.7	4.3	3.8	3.1	2.4
Bolivia	5.0	6.5	34.2	31.3	27.3	21.1	18.3	16.0	12.6	8.0
Brazil	3.5	4.3	282.0	247.1	205.6	162.7	95.3	80.0	60.7	40.1
Chile	1.2	1.4	6.2	5.5	4.5	3.6	1.3	1.1	0.9	0.6
Colombia	2.5	3.0	43.0	37.8	31.4	24.8	21.0	17.0	11.8	6.5
Costa Rica	1.0	1.1	1.5	1.4	1.1	0.9	0.3	0.2	0.2	0.1
Cuba	0.8	0.9	2.9	2.7	2.3	1.8	0.5	0.5	0.4	0.2
Dominican Republic	3.7	4.6	14.8	13.0	10.7	8.3	4.0	3.5	2.8	2.0
Ecuador	3.5	4.2	23.3	21.9	19.5	16.0	8.1	7.2	5.9	4.1
El Salvador	3.5	4.3	15.1	14.2	12.9	10.9	6.2	5.3	4.3	2.9
Guatemala	3.5	4.3	23.2	21.8	19.7	16.3	15.6	13.0	9.6	5.3
Guyana	1.8	2.1	0.9	0.7	0.6	0.5	0.2	0.2	0.1	0.1
Haiti	7.5	10.5	34.3	33.8	32.7	29.3	15.7	15.1	13.9	12.2
Honduras	4.1	5.1	14.7	13.6	12.8	11.2	7.6	6.3	5.0	3.6
Jamaica	1.1	1.2	1.3	1.1	0.9	0.7	0.4	0.3	0.2	0.1
Mexico	2.7	3.1	135.5	119.3	99.9	79.1	55.1	44.5	32.1	18.5
Nicaragua	3.8	4.8	10.7	10.1	9.0	7.4	5.1	4.5	3.5	2.3
Panama	1.3	1.5	1.5	1.4	1.1	0.9	0.7	0.5	0.4	0.2
Paraguay	2.3	2.6	5.8	5.3	4.7	3.8	2.4	2.1	1.5	0.9
Peru	4.9	6.4	68.6	61.3	51.6	41.0	31.3	26.8	20.7	13.5
Puerto Rico	0.8	0.9	1.2	1.1	0.9	0.7	0.2	0.1	0.1	0.1
Trinidad and Tobago	1.2	1.4	0.7	0.6	0.5	0.4	0.1	0.1	0.1	0.1
Uruguay	1.5	1.7	1.7	1.5	1.2	1.0	0.2	0.2	0.2	0.1
Venezuela	1.9	2.2	21.2	19.1	16.4	13.2	4.4	3.8	3.0	2.2
Less Developed	**4.3**	**5.6**	**9,745.3**	**8,713.6**	**7,482.6**	**5,957.4**	**4,998.2**	**4,209.3**	**3,278.1**	**2,108.6**
More Developed	**0.8**	**0.9**	**287.1**	**245.1**	**201.9**	**159.2**	**42.0**	**35.1**	**27.8**	**20.5**
Sweden	0.5	0.6	0.6	0.5	0.5	0.4	0.1	0.1	0.1	0.1
Japan	0.5	0.6	10.0	9.3	9.2	8.8	3.9	3.1	2.5	2.0
United States	0.6	0.7	42.2	36.8	30.5	23.9	6.5	5.9	5.1	4.1
World Total	**3.9**	**5.0**	**10,032.4**	**8,958.7**	**7,684.5**	**6,116.7**	**5,040.2**	**4,244.3**	**3,305.9**	**2,129.1**

Notes appear on page 96

Table 5: Country Populations and Basic Demographic Indicators

	Total population (in thousands) 1985	Number of years until population doubles	Percent urban 1985	Crude birth rate 1985	Crude death rate 1985	Life expectancy at birth 1960	Life expectancy at birth 1985
Africa	**451,811.3**	**23**	**26**	**48**	**17**	**40**	**49**
Angola	8,753.6	27	25	47	21	33	43
Benin	4,049.8	23	35	51	20	35	45
Botswana	1,107.2	18	19	49	12	45	55
Burkina Faso	6,941.6	28	8	48	19	35	46
Burundi	4,721.3	24	8	46	18	42	48
Cameroon, U. Rep. of	9,873.2	25	42	43	15	40	52
Central African Republic	2,576.0	30	42	44	21	37	44
Chad	5,018.2	29	27	44	21	35	44
Congo	1,740.0	26	39	44	18	38	48
Ethiopia	43,556.6	26	12	50	23	36	41
Gabon	1,150.8	39	41	36	18	41	50
Gambia	642.9	34	20	48	28	31	36
Ghana	13,587.6	21	32	47	14	45	53
Guinea	6,075.4	29	22	47	23	33	41
Guinea-Bissau	889.5	35	27	41	21	36	44
Ivory Coast	9,809.7	20	42	45	15	39	52
Kenya	20,599.6	17	20	55	13	42	54
Lesotho	1,519.6	27	17	41	16	40	50
Liberia	2,190.6	22	40	48	16	40	50
Madagascar	10,011.6	24	22	44	16	41	51
Malawi	6,944.0	22	12	53	21	38	46
Mali	8,082.3	24	18	50	22	35	43
Mauritania	1,888.0	23	35	50	20	36	45
Mauritius	1,050.1	39	42	24	6	59	67
Mozambique	13,960.8	25	19	45	19	40	46
Namibia	1,550.1	24	51	45	17	41	49
Niger	6,115.1	24	16	51	22	35	44
Nigeria	95,198.4	20	23	50	16	40	50
Reunion	530.9	59	60	21	5	56	70
Rwanda	6,069.6	21	6	51	18	42	48
Senegal	6,443.6	26	36	46	20	37	44
Sierra Leone	3,601.8	37	28	47	29	30	35
Somalia	4,652.7	28	34	48	23	36	41
South Africa	32,392.2	28	56	38	13	44	54
Sudan	21,550.2	24	21	45	16	39	49
Swaziland	649.6	23	26	47	16	42	50
Tanzania	22,499.4	19	22	50	15	41	52
Togo	2,960.2	23	22	45	15	39	52
Uganda	15,477.2	20	10	50	16	43	50
Zaire	29,937.8	23	37	45	15	42	51
Zambia	6,665.7	21	49	48	14	42	52
Zimbabwe	8,777.5	20	25	47	12	45	57
Near East	**257,589.0**	**26**	**51**	**37**	**10**	**48**	**61**
Algeria	21,718.4	22	43	42	10	47	61
Cyprus	668.8	62	49	20	8	69	74
Egypt	46,909.4	29	46	35	11	46	59
Iran, Islamic Rep. of	44,631.7	25	52	40	11	50	58
Iraq	15,897.8	20	71	43	8	48	63
Israel	4,251.8	40	90	22	7	69	75
Jordan	3,515.0	18	64	46	7	47	65
Kuwait	1,811.3	14	94	37	3	60	72
Lebanon	2,667.7	66	80	29	8	60	66
Libyan Arab Jamahiriya	3,605.1	18	64	45	10	47	60
Morocco	21,940.8	29	45	34	10	47	60
Oman	1,242.3	18	9	46	13	40	54
Saudi Arabia	11,542.2	17	72	41	8	44	62
Syrian Arab. Rep.	10,504.6	19	49	46	8	50	64
Tunisia	7,080.5	33	57	32	9	48	62
Turkey	49,289.3	34	46	30	9	51	63
United Arab Emirates	1,327.0	15	78	27	4	53	68
Yemen, Democratic	2,136.8	24	40	47	17	37	50
Yemen	6,848.5	25	20	48	17	37	50

	Total population 1985	Number of years until population doubles	Percent urban 1985	Crude birth rate 1985	Crude death rate 1985	Life expectancy at birth	
						1960	1985
Asia (without China)	**1,489,397.3**	**35**	**27**	**32**	**12**	**45**	**57**
Afghanistan	16,518.7	26	19	48	26	33	38
Bangladesh	101,146.6	26	12	43	17	40	49
Bhutan	1,417.2	34	5	38	17	38	47
Burma	37,152.6	36	24	30	10	44	59
East Timor	659.0	29	12	46	22	34	41
Fiji	691.1	40	41	29	5	59	70
Hong Kong	5,547.8	38	92	17	6	65	76
India	758,927.3	38	26	30	12	44	57
Indonesia	166,440.1	38	25	30	12	41	55
Kampuchea	7,284.3	27	11	43	18	42	46
Korea, Dem. Rep. of	20,385.1	29	64	30	6	54	69
Korea, Rep. of	41,257.9	43	65	23	6	54	69
Laos People's Dem. Rep.	4,116.9	30	16	39	15	44	51
Malaysia	15,557.2	30	38	29	6	54	68
Melanesia	4,767.0	28	20	36	11	45	57
Micronesia	358.0	38	45	33	6	51	69
Mongolia	1,907.8	25	51	35	8	52	63
Nepal	16,482.3	30	8	41	18	38	47
Papua New Guinea	3,511.1	28	14	37	13	41	53
Pakistan	100,380.3	26	30	42	15	43	51
Philippines	54,497.5	30	40	32	8	53	63
Polynesia	503.9	44	36	36	5	60	70
Singapore	2,558.7	62	100	17	6	64	72
Sri Lanka	16,205.2	42	21	26	6	62	69
Thailand	51,411.3	38	20	26	8	52	63
Viet Nam	59,712.8	35	20	30	10	44	60
China	1,059,521.0	57	21	19	7	47	69
Latin America & Caribbean	**402,063.4**	**41**	**69**	**31**	**8**	**56**	**65**
Argentina	30,563.8	46	85	24	9	65	70
Bolivia	6,370.6	25	48	43	15	43	52
Brazil	135,564.4	32	73	30	8	55	64
Chile	12,038.1	45	84	22	7	57	70
Colombia	28,713.7	33	67	30	8	55	64
Costa Rica	2,599.5	27	50	30	4	62	73
Cuba	10,037.8	87	72	18	7	63	74
Dominican Republic	6,242.7	31	56	32	8	51	64
Ecuador	9,378.0	24	52	36	8	53	65
El Salvador	5,552.4	23	39	39	8	50	66
Guatemala	7,963.4	24	40	42	10	46	60
Guyana	953.4	38	32	27	6	60	69
Haiti	6,585.3	27	27	41	13	42	54
Honduras	4,372.5	21	40	42	9	46	61
Jamaica	2,336.5	47	54	27	6	63	73
Mexico	78,995.6	28	70	33	7	57	66
Nicaragua	3,272.1	21	57	43	9	47	62
Panama	2,180.5	33	52	27	5	61	72
Paraguay	3,681.5	24	44	35	7	56	66
Peru	19,697.6	27	67	36	10	48	60
Puerto Rico	3,450.5	47	71	21	7	69	74
Trinidad and Tobago	1,184.8	44	64	25	7	64	69
Uruguay	3,012.2	95	85	19	10	68	71
Venezuela	17,316.7	25	87	32	5	60	69
Less Developed	**3,662,834.9**	**35**	**31**	**30**	**10**	**46**	**60**
More Developed	**1,173,810.5**	**111**	**71**	**15**	**10**	**69**	**74**
Sweden	8,351.5	—[a]	83	11	12	73	77
Japan	120,741.8	118	76	13	7	68	77
United States	238,020.1	80	74	16	9	70	75
World Total	**4,836,645.4**	**42**	**41**	**27**	**10**	**52**	**64**

