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Ending Hunger: Current Status and Future Prospects

by

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Hunger has always been with us, and the most detailed long-term computer simulation of future food availability finds as many or more hungry people in the year 2060 as there are today. But it need not happen. It is possible to visualize the world of the coming century without famine, with little seasonal or chronic undernutrition, and with virtually no nutrient deficiencies and nutrition-related illness. But ending hunger is not a simple matter. It will require a broad acceptance of food as a basic human right, an increased food availability that is far in excess of increased population, an extensive growth in household income, and a pervasive safety net of emergency assistance, entitlements, and special needs programs. There will be a need as well for a worldwide capability to cope with the surprises of the future. What is more, these changes will need to be accomplished in a probably warmer, more crowded, more connected but more diverse world, in which the economy, the environment and social institutions will all come under considerable strain. Thus ending hunger is both a deeply desired outcome and an extraordinary challenge.

This assessment describes what is now known about global hunger, past and present trends, and the possibility of ending hunger in a world with at least twice the current population. It begins by defining what hunger means, and reviewing current estimates and trends in the number and location of hungry people in the world today.

WHAT IS HUNGER?

All of us have experienced short-term hunger or hunger pangs, but for