Notes appear on page 96

Table 6: Women of Reproductive Age, Fertility Rates, and Births

	Projected number of women of reproductive age (15-49) (in thousands)				Total fertility rate		Projected number of births during 5 year periods (in thousands)		
	1985	1990	1995	2000	1960	1985	1985-89	1990-94	1995-99
Africa	**101,200.6**	**117,569.5**	**137,429.9**	**161,754.7**	**6.5**	**6.6**	**116,398.3**	**133,833.2**	**152,281.2**
Angola	1,997.0	2,275.7	2,615.5	3,008.9	6.4	6.4	2,213.1	2,510.7	2,814.0
Benin	903.0	1,045.8	1,225.7	1,442.8	6.8	7.0	1,108.7	1,276.9	1,460.2
Botswana	256.3	300.0	357.4	428.6	6.3	6.5	297.7	344.8	400.4
Burkina Faso	1,593.8	1,807.9	2,053.8	2,365.4	6.5	6.5	1,773.2	1,995.2	2,237.1
Burundi	1,068.6	1,213.4	1,405.4	1,644.1	5.5	6.4	1,162.2	1,300.4	1,425.6
Cameroon	2,232.7	2,554.0	2,964.3	3,467.9	5.7	5.8	2,256.1	2,561.5	2,895.9
Central African Republic	602.0	674.4	765.3	874.00	5.6	5.9	607.3	676.5	749.0
Chad	1,165.2	1,308.2	1,479.2	1,689.5	6.0	5.9	1,181.0	1,315.0	1,450.9
Congo	398.8	454.7	521.2	601.8	5.8	6.0	414.5	469.6	525.3
Ethiopia	9,968.6	11,353.5	12,983.8	14,994.8	6.7	6.7	11,544.4	12,998.4	14,571.9
Gabon	277.9	296.0	317.2	349.2	4.1	4.8	226.2	269.5	280.2
Gambia	151.3	166.7	186.2	209.2	6.3	6.4	163.7	179.3	194.8
Ghana	3,015.4	3,544.3	4,194.9	4,998.4	6.4	6.5	3,475.0	4,034.7	4,686.3
Guinea	1,423.5	1,595.4	1,801.2	2,049.3	6.4	6.2	1,509.7	1,671.9	1,845.0
Guinea-Bissau	210.5	232.9	263.6	294.8	5.1	5.4	191.4	209.1	226.8
Ivory Coast	2,086.5	2,481.4	2,937.8	3,491.0	6.6	6.6	2,426.8	2,825.2	3,223.1
Kenya	4,238.8	5,223.9	6,476.6	8,048.1	8.2	8.1	6,236.4	7,507.8	8,823.3
Lesotho	364.5	410.5	465.7	533.3	5.8	5.8	334.9	372.6	412.5
Liberia	477.0	554.0	660.1	787.5	6.2	6.9	573.0	667.7	782.6
Madagascar	2,263.8	2,594.0	3,002.3	3,495.8	5.8	6.1	2,381.9	2,715.8	3,063.8
Malawi	1,610.9	1,884.1	2,168.6	2,524.5	6.9	7.0	2,009.8	2,300.8	2,578.4
Mali	1,869.0	2,134.0	2,454.9	2,849.6	6.4	6.7	2,185.8	2,478.9	2,798.5
Mauritania	418.8	485.5	567.7	669.4	6.8	6.9	511.1	578.1	647.1
Mauritius	295.0	315.6	340.2	363.6	5.9	2.6	124.8	118.1	111.6
Mozambique	3,216.8	3,656.3	4,183.0	4,794.0	5.6	6.1	3,385.2	3,833.2	4,272.5
Namibia	352.1	403.9	467.4	545.1	6.0	6.1	375.6	428.1	483.0
Niger	1,340.8	1,558.9	1,831.6	2,145.6	7.0	7.1	1,684.2	1,934.1	2,209.1
Nigeria	20,779.0	24,581.1	29,241.3	35,022.9	6.8	7.1	26,323.3	30,986.3	36,039.9
Reunion	153.5	168.3	179.6	186.9	5.8	2.2	57.4	58.8	58.3
Rwanda	1,324.2	1,565.9	1,846.4	2,217.1	6.7	7.4	1,680.3	1,962.3	2,255.4
Senegal	1,476.1	1,685.8	1,938.3	2,233.8	6.7	6.5	1,603.8	1,809.8	2,029.7
Sierra Leone	867.2	943.4	1,037.1	1,150.7	6.1	6.1	887.8	952.8	1,023.0
Somalia	1,047.4	1,157.7	1,319.7	1,521.7	6.6	6.6	1,171.8	1,301.5	1,463.9
South Africa	7,633.7	8,674.2	9,852.8	11,288.1	5.6	5.0	6,554.9	7,113.9	7,575.1
Sudan	4,847.9	5,580.6	6,498.9	7,583.4	6.7	6.5	5,134.2	5,628.1	6,057.0
Swaziland	145.1	168.5	197.5	233.3	6.2	6.5	165.9	191.1	219.5
Tanzania	4,899.9	5,846.3	6,994.0	8,405.9	6.8	7.1	6,222.4	7,379.9	8,653.6
Togo	672.7	775.7	902.2	1,058.5	6.1	6.1	720.2	825.2	936.4
Uganda	3,382.5	4,018.3	4,784.4	5,726.5	6.9	6.9	4,249.9	4,971.9	5,779.0
Zaire	6,797.6	7,875.5	9,164.9	10,711.7	6.0	6.1	7,259.5	8,356.6	9,503.4
Zambia	1,458.0	1,719.8	2,044.5	2,446.5	6.6	6.8	1,747.1	2,049.7	2,393.9
Zimbabwe	1,917.4	2,283.2	2,738.2	3,302.1	6.6	6.6	2,266.4	2,671.7	3,124.7
Near East	**59,183.4**	**68,945.2**	**80,148.2**	**92,376.**	**.0**	**5.1**	**49,327.3**	**51,159.2**	**52,022.1**
Algeria	4,830.7	5,770.2	6,916.2	8,191.1	7.3	6.4	4,849.9	5,085.6	4,882.4
Cyprus	172.4	174.9	184.9	191.1	3.5	2.4	62.9	58.7	57.1
Egypt	11,056.3	12,501.1	14,512.3	16,484.8	7.0	4.6	8,166.6	7,996.4	7,994.1
Iran, Islamic Rep. of	10,390.9	12,266.5	14,232.7	16,323.2	8.2	5.4	9,221.3	9,456.4	9,359.9
Iraq	3,429.8	4,109.5	4,972.9	5,964.6	7.2	6.4	3,531.7	3,833.3	4,123.4
Israel	1,023.5	1,164.3	1,259.2	1,341.5	3.9	3.0	472.4	486.0	491.5
Jordan	728.9	891.8	1,081.1	1,335.9	7.2	7.3	905.3	1,109.3	1,305.1
Kuwait	357.2	434.9	515.6	628.2	7.3	5.9	349.1	378.0	382.5
Lebanon	672.3	780.3	879.2	978.0	6.3	3.6	407.4	431.7	431.5
Libyan Arab Jamahiriya	741.9	912.5	1,105.7	1,332.4	7.1	7.0	871.6	1,003.0	1,109.3
Morocco	5,288.8	6,171.1	7,065.7	8,053.4	7.2	4.7	3,780.6	3,583.7	3,336.2
Oman	260.3	302.7	360.2	432.0	7.2	7.0	298.6	325.8	355.6
Saudi Arabia	2,223.8	2,704.1	3,350.1	4,100.8	7.2	7.0	2,591.4	3,011.7	3,430.8
Syrian Arab Rep.	2,199.4	2,671.0	3,273.0	4,039.2	7.3	7.0	2,627.2	2,937.1	3,123.6
Tunisia	1,711.6	1,955.7	2,266.3	2,560.9	7.1	4.5	1,139.2	1,103.3	1,056.7
Turkey	11,812.4	13,486.2	15,081.0	16,796.8	6.1	3.8	7,580.9	7,570.6	7,455.4
United Arab Emirates	189.0	233.3	288.9	356.0	6.9	5.7	181.1	176.6	186.9
Yemen, Democratic	494.8	578.7	662.8	770.9	7.0	6.7	538.6	612.1	660.6
Yemen	1,599.6	1,836.5	2,140.6	2,495.6	7.0	6.9	1,751.4	2,000.0	2,279.7

	Projected number of women of reproductive age (15-49) (in thousands)				Total fertility rate		Projected number of births during 5-year periods (in thousands)		
	1985	1990	1995	2000	1960	1985	1985-89	1990-94	1995-99
Asia (without China)	**356,607.9**	**403,529.6**	**452,753.3**	**503,370.2**	**6.0**	**4.3**	**236,493.9**	**239,908.3**	**235,435.8**
Afghanistan	3,809.7	4,831.2	5,349.9	5,939.8	6.9	6.8	4,455.8	4,992.3	5,088.1
Bangladesh	21,937.8	25,880.9	30,344.1	35,316.7	6.7	5.8	22,540.1	23,587.5	23,989.8
Bhutan	328.6	366.4	407.7	453.2	6.0	5.4	276.1	283.8	290.5
Burma	9,152.0	10,512.7	11,730.1	12,854.3	6.0	3.9	5,613.6	5,701.7	5,670.7
East Timor	173.5	189.8	183.5	210.0	6.4	5.6	153.0	147.9	131.4
Fiji	179.0	191.4	207.3	225.0	6.3	3.3	98.4	87.1	83.8
Hong Kong	1,420.9	1,548.8	1,672.4	1,730.5	5.0	1.9	478.5	477.4	451.2
India	179,925.0	202,394.5	225,763.1	249,042.6	5.9	4.0	111,426.0	111,834.6	108,655.7
Indonesia	41,244.8	46,707.0	51,981.2	57,339.1	5.5	3.8	24,924.2	24,975.2	23,962.4
Kampuchea	2,059.2	2,227.9	2,163.9	2,459.6	6.3	4.9	1,607.1	1,485.7	1,235.0
Korea, Dem. Rep. of	5,102.7	5,842.7	6,624.4	7,420.0	5.7	3.8	3,133.8	3,213.5	3,260.5
Korea, Rep. of	11,072.9	11,984.5	12,880.3	13,753.6	5.7	2.6	5,000.1	4,693.6	4,438.7
Laos People's Dem. Rep.	947.7	1,089.1	1,247.7	1,429.3	5.6	5.6	835.9	868.0	874.1
Malaysia	3,951.1	4,508.7	5,044.7	5,632.7	6.8	3.6	2,223.3	2,179.5	2,029.0
Melanesia	1,096.6	1,248.0	1,415.0	1,600.7	6.2	5.1	882.9	920.2	954.2
Micronesia	80.8	91.4	102.1	112.3	6.3	4.8	60.1	60.1	60.3
Mongolia	452.5	524.6	604.3	694.7	5.7	5.0	355.6	391.7	411.2
Nepal	3,659.3	4,165.3	4,750.3	5,392.8	5.8	6.0	3,446.0	3,702.6	3,870.8
Papua New Guinea	794.3	910.3	1,036.0	1,172.5	6.2	5.5	669.7	710.1	746.5
Pakistan	22,559.3	25,498.5	29,448.9	34,342.4	7.1	5.6	21,478.1	21,676.4	21,343.9
Philippines	13,435.7	15,377.5	17,617.6	19,765.6	6.8	4.2	8,884.3	9,086.1	8,979.2
Polynesia	110.0	122.5	137.2	152.3	7.4	5.3	89.6	87.8	85.1
Singapore	754.1	795.0	819.2	815.9	5.4	1.7	216.8	213.8	200.7
Sri Lanka	4,180.1	4,547.8	4,956.8	5,387.3	5.3	3.1	2,034.5	1,844.6	1,770.5
Thailand	13,283.8	15,100.8	16,685.8	18,231.3	6.4	3.1	6,281.8	6,883.0	7,198.3
Viet Nam	14,896.6	16,872.7	19,579.9	21,896.3	6.7	4.0	9,328.9	9,804.4	9,653.9
China	275,991.0	312,160.8	333,656.6	346,036.1	5.6	2.2	100,382.0	104,223.0	107,558.0
Latin America & Caribbean	**88,726.8**	**112,403.3**	**126,785.8**	**141,422.6**	**5.9**	**3.9**	**63,295.8**	**64,989.1**	**66,029.2**
Argentina	7,139.2	7,673.1	8,368.0	9,076.0	3.1	3.3	3,682.8	3,636.9	3,649.3
Bolivia	1,478.5	1,700.5	1,967.2	2,282.9	6.7	6.2	1,465.8	1,626.1	1,794.7
Brazil	34,404.5	38,672.4	43,261.4	47,771.1	6.2	3.6	20,430.3	20,616.6	20,607.2
Chile	3,258.6	3,548.4	3,734.3	3,929.7	5.2	2.5	1,377.6	1,392.7	1,374.1
Colombia	7,286.8	8,166.4	9,122.3	10,105.2	6.7	3.8	4,423.0	4,450.9	4,434.0
Costa Rica	665.2	748.9	844.7	947.0	7.0	3.4	395.1	399.6	400.7
Cuba	2,686.3	2,902.7	2,969.4	3,028.6	4.2	2.0	935.5	988.8	975.3
Dominican Republic	1,541.7	1,807.5	2,046.0	2,286.8	7.4	3.9	1,020.6	1,026.1	1,001.7
Ecuador	2,216.3	2,598.2	3,008.8	3,456.1	6.9	4.8	1,784.2	1,939.4	2,058.0
El Salvador	1,243.7	1,490.1	1,778.2	2,099.7	6.8	5.3	1,141.5	1,258.4	1,389.4
Guatemala	1,737.5	2,028.6	2,401.0	2,835.9	6.9	5.9	1,749.2	1,915.7	2,075.1
Guyana	245.8	278.0	312.4	343.2	6.4	3.0	123.6	116.9	111.8
Haiti	1,532.5	1,754.1	2,017.1	2,328.8	6.2	5.7	1,438.1	1,614.0	1,805.3
Honduras	952.8	1,154.4	1,398.1	1,674.9	7.3	6.0	932.7	1,047.0	1,228.1
Jamaica	576.1	653.3	726.9	811.5	5.2	3.1	316.1	295.7	282.2
Mexico	18,731.0	22,268.6	25,786.0	29,202.5	6.7	4.3	13,083.9	13,339.5	13,340.7
Nicaragua	735.4	882.4	1,055.2	1,257.3	7.3	5.7	746.4	813.6	867.6
Panama	535.2	618.9	694.0	763.3	5.9	3.3	306.7	316.5	316.8
Paraguay	882.4	1,030.5	1,198.0	1,380.5	6.6	4.7	678.8	721.6	753.2
Peru	4,695.2	5,429.2	6,228.8	7,108.9	6.9	4.7	3,605.3	3,703.2	3,717.2
Puerto Rico	912.9	984.5	1,047.0	1,096.4	4.6	2.5	375.5	374.4	365.6
Trinidad and Tobago	315.9	344.7	376.0	407.6	5.2	2.8	147.9	142.6	135.2
Uruguay	701.4	737.6	780.0	821.2	2.9	2.7	289.6	290.7	292.6
Venezuela	4,252.0	4,930.8	5,664.9	6,407.7	6.5	3.9	2,845.7	2,962.5	3,053.3
Less Developed	**892,333.9**	**1,015,318.9**	**1,131,566.2**	**1,245,864.6**	**6.0**	**3.9**	**566,247.2**	**594,503.9**	**613,733.9**
More Developed	**296,214.3**	**301,804.4**	**309,466.1**	**311,895.6**	**2.7**	**2.0**	**89,777.1**	**89,416.6**	**88,879.5**
Sweden	1,983.9	2,034.2	1,988.5	1,906.9	2.3	1.6	420.6	417.9	409.8
Japan	30,831.2	31,458.0	31,014.1	29,446.4	2.1	1.8	7,533.0	7,913.3	8,547.2
United States	62,547.6	65,307.8	66,937.1	67,827.5	3.5	1.9	19,095.8	19,317.8	19,018.9
World Total	**1,188,548.2**	**1,317,123.3**	**1,441,032.3**	**1,557,760.2**	**4.9**	**3.4**	**656,024.3**	**683,920.5**	**702,613.4**

Table 7: Immunization and Health

	Percent of children fully immunized by age 1 1985				Percent of pregnant women fully immunized against tetanus 1985	Percent of births assisted by a trained attendant around 1980	Population per physician 1980
	TB	DPT	Polio	Measles			
Africa	**37**	**28**	**27**	**38**	**—**	**35**	**23,229**
Angola	25	6	—	26	9	13	—
Benin	60	79	94	64	82	19[a]	16,980
Botswana	81	82	77	75	24	52	—
Burkina Faso	16	2	2	23	11	5	48,510
Burundi	37	27	20	45	12	15[a]	45,020
Cameroon, U. Rep. of	77	50	43	39	8	52	13,990
Central African Rep.	25	14	14	16	16	71	26,750
Chad	—	1	—	—	—	45	47,640
Congo	80	59	59	52	—	45	5,510
Ethiopia	11	7	7	8	3	10-15	69,390
Gabon	—	14	—	57	—	—	—
Gambia, The	98	70	77	79	85	25[a]	—
Ghana	31	19	17	1	7	25[a]	7,160
Guinea	—	—	—	—	—	90[a]	17,110
Guinea-Bissau	43	16	15	35	15	31	—
Ivory Coast	—	—	—	—	—	—	—
Kenya	76	58	57	55	—	10	7,890
Lesotho	91	82	80	73	49	75	18,640
Liberia	87	23	26	99	60	10	8,550
Madagascar	13	20	3	—	—	52[a]	10,220
Malawi	74	58	56	52	30	40	41,460
Mali	19	—	—	—	1	14	22,130
Mauritania	74	21	21	59	1	—	14,500
Mauritius	94	89	89	57	1	90	—
Mozambique	40	16	16	22	40	—	39,140
Namibia	—	—	—	—	—	—	—
Niger	28	6	6	19	3	25	38,790
Nigeria	23	—	—	55	11	—	12,550
Reunion	—	—	—	—	—	—	—
Rwanda	86	62	56	66	—	20	31,340
Senegal	32	54	54	40	8	50	13,780
Sierra Leone	45	12	9	21	45	30	17,520
Somalia	31	22	22	36	7	2	15,630
South Africa	—	—	—	—	—	—	—
Sudan	12	8	8	6	1	5	8,930
Swaziland	89	57	56	47	1	25	—
Tanzania, U. Rep. of	73	52	49	63	32	50	17,740
Togo	44	18	9	47	57	50[a]	18,100
Uganda	18	14	8	22	20	20-30	26,810
Zaire	34	16	18	20	—	—	13,940
Zambia	82	49	47	56	38	20[a]	7,670
Zimbabwe	87	66	61	53	30	37	5,900
Near East	**62**	**54**	**54**	**44**	**—**	**44**	**3,211**
Algeria	59	33	30	17	—	40	2,630
Cyprus	0	91	91	60	—	100	—
Egypt	79	90	90	70	1	6	970
Iran, Islamic Rep. of	66	52	53	53	23	—	6,090
Iraq	75	86	86	71	59	79	1,800
Israel	68	86	92	83	—	100[a]	370
Jordan	2	54	54	39	17	65	900
Kuwait	3	89	90	4	3	95[a]	570
Lebanon	—	4	4	10	—	60	540
Libyan Arab Jamahiriya	96	77	77	63	12	68[a]	730
Morocco	70	48	48	42	—	29	10,750
Oman	92	57	57	62	21	74[a]	1,900
Saudi Arabia	47	51	49	47	0.1	—	1,670
Syrian Arab Rep.	46	25	25	28	4	—	2,240
Tunisia	83	72	72	62	8	50	3,690
Turkey	50	32	31	20	—	50	1,630
United Arab Emirates	11	62	62	37	—	85[a]	910
Yemen, Democratic	11	7	7	8	6	33	7,120
Yemen	32	15	15	17	2	3[a]	1,167

	Percent of children fully immunized by age 1 1985				Percent of pregnant women fully immunized against tetanus 1985	Percent of births assisted by a trained attendant around 1980	Population per physician 1980
	TB	DPT	Polio	Measles			
Asia (without China)	**36**	**37**	**31**	**9**	**—**	**29**	**5,565**
Afghanistan	18	16	16	15	4	5	16,730
Bangladesh	23	23	12	1	3	5[a]	7,810
Bhutan	21	11	11	11	3	1[a]	18,160
Burma	25	9	21	—	14	10[a]	4,680
East Timor	—	—	—	—	—	—	—
Fiji	98	60	60	40	—	92[a]	—
Hong Kong	96	86	91	—	—	100	1,210
India	24	45[d]	35[d]	0.1	37	25	3,690
Indonesia	68	16	14	16	25	27	11,530
Kampuchea	—	—	—	—	—	20	—
Korea, Dem. Rep. of	51	55	65	63	—	60	430
Korea, Rep. of	47	76	80	—	—	60	1,440
Laos People's Dem. Rep.	4	—	—	—	—	15	—
Malaysia	96	43	45	—	16	73	—
Melanesia	—	—	—	—	—	—	
Micronesia	—	—	—	—	—	—	—
Mongolia	53	84	100	18	—	90[a]	450
Nepal	67	32	20	47	10	4[a]	30,060
Papua New Guinea	67	34	32	27	2	24	13,590
Pakistan	42	30	30	23	2	5	3,480
Philippines	76	37	54	47	—	86	7,970
Polynesia	—	—	—	—	—	—	—
Singapore	74	74	79	1	—	100	1,150
Sri Lanka	65	64	65	19	37	85	7,170
Thailand	77	60	61	28	44	60	7,100
Viet Nam	5	4	2	4	—	99[a]	4,190
China	67	74	84	83	—	—	1,740
Latin America & Caribbean	**58**	**53**	**60**	**59**	**—**	**64**	**1,899**
Argentina	89	63	69	67	—	87	430
Bolivia	24	33	30	21	—	47	—
Brazil	58	62	86	63	—	65[a]	—
Chile	90	89	89	91	—	92	1,930
Colombia	62	61	62	53	6	40[a]	1,710
Costa Rica	85	75	75	81[b]	—	96	1,460
Cuba	98	91	88[a]	85	—	96[a]	720
Dominican Republic	43	20	22	19	25	49[a]	2,410
Ecuador	99	41	39	54	11	36	760
El Salvador	50	54	54[a]	71	—	34[a]	3,220
Guatemala	30	21	21[c]	23	1	16	8,610
Guyana	49	70	67	56	—	60[a]	—
Haiti	57	19	19	21	—	12	8,200
Honduras	65	59	58	53	11	34	3,120
Jamaica	48	57	56	60	—	86	2,830
Mexico	16	40	67	64	—	40[a]	—
Nicaragua	97	35	70	49	—	32[a]	1,800
Panama	94	73	71	83	—	68	980
Paraguay	99	54	97	46	6	65	1,310
Peru	70	48	47	53	4	30	1,390
Puerto Rico	—	—	—	—	—	99[a]	—
Trinidad and Tobago	—	65	66	10	—	94	1,360
Uruguay	92	63	58[c]	59	11	96	540
Venezuela	92	49	59	56	—	87	990
Less Developed	**45**	**43**	**44**	**36**	**—**	**—**	**5,945**
More Developed	**86**	**87**	**92**	**90**			**—**
Sweden	31	99	99	87[b]	—	100	490
Japan	90	81	95	66	—	100	780
United States [b]	—	97	98	98[a]	—	100[a]	520
World Total	**48**	**50**	**51**	**42**	**—**	**—**	**—**

Notes appear on page 96

Table 8: Nutrition: Breastfeeding, Percent Malnourished, and Food Production Per Capita

	Percent of infants of low birth-weight 1979-83	Median months breast-feeding 1974-82	Percent of mothers breastfeeding 1975-83			Percent of children malnourished: Percent of children under age 5 underweight for age 1975-83		Percent of children age 12-23 months underweight for height 1975-83	Index of food production per capita (1969-71=100) 1982-84 average	Daily per-capita calorie supply as a percent of requirement 1983
			3 mos	6 mos	12 mos	Mild-moderate	Severe			
Africa	**15**	—	—	—	—	—	—	—	**92**	**92**
Angola	19	—	96	—	—	—	—	—	81	87
Benin	10	—	95	90	75	—	—	14	97	83
Botswana	12	—	—	—	97	31	1	19	61	93
Burkina Faso	21	—	—	—	—	—	40	17	94	85
Burundi	14	—	—	95	90	30	3	36	106	102
Cameroon, U. Rep. of	13	—	—	98	97	—	—	2	83	88
Central African Rep.	23	—	—	—	—	—	—	—	94	91
Chad	11	—	—	—	—	—	—	—	95	68
Congo	15	—	97	97	85	—	—	—	96	109
Ethiopia	13	—	—	97	95	60	10	41	100	93
Gabon	—	—	—	—	—	—	—	—	103	—
Gambia, The	—	—	—	—	—	—	—	—	77	—
Ghana	15	—	100	70	25	—	—	28	73	66
Guinea	18	—	—	—	—	—	—	—	93	84
Guinea-Bissau	13	—	—	—	—	—	—	—	92	—
Ivory Coast	14	—	93	90	50	23	28	21	110	112
Kenya	13	15	89	84	44	30	2	8	82	83
Lesotho	8	21	99	98	90	—	—	7	78	104
Liberia	—	—	96	92	64	17	2	7	91	102
Madagascar	10	—	95	95	85	—	—	—	89	112
Malawi	12	—	—	—	95	—	—	28	100	95
Mali	13	—	—	—	—	—	—	26	101	68
Mauritania	—	—	—	—	—	30	10	—	95	97
Mauritius	11	—	—	—	—	—	—	—	88	118
Mozambique	16	—	—	—	—	—	—	—	73	71
Namibia	—	—	—	—	—	—	—	—	74	—
Niger	15	—	65	30	15	17	9	21	113	97
Nigeria	18	—	98	94	90	24	16	—	96	86
Reunion	—	—	—	—	—	—	—	—	107	—
Rwanda	20	—	—	—	—	29	8	23	112	98
Senegal	10	19	94	94	82	—	—	20	66	102
Sierra Leone	17	—	98	94	83	24	3	36	95	91
Somalia	—	—	100	100	—	16	—	62	69	89
South Africa	12	—	—	—	—	—	—	3	83	118
Sudan	17	16	91	86	72	50	5	—	93	90
Swaziland	—	—	—	—	—	—	—	—	114	—
Tanzania, U. Rep. of	14	—	—	—	—	43	7	16	100	98
Togo	17	—	—	99	90	—	—	9	92	94
Uganda	10	—	85	70	20	15	4	—	98	101
Zaire	16	—	100	100	85	—	—	11	92	96
Zambia	14	—	—	—	93	—	—	47	74	84
Zimbabwe	15	—	—	—	88	—	—	—	69	82
Near East	**8**	—	—	—	—	—	—	—	**94**	**116**
Algeria	12	—	—	—	—	—	—	—	79	115
Cyprus	—	—	—	—	—	—	—	—	—	—
Egypt	7	—	—	91	84	46	1	3	91	126
Iran, Islamic Rep. of	14	—	—	—	—	—	—	—	99	118
Iraq	6	—	—	—	—	—	—	—	85	118
Israel	7	—	—	—	—	—	—	—	98	121
Jordan	7	9	79	70	41	—	—	9	136	117
Kuwait	7	—	—	—	—	—	—	3	—	—
Lebanon	12	—	—	—	—	—	—	—	145	—
Libyan Arab Jamahiriya	—	—	—	—	—	—	—	—	94	155
Morocco	9	—	93	93	93	40	5	—	91	105
Oman	16	—	—	—	—	—	—	—	—	—
Saudi Arabia	—	—	—	—	—	—	—	9	98	134
Syrian Arab Rep.	—	9	88	72	41	—	—	—	123	127
Tunisia	7	—	95	92	71	60	4	3	84	121
Turkey	8	—	99	91	51	—	—	—	103	123
United Arab Emirates	7	—	—	—	—	—	—	—	—	—
Yemen, Democratic	—	—	85	73	58	—	—	36	83	94
Yemen	—	—	80	76	55	54	4	17	84	92

	Percent of infants of low birth-weight 1979-83	Median months breast-feeding 1974-82	Percent of mothers breastfeeding 1975-83			Percent of children malnourished: Percent of children under age 5 underweight for age 1975-83		Percent of children age 12-23 months underweight for height 1975-83	Index of food production per capita (1969-71=100) 1982-84 average	Daily per-capita calorie supply as a percent of requirement 1983
			3 mos	6 mos	12 mos	Mild-moderate	Severe			
Asia (without China)	**27**	—	—	—	—	—	—	—	**110**	**97**
Afghanistan	20	—	—	—	—	—	—	—	102	—
Bangladesh	50	31	98	97	89	63	21	21	99	81
Bhutan	—	—	—	—	—	—	—	—	104	—
Burma	20	—	90	90	90	50	1	48	124	117
East Timor	—	—	—	—	—	—	—	—	—	—
Fiji	—	9	—	—	—	—	—	—	119	—
Hong Kong	8	—	—	18	—	—	—	—	99	122
India	30	—	—	—	—	33	5	37	110	96
Indonesia	14	22	98	97	83	27	3	17	120	110
Kampuchea	—	—	100	100	93	—	—	—	107	—
Korea, Dem. Rep. of	—	—	—	—	—	—	—	—	113	127
Korea, Rep. of	9	17	94	93	84	—	—	—	109	118
Laos People's Dem. Rep.	18	—	90	90	90	—	—	—	129	90
Malaysia	11	3	47	34	19	—	—	6	112	111
Melanesia	—	—	—	—	—	—	—	—	—	—
Micronesia	—	—	—	—	—	—	—	—	—	—
Mongolia	10	—	—	—	—	—	—	—	90	117
Nepal	—	24	99	99	97	50	7	27	91	93
Papua New Guinea	25	—	—	—	—	38	—	52	95	79
Pakistan	27	19	98	96	90	62	10	14	104	95
Philippines	20	13	68	58	28	40	3	16	107	104
Polynesia	—	—	—	—	—	—	—	—	—	—
Singapore	7	—	—	—	—	—	—	9	68	115
Sri Lanka	27	21	83	74	48	—	—	22	125	106
Thailand	38	19	48	47	20	34	1	18	115	105
Viet Nam	10	—	—	—	—	—	—	—	123	93
China	6	—	—	—	—	—	—	—	128	111
Latin America & Caribbean	**10**	—	—	—	—	—	—	—	**104**	**108**
Argentina	6	—	—	—	—	—	—	—	109	119
Bolivia	10	—	93	91	—	49	3	1	84	82
Brazil	9	—	59	19	5	—	—	6	115	106
Chile	9	—	—	—	—	10	—	11	102	105
Colombia	10	7	78	63	44	43	8	10	104	110
Costa Rica	9	2	38	20	9	46	—	—	87	114
Cuba	9	—	—	—	—	—	—	—	129	126
Dominican Republic	15	7	66	47	26	—	—	4	99	105
Ecuador	—	—	—	—	57	40	—	—	89	89
El Salvador	13	—	—	77	55	52	6	1	88	90
Guatemala	18	—	—	84	74	—	—	—	101	95
Guyana	—	4	77	60	35	—	—	—	91	—
Haiti	—	15	93	85	72	70	3	18	90	83
Honduras	—	—	48	28	24	29	2	—	99	94
Jamaica	12	6	57	40	16	—	—	14	89	111
Mexico	12	7	62	48	27	—	—	—	104	126
Nicaragua	—	—	—	—	71	65	3	—	78	101
Panama	10	4	62	48	30	48	3	8	99	98
Paraguay	—	12	80	77	49	—	—	—	105	122
Peru	9	13	78	72	55	42	2	1	84	85
Puerto Rico	—	—	—	—	—	—	—	—	—	—
Trinidad and Tobago	—	6	59	50	14	—	—	—	60	129
Uruguay	8	—	51	21	13	—	—	—	105	99
Venezuela	9	3	50	40	30	—	—	—	88	99
Less Developed	**18**	—	—	—	—	—	—	—	**112**	**103**
More Developed	**7**								**106**	**131**
Sweden	4	—	35	14	—	—	—	—	112	116
Japan	5	—	56	—	—	—	—	4	91	113
United States	7	—	33	25	8	—	—	2	105	137
World Total	**16**	—	—	—	—	—	—		**110**	**110**

Table 9: Education Indicators

	Percent literate of population age 15 and older				Percent of children enrolled in primary school[a]				Percent of children enrolled in secondary school[a]		Percent of 20-24-year-olds enrolled in post-secondary school	
	Males		Females		Males		Females		Males	Females	Males	Females
	1970	1985	1970	1985	1960	1980-84	1960	1980-84	1980-84	1980-84	1980-84	1980-84
Africa	**34**	**57**	**15**	**35**	**50**	**78**	**28**	**60**	**19**	**11**	**—**	**—**
Angola	16	49	7	—	—	146	—	121	—	—	—	—
Benin	23	37	8	16	38	90	15	42	—	—	3	1
Botswana	37	73	44	69	35	89	48	102	19	23	2	1
Burkina Faso	13	21	3	6	12	34	5	20	5	3	1	0
Burundi	29	43	10	26	27	55	9	36	5	3	—	—
Cameroon, U. Rep. of	47	68	19	45	87	117	43	98	27	16	—	—
Central African Rep.	26	53	6	29	53	98	12	51	24	8	2	0
Chad	20	40	2	11	29	55	4	21	11	2	—	—
Congo	50	71	19	55	103	—	53	—	—	—	11	2
Ethiopia	8	—	0	—	11	58	3	34	17	9	1	0
Gabon	—	70	—	53	—	120	—	117	28	18	5	2
Gambia, The	—	36	—	15	—	85	—	51	27	12	—	—
Ghana	43	64	18	43	52	89	25	70	48	28	—	—
Guinea	21	40	7	17	44	43	16	20	21	8	—	—
Guinea-Bissau	13	46	6	17	35	88	15	40	17	4	—	—
Ivory Coast	26	53	10	31	68	93	24	64	27	11	—	—
Kenya	44	70	19	49	64	104	30	97	23	16	2	0
Lesotho	49	62	74	84	63	—	102	—	—	—	2	3
Liberia	27	47	8	23	45	95	18	57	33	13	—	—
Madagascar	56	74	43	62	58	—	45	—	—	—	—	—
Malawi	42	52	18	31	81	76	45	54	6	2	1	0
Mali	11	23	4	11	14	30	6	18	10	4	2	0
Mauritania	—	—	—	—	13	45	3	29	19	6	—	—
Mauritius	77	89	59	77	103	112	93	112	53	49	1	0
Mozambique	29	55	14	22	60	91	36	68	8	4	—	—
Namibia	—	74	—	71	—	—	—	—	—	—	—	—
Niger	6	19	2	9	7	34	3	19	—	—	1	0
Nigeria	35	54	14	31	46	—	27	—	—	—	—	—
Reunion	—	—	—	—	—	—	—	—	—	—	—	—
Rwanda	43	61	21	33	68	64	30	60	3	1	—	—
Senegal	18	37	5	19	36	63	17	42	17	8	4	1
Sierra Leone	18	38	8	21	30	—	15	—	—	—	—	—
Somalia	5	18	1	6	13	28	5	15	19	10	—	—
South Africa	—	—	—	—	94	—	85	—	—	—	—	—
Sudan	28	—	6	—	35	59	14	42	21	15	—	—
Swaziland	—	70	—	66	—	114	—	109	44	42	—	—
Tanzania, U. Rep. of	48	—	18	—	33	91	18	84	4	2	—	—
Togo	27	53	7	28	63	124	24	80	36	12	3	1
Uganda	52	70	30	45	65	65	32	49	10	5	1	0
Zaire	61	79	22	45	88	—	32	—	—	—	—	—
Zambia	66	84	37	67	51	100	34	89	22	12	3	1
Zimbabwe	63	81	47	67	—	136	—	127	46	31	3	2
Near East	**49**	**68**	**21**	**44**	**73**	**107**	**43**	**85**	**52**	**35**	**—**	**—**
Algeria	39	63	11	37	55	106	37	82	50	35	—	—
Cyprus	—	—	—	—	—	—	—	—	—	—	—	—
Egypt	50	59	20	30	80	101	52	76	67	45	20	11
Iran Islamic Rep. of	40	62	17	39	56	113	27	88	47	33	5	2
Iraq	50	90	18	87	94	113	36	99	67	37	13	7
Israel	93	97	83	93	99	95	97	97	73	83	35	32
Jordan	64	87	29	63	94	101	59	98	79	77	39	28
Kuwait	65	76	42	63	131	96	102	94	86	79	12	19
Lebanon	79	86	58	69	105	115	99	105	61	63	39	20
Libyan Arab Jamahiriya	60	81	13	50	92	—	24	—	—	—	16	6
Morocco	34	45	10	22	67	97	27	61	35	24	8	4
Oman	—	—	—	—	—	94	—	72	38	19	—	—
Saudi Arabia	15	—	2	—	22	81	2	56	42	28	—	—
Syrian Arab Rep.	60	76	20	43	89	113	39	92	63	40	21	11
Tunisia	44	68	17	41	88	125	43	102	40	26	7	4
Turkey	69	86	35	62	90	116	58	107	47	28	9	5
United Arab Emirates	24	—	7	—	—	94	—	95	49	61	4	11
Yemen, Democratic	31	59	9	25	20	97	5	36	26	11	—	—
Yemen	9	27	1	3	14	107	—	21	16	2	—	—

	Percent literate of population age 15 and older				Percent of children enrolled in primary school[a]				Percent of children enrolled in secondary school[a]		Percent of 20-24-year-olds enrolled in post-secondary school	
	Males		Females		Males		Females		Males	Females	Males	Females
	1970	1985	1970	1985	1960	1980-84	1960	1980-84	1980-84	1980-84	1980-84	1980-84
Asia (without China)	**53**	**61**	**29**	**38**	**77**	**97**	**45**	**74**	**43**	**28**	**—**	**—**
Afghanistan	13	39	2	8	15	19	2	9	11	5	—	—
Bangladesh	36	43	12	22	66	67	26	55	26	11	—	—
Bhutan	—	—	—	—	5	32	—	17	6	1	—	—
Burma	85	—	57	—	61	—	52	—	—	—	—	—
East Timor	—	—	—	—	—	—	—	—	—	—	—	—
Fiji	—	90	—	81	—	111	—	109	72	75	4	2
Hong Kong	90	95	64	81	93	107	79	105	64	70	15	8
India	47	57	20	29	80	100	40	68	44	24	—	—
Indonesia	66	83	42	65	86	118	58	112	42	31	5.8	2.7
Kampuchea	71	—	23	—	—	—	—	—	—	—	—	—
Korea, Dem. Rep. of	—	—	—	—	—	—	—	—	—	—	—	—
Korea, Rep. of	94	—	81	—	99	104	89	102	92	86	37	16
Laos People's Dem. Rep.	37	92	28	76	34	—	16	—	21	12	2	1
Malaysia	71	81	48	66	108	100	83	98	50	49	—	—
Melanesia	—	—	—	—	—	—	—	—	—	—	—	—
Micronesia	—	—	—	—	—	—	—	—	—	—	—	—
Mongolia	87	—	74	—	79	105	78	107	82	90	—	—
Nepal	23	39	3	12	19	100	1	43	34	10	7.1	2.0
Papua New Guinea	39	55	24	35	59	68	7	55	15	8	3	1
Pakistan	30	40	11	19	46	56	13	30	20	8	—	—
Philippines	83	86	80	85	98	115	93	113	61	66	—	—
Polynesia	—	—	—	—	—	—	—	—	—	—	—	—
Singapore	82	93	55	79	121	115	101	111	68	69	13	10
Sri Lanka	85	91	69	83	100	104	90	99	52	56	4	4
Thailand	86	94	72	88	88	—	79	—	—	—	—	—
Viet Nam	—	—	—	—	—	120	—	105	53	43	4	1
China	—	82	—	55	—	116	—	93	41	27	2	1
Latin America & Caribbean	**75**	**84**	**69**	**80**	**91**	**109**	**87**	**105**	**51**	**51**	**—**	**—**
Argentina	94	96	92	95	98	107	99	107	57	62	23	27
Bolivia	68	84	46	65	78	94	50	81	38	32	—	—
Brazil	69	79	63	76	97	106	93	99	—	—	—	—
Chile	90	—	88	—	111	112	107	110	62	68	13	9
Colombia	79	89	76	87	77	119	77	122	48	49	—	—
Costa Rica	88	94	87	93	97	103	95	100	41	46	—	—
Cuba	86	—	87	—	109	111	109	105	71	77	—	—
Dominican Republic	69	78	65	77	99	104	98	115	—	—	—	—
Ecuador	75	85	68	80	87	117	79	114	53	54	—	—
El Salvador	61	75	53	69	82	69	77	69	23	25	14	10
Guatemala	51	63	37	47	50	78	39	67	16	15	—	—
Guyana	94	97	89	95	107	99	106	99	58	62	3	3
Haiti	26	40	17	35	50	74	42	64	13	12	—	—
Honduras	55	61	50	58	68	101	67	100[a]	31	34	11	8
Jamaica	96	—	97	—	92	106	93	107	56	60	—	—
Mexico	78	92	69	88	82	120	77	117	56	53	19	11
Nicaragua	58	—	57	—	65	97	66	103	36	42	13	11
Panama	81	89	81	88	98	106	94	101	55	62	19	26
Paraguay	84	91	75	85	105	107	90	99	37	35	0	0
Peru	81	91	60	78	95	120	71	112	64	57	27	16
Puerto Rico	—	—	—	—	—	—	—	—	—	—	—	—
Trinidad and Tobago	95	97	89	95	89	107	87	108	69	72	6	4
Uruguay	93	—	93	—	111	110	111	107	—	—	18	24
Venezuela	79	88	71	85	100	106	100	104	37	46	—	—
Less Developed	**53**	**70**	**32**	**48**	**75**	**104**	**48**	**83**	**42**	**29**	**—**	**—**
More Developed	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**
Sweden	—	99	—	99	95	97	96	98	80	90	38	36
Japan	99	99	99	99	103	100	102	100	93	95	40	21
United States[b]	—	99	—	99	100	99	100	98	99	98	54	60
World Total	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**

Notes appear on page 96

Table 10: Economic and Water and Sanitation Indicators

	Gross National Product per capita in 1983 US $		Percent of population below absolute poverty level 1977-83		Percent of population with access to safe water 1975-1983		Percent of population with access to sanitation facility 1983	
	1960	1983	Urban	Rural	Urban	Rural	Urban	Rural
Africa	**549**	**585**	**33**	**64**	**65**	**26**	**53**	**21**
Angola	1,609	—	—	—	90	12	29	15
Benin	299	290	—	65	26	15	—	—
Botswana	334	880	40	55	98	72	—	—
Burkina Faso	189	180	—	—	27	31	—	—
Burundi	207	240	55	85	90	22	50	52
Cameroon, U. Rep. of	531	820	15	40	—	—	—	—
Central African Rep.	345	280	—	—	—	—	—	—
Chad	220	—	30	56	—	—	—	—
Congo	705	1,220	—	—	42	7	—	—
Ethiopia	117	120	60	65	—	—	—	—
Gabon	—	3,430	—	—	—	—	—	—
Gambia, The	234	290	—	—	—	—	—	—
Ghana	567	320	—	—	72	33	—	—
Guinea	255	300	—	—	69	2	—	—
Guinea-Bissau	—	190	—	—	21	37	6	18
Ivory Coast	682	710	30	26	30	10	—	—
Kenya	279	340	10	55	85	15	—	—
Lesotho	166	560	50	55	37	11	—	—
Liberia	533	480	23	—	71	20	24	20
Madagascar	448	310	50	50	73	9	3	—
Malawi	152	210	25	85	66	49	75	—
Mali	162	150	27	48	37	0	—	—
Mauritania	348	480	—	—	80	—	4	0
Mauritius	849	1,160	12	12	95	95	—	—
Mozambique	539	—	—	—	50	7	—	—
Namibia	1,415	1,670	—	—	—	—	—	—
Niger	390	240	—	35	41	33	36	3
Nigeria	658	770	—	—	60	30	—	—
Reunion	—	3,920	—	—	—	—	—	—
Rwanda	233	270	30	90	55	60	60	60
Senegal	515	440	—	—	63	27	87	—
Sierra Leone	—	330	—	65	61	6	46	10
Somalia	358	250	40	70	65	21	48	5
South Africa	1,829	2,240	—	—	—	—	—	—
Sudan	465	400	—	85	100	31	73	—
Swaziland	422	870	—	—	—	—	—	—
Tanzania, U. Rep. of	226	240	10	60	85	41	—	—
Togo	243	280	42	—	68	26	34	8
Uganda	303	220	—	—	45	12	—	10
Zaire	225	170	—	80	—	—	—	—
Zambia	769	580	25	—	65	33	100	48
Zimbabwe	717	740	—	—	—	—	—	—
Near East	**577**	**2,395**	**20**		**84**	**68**		**31**
Algeria	1,831	2,320	20	—	—	—	—	—
Cyprus	1,267	3,670	—	—	100	100	100	100
Egypt	336	690	21	25	88	64	—	—
Iran, Islamic Rep. of	—	—	—	—	—	—	—	—
Iraq	—	—	—	40	97	22	—	—
Israel	3,295	5,270	—	—	—	—	—	—
Jordan	—	1,720	14	17	100	65	—	—
Kuwait	—	16,200	—	—	—	—	—	—
Lebanon	—	—	—	—	95	85	—	—
Libyan Arab Jamahiriya	3,071	8,460	—	—	100	90	—	—
Morocco	626	760	28	45	—	—	—	—
Oman	1,715	6,230	—	—	—	—	—	—
Saudi Arabia	—	12,220	—	—	100	68	100	33
Syrian Arab Rep.	794	1,790	—	—	98	54	—	—
Tunisia	—	1,290	20	15	100	—	—	—
Turkey	815	1,250	—	—	63	63	—	—
United Arab Emirates	815	22,770	—	—	95	81	—	—
Yemen, Democratic	—	520	—	20	85	25	—	—
Yemen	—	550	—	—	100	75	75	21

	Gross National Product per capita in 1983 US $		Percent of population below absolute poverty level 1977-83		Percent of population with access to safe water 1975-1983		Percent of population with access to sanitation facility 1983	
	1960	1983	Urban	Rural	Urban	Rural	Urban	Rural
Asia (without China)	**255**	**443**	**39**	**48**	**67**	**42**	**16**	**31**
Afghanistan	—	—	18	36	28	8	—	—
Bangladesh	129	130	86	86	29	43	2	21
Bhutan	—	—	—	—	—	14	—	—
Burma	141	180	40	40	36	21	15	—
East Timor	—	—	—	—	—	—	—	—
Fiji	1,302	1,780	—	—	100	48	—	—
Hong Kong	—	6,070	—	—	100	93	—	—
India	213	260	40	51	80	47	1	30
Indonesia	297	560	26	44	40	29	30	31
Kampuchea	—	—	—	—	—	—	—	—
Korea, Dem. Rep. of	—	—	—	—	—	—	—	—
Korea, Rep. of	621	2,010	18	11	—	60	—	—
Laos People's Dem. Rep.	—	—	—	—	28	20	13	4
Malaysia	809	1,870	13	38	97	71	100	59
Melanesia	—	—	—	—	—	—	—	—
Micronesia	—	—	—	—	—	—	—	—
Mongolia	—	—	—	—	—	—	—	—
Nepal	191	160	55	61	71	11	1	16
Papua New Guinea	—	760	10	75	56	10	91	3
Pakistan	222	390	32	29	78	24	53	6
Philippines	517	750	32	41	53	56	75	47
Polynesia	—	—	—	—	—	—	—	—
Singapore	1,537	6,660	—	—	100	—	100	0
Sri Lanka	203	330	—	—	76	26	—	—
Thailand	351	820	15	34	50	70	50	44
Viet Nam	—	—	—	—	—	31	—	70
China	121	300	—	—	85	—	—	0
Latin America & Caribbean	**1,459**	**1,423**	**35**	**46**	**—**	**44**	**—**	**16**
Argentina	3,508	2,510	30	35	72	17	94	32
Bolivia	1,084	480	65	85	78	12	40	9
Brazil	1,096	1,870	—	—	86	53	33	—
Chile	2,280	1,890	35	45	100	18	100	4
Colombia	923	1,410	34	—	100	79	96	13
Costa Rica	1,032	1,070	—	—	99	99	100	—
Cuba	—	—	—	—	—	—	—	—
Dominican Republic	851	1,160	45	43	85	32	41	9
Ecuador	—	1,420	40	65	98	21	64	26
El Salvador	801	680	20	32	—	42	—	34
Guatemala	853	1,110	21	25	90	26	48	28
Guyana	666	560	—	—	100	60	100	80
Haiti	326	290	55	78	58	25	41	12
Honduras	650	670	14	55	91	55	50	40
Jamaica	1,408	1,270	—	80	—	—	—	—
Mexico	1,221	2,180	—	—	91	40	78	12
Nicaragua	961	880	21	19	91	—	—	—
Panama	1,066	2,110	21	30	97	26	61	—
Paraguay	836	1,320	19	50	46	10	92	84
Peru	1,102	1,040	49	—	73	18	57	0
Puerto Rico	—	3,800	—	—	—	—	—	—
Trinidad and Tobago	—	6,830	—	39	100	96	100	96
Uruguay	3,039	2,470	25	—	95	3	—	—
Venezuela	2,914	3,830	—	—	—	65	—	2
Less Developed	**408**	**599**	**36**	**49**	**75**	**42**	**37**	**27**
More Developed	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**
Sweden	7,925	12,440	—	—	—	—	—	—
Japan	2,825	10,100	—	—	—	—	—	—
United States	9,636	14,080	—	—	—	—	—	—
World Total	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**

Notes to Appendix Tables

Tables 1–6

Tables 1 through 4 exclude countries with populations below 500,000 in 1980 in regional and world totals; Less Developed and World totals in Tables 5 and 6 include all countries.

Table 2

a Values of 0.0 represent fewer than 50 deaths.

Table 4

a Values of 0.0 represent fewer than 50 deaths.

Table 5

a This statistic is negative because the population is declining.

Table 7

a Delivered in an institution.
b Measles immunization given at, or later than, 12 months and up to 60 months of age.
c Figures for the United States represent the percent of children aged 5-6 entering first grade who have been fully immunized for the specified diseases. The United States does not require immunization for tuberculosis with BCG.
d Less than 24 months of age.
e Two doses only.

Table 9

a Percent of children enrolled is a gross enrollment ratio and may exceed 100 if persons older or younger than the conventional age group are attending.
b 1980-84 percent of children enrolled combines primary and secondary enrollments.

APPENDIX 2.

METHODOLOGY OF PROJECTIONS

The projections presented in Appendix 1 are based on two scenarios of infant and child mortality: the first assumes there will be no changes in mortality; the second assumes reductions in mortality adequate to achieve internationally stated goals by the year 2000. These projections have been prepared to illustrate the differences in numbers of children who will live and die if the impediments to child survival discussed in this report either continue or are removed. The data show both the numbers of children who will survive as a result of changes in mortality, and the reductions in the percent dying that must be achieved for global goals to be reached.

Mortality goals for the year 2000 are based on infant mortality goals suggested by the United Nations and AID: levels of infant mortality below 10.0 (percent dying before age 1) would be reduced by half; levels of infant mortality from 10.0 percent to 12.5 percent would be reduced to 5.0 percent; in accordance with AID, levels of infant mortality above 12.5 percent would be reduced to 7.5 percent. Because reductions in infant mortality are generally slower below 1.0 percent and uncommon below .5 percent, infant mortality rates below 1.0 percent would be reduced to .5 percent. Reductions in mortality are not the same for all countries. Countries with high proportions of infants dying (e.g., Afghanistan and Sierra Leone) would drop to 40 percent of their current level; countries with low proportions of infants dying (e.g., Japan and Sweden) would drop to 70 percent of their current level.

The data used in the projections are primarily from the United Nations. Numbers of births are the medium variant of the Population Division's *World Population Prospects: Estimates and Projections as Assessed in 1984*. The same numbers of births are used for both scenarios. The 5 years of births are divided into 4 and 1 years of births (to estimate numbers of infants and 1-4 year olds) with an adjustment for growth in the number of births from 1980 to 2000. Estimates of mortality levels are based on the percent of children dying before age 1 during the period 1980-85 and before age 5 as of 1983, and are derived from the United Nation's Population Division and from *UNICEF, The State of the World's Children 1986*. For 12 countries (Gabon, Gambia, Namibia, Reunion, Swaziland, Cyprus, East Timor, Fiji, Melanesia, Micronesia, Polynesia, Puerto Rico) percent dying before age 5 is estimated from the level of infant mortality and the Coale-Demeny model life tables. Estimates of the numbers of children alive at each quinquennial are based on either a continuation of the "current" 1980-85/1983 percents dying, or the "reduced" percents dying, which are a linear decrease from the 1980-85/1983 level to the 2000 goal. Separation factors are from the Coale-Demeny model life tables. Male and female separation factors are adjusted to a one-sex population, assuming a sex ratio at birth of 105 males to 100 females. The region "west" is used for all areas except SubSaharan Africa, where "north" is used. All countries converge to a "west" pattern of child mortality, with the level of 1 through 4 mortality based on the stated goal for infant mortality.

Child mortality rates are presented as 5q0; the percent of children who will die before the age of 5. Though less common, this statistic is easy to understand and compare with infant mortality. As used in this report, 5q0 minus the infant mortality is the number of children, from 100 births, who will die between their first and fifth birthday. 5q0 was also chosen because it is used in the U.N. Population Division and UNICEF's first internationally standardized set of infant mortality estimates and projections. Comparisons of stated goals and expected levels is simplified by the presentation of statistics in the same format.

APPENDIX 3.

DEFINITIONS AND SOURCES OF DATA

BIRTHS: Number of births that will occur in a country according to U.N. medium level growth projections.
Source: United Nations, 1986. World Population Prospects: Estimates and Projections as Assessed in 1984. New York: United Nations.

BREASTFEEDING, MEDIAN DURATION, IN MONTHS: Number of months after a birth after which half of mothers no longer breastfeed their children.
Source: World Fertility Survey Data. Ferry, Benoit, and D.P. Smith. 1983. Breastfeeding Differentials. WFS Comparative Studies number 23. Voorburg, Netherlands. International Statistical Institute. Table 3, page 15.

BREASTFEEDING 3, 6, 12 MONTHS, PERCENT OF MOTHERS: Percent of mothers who are still breastfeeding their child 3, 6, or 12 months after birth, exclusively or in addition to other foods.
Source: UNICEF. The State of the World's Children 1986. New York: Oxford University Press. Table 2, pp. 134-35.

CALORIES, DAILY PER CAPITA SUPPLY AS A PERCENT OF REQUIREMENTS: Daily per capita calorie supply was calculated by dividing the calorie equivalent of the food supplies in a country by the population (supplies include domestic production, imports less exports and changes in stocks). Requirements are the number of calories needed to sustain a person at normal levels of activity and health, taking into account age and sex distributions, average body weights, and environmental temperatures.
Source: World Bank, 1986 World Development Report, Washington, D.C., Table 28, pp. 234-35.

CHILDREN AGE 1-4, NUMBER OF: Numbers of children age 1 through 4, on July 1 of a given year, based on births 1 to 5 years ago, and each of 2 mortality scenarios. For a discussion of the methodology see the Methodology of Projections section.
Source: Births and prevailing mortality rates are from United Nations, 1986. World Population Prospects: Estimates and Projections as Assessed in 1984. New York: United Nations; and UNICEF. The State of the World's Children 1986. New York: Oxford University Press. Table 5, pp. 140-141.

CRUDE BIRTH RATE: Annual number of births per 1,000 persons.
Source: United Nations. 1986. World Population Prospects: Estimates and Projections as Assessed in 1984. New York: United Nations.

CRUDE DEATH RATE: Annual number of deaths per 1,000 persons.
Source: United Nations, 1986. World Population Prospects: Estimates and Projections as Assessed in 1984. New York: United Nations.

DOUBLING TIME: Number of years until 1985 population would double at the 1985 rate of growth.
Source: United Nations, 1986. World Population Prospects: Estimates and Projections as Assessed in 1984. New York: United Nations.

DYING BEFORE AGE 1 AND 5, NUMBERS: Number of infants, and children age 1 through 4, who die during a given year.
Source: see Methodology of Projections section.

DYING BEFORE AGE 1 AND 5, PERCENT: Percent of children who do not survive from birth to exact age 1, and from birth to exact age 5. Percent dying before age 1 are part of the percent who die before age 5, similar to a 1q0 and 5q0.
Source: United Nations, 1986. World Population Prospects: Estimates and Projections as Assessed in 1984. New York: United Nations, and UNICEF. The State of the World's Children 1986. New York: Oxford University Press. Table 5, pp. 140-141; for projections of percents dying see the Methodology of Projections section.

FOOD PRODUCTION PER CAPITA, INDEX OF: This index shows the average annual quantity of food produced per capita over a three year period from 1982 to 1984, expressed as a percent of average food production from the base period 1969-71.
Source: Food and Agriculture Organization of the United Nations, maintained on the economic and social data base of AID.

GROSS NATIONAL PRODUCT, PER CAPITA: Gross national product at current market prices in U.S. dollars divided by the population. Dollars for 1960 have been converted to their value in 1983 dollars. One 1960 dollar is equal to 3.367 1983 dollars.
Source: World Bank. 1986. World Bank Atlas. Washington, D.C.: World Bank. page 6; data for 1960 are from a previous World Bank Atlas, maintained in a computer data bank, the Economic and Social Data Base of AID.

IMMUNIZED, PERCENT OF 1-YEAR-OLDS FULLY: The estimated percent of children in 1984 who were fully immunized against each disease or group of diseases by exact age 1. The requirements for full immunity depend on the type of vaccine. The vaccination schedule recommended by the World Health Organization is as follows:

Tuberculosis: 1 injection of BCG (Bacterium Calmette-Guerin), which can be given at the time of birth.

Diphtheria, Pertussis, Tetanus: 3 injections with DPT vaccine before age 1; the first is recommended 6 weeks after birth followed by 2 more at 1-month intervals (i.e.,10 weeks and 14 weeks).

Polio: At least 3 doses of oral polio vaccine before age 1, given 1 month apart. In areas where polio is endemic, the first dose is recommended at the time of birth, followed by 3 more doses at the same time as the DPT injections.

Measles: 1 injection of measles vaccine, given after 9 months in developing countries. Because measles vaccine is usually given later in developed countries, estimates of immunization coverage in these countries are based on the number of children under 5 who have been vaccinated against measles.
Source: World Health Organization/Expanded Program on Immunization (EPI). Official immunization coverage estimates available as of January 20, 1986.

IMMUNIZED, PERCENT OF PREGNANT WOMEN FULLY IMMUNIZED FOR NEONATAL TETANUS: The estimated percent of women giving birth in 1984 who received 2 tetanus toxoid injections or 1 booster dose during pregnancy.
Source: World Health Organization/Expanded Program on Immunization (EPI). Official immunization coverage estimates available as of January 20, 1986.

INFANTS, NUMBER OF: Numbers of children younger than age 1, on July 1 of a given year, based on births during the last year and each of 2 mortality scenarios. For a discussion of the methodology see the Methodology of Projections section.
Source: Births and "current" 1980-85 mortality rates are from United Nations. 1986. World Population Prospects: Estimates and Projections as Assessed in 1984. New York: United Nations.

INFANT MORTALITY GOALS: Goals for the year 2000 are: reduce rates from 12.5 percent or higher to 7.5 percent; reduce rates from 10.0 to 12.4 percent to 5.0 percent; reduce rates from 1.1 to 9.9 percent to half their current level; reduce rates of 1.0 percent and less to .5 percent.
Source: statements by United Nations and AID; see the Methodology of Projections section.

LESS DEVELOPED: For statistical purposes, the less developed areas are defined as Africa, the Near East, Asia, Latin America, and the Caribbean.

LIFE EXPECTANCY: The number of years a person would live if exposed to the mortality rates that each age group experiences in a given year.
Source: United Nations, 1986. World Population Prospects: Estimates and Projections as Assessed in 1984. New York: United Nations.

LITERACY: Percent of persons aged 15 and older who can read and write. Definitions of ability can differ greatly from country to country.
Source: UNESCO. Statistical Yearbook 1985.

LOW BIRTH WEIGHT: 2,500 grams (5.5 pounds) or less.
Source: UNICEF. The State of the World's Children 1986. New York: Oxford University Press. Table 2, pp. 134-35.

MALNOURISHED, MILD/MODERATE AND SEVERE, PERCENT OF CHILDREN UNDER 5: Mild/moderate is between 60 percent and 80 percent of desirable weight for age; severe is less than 60 percent of desirable weight for age.
Source: UNICEF. The State of the World's Children 1986. New York: Oxford University Press. Table 2, pp. 134-35.

MALNOURISHED, UNDERWEIGHT FOR HEIGHT: The percent of children with less than 77 percent of the median weight-for-height of the U.S. National Center for Health Statistics reference population.
Source: UNICEF. The State of the World's Children 1986. New York: Oxford University Press. Table 2, pp. 134-35.

MORE DEVELOPED: For statistical purposes, the more developed areas are defined as Europe, the USSR, North America, Japan, Australia, and New Zealand.

MORTALITY, 1980-85 LEVEL AND REDUCED LEVEL: Percent of children who would die before their first, or fifth, birthday if mortality rates prevailing in 1980-85 continue, or if there is a linear decline to mortality goals for 2000.
Source: "Current" 1980-85 mortality rates are from United Nations, 1986. World Population Prospects: Estimates and Projections as Assessed in 1984. New York: United Nations; and UNICEF. The State of the World's Children 1986. New York: Oxford University Press. Table 5, pp. 140-141; for projected mortality rates, see the Methodology of Projections section.

MORTALITY RATE, INFANT: The number of deaths to infants under 1 year of age in any calendar year per 1,000 live births. This report uses the more common percent rate and expresses rates per 100, rather than per 1,000.

PHYSICIAN, POPULATION PER: A country's total population in 1980 divided by the number of physicians in that country.
Source: World Bank. 1985. World Development Report. Washington, D.C., table 24, pp. 220-21.

POVERTY, ABSOLUTE LEVEL: That income level below which a minimum nutritionally adequate diet plus essential non-food requirements is not affordable.
Source: UNICEF. The State of the World's Children 1986. New York: Oxford University Press. Table 6, page 142-43.

SANITATION FACILITIES: Sanitation facilities may include the collection and disposal, with or without treatment, of human excreta and wastewater by water-borne systems or the use of pit latrines and similar installations (no definition provided in the source document; this definition is from WHO. 1976. World Health Statistics Report, vol. 29, no. 10. Geneva).
Source: United Nations General Assembly, Economic and Social Council. 1985. Report of the Secretary-General. Progress in the Attainment of the Goals of the International Drinking Water Supply and Sanitation Decade.

SCHOOL ENROLLMENT, PRIMARY, SECONDARY AND POST-SECONDARY: The enrollment ratio is the total number of children enrolled in school, whether or not they belong in the relevant age group for that level, expressed as a percent of the total number of children in the relevant age group for the level. Percents may exceed 100 if persons who are older than the conventional age are attending. The relevant age group is defined by individual country educational systems, except for post-secondary school, when 20-24 is always the age group used.
Source: UNESCO. Statistical Yearbook 1985.

TOTAL FERTILITY RATE: The average number of children that will be born to a woman if she lives through her reproductive years and bears the same number of children as women at each age group bear in a given year.
Source: United Nations, 1986. World Population Prospects: Estimates and Projections as Assessed in 1984. New York: United Nations.

TOTAL POPULATION: The total number of persons resident in a given country on 1 July of a given year, irrespective of nationality.
Source: United Nations, 1986. World Population Prospects: Estimates and Projections as Assessed in 1984. New York: United Nations.

TRAINED ATTENDANT, PERCENT OF BIRTHS ASSISTED BY: Trained attendants include physicians, nurses, midwives, trained primary health care and other health workers, and trained traditional birth attendants. National coverage levels are drawn from official estimates and sample surveys over a broad 10-year period. If no direct figures were available,the percent of births in institutions has been substituted as a conservative estimate for trained attendant coverage.
Source: World Health Organization/Division of Family Health.

URBAN: Varies according to national definitions; caution is advised in country-to-country comparisons (e.g., Nigeria uses a size cutoff of 20,000 persons, Peru uses a size cutoff of 100 occupied dwellings, Chile looks for the presence of certain public and administrative services, and many countries merely name a few cities). Rural is defined as the rest of the country.
Source: Individual countries, United Nations, 1986. World Population Prospects: Estimates and Projections as Assessed in 1984. New York: United Nations.

WATER, ACCESS TO SAFE/ADEQUATE DRINKING: "Safe" commonly includes treated surface waters or untreated but uncontaminated water such as that from protected boreholes, springs, and sanitary wells. "Reasonable access" in urban areas is defined as a public fountain or stand post located not more than 200 meters from a house. In rural areas reasonable access is when members of the household do not have to spend a disproportionate part of the day in fetching the family's water needs (no definition provided in the source documents; this definition is from WHO. 1976. World Health Statistics Report, vol. 29, no. 10. Geneva).
Source: United Nations General Assembly, Economic and Social Council, 1985. Report of the Secretary-General. Progress in the Attainment of the Goals of the International Drinking Water Supply and Sanitation Decade. Where data were not available for 1983, the source is UNICEF. The State of the World's Children 1986. New York: Oxford University Press. Table 3, pp. 136-37.

WOMEN OF REPRODUCTIVE AGE, NUMBERS OF: The total number of women age 15 through 49 resident in a given country on 1 July of a given year, irrespective of marital status and fertility.
Source: United Nations. 1986. World Population Prospects: Estimates and Projections as Assessed in 1984. New York: United Nations.

APPENDIX 4.

COUNTRIES AND REGIONS

Data are presented for all developing countries with a 1980 population of at least 500,000. Several small south Pacific nations have been grouped together. These groups are: Melanesia, which includes New Caledonia, Solomon Islands, and Vanuatu; Micronesia, which includes Guam, Kiribati, Nauru, Pacific Islands, Tuvalu, Johnston Island, Midway Islands, Pitcairn, Tokelau, and Wake Islands; Polynesia, which includes American Samoa, Cook Islands, French Polynesia, Niue, Samoa, Tonga, Wallis, and Futuna Islands. Data for three developed nations, the United States, Sweden, and Japan, are presented for comparative purposes.

Regions are based on AID country groupings. It should be noted that AID, the United Nations and the World Health Organization group countries into slightly different regions.

Except as otherwise noted, regional statistics are weighted averages of statistics of countries for which data are available. Total population statistics (e.g., Gross National Product) are weighted by the 1985 total population of countries; infant statistics (e.g., mortality and immunization) are weighted by the number of births or 1-year olds. Because dates of information vary, regional estimates may be composed of statistics and weights of different dates.

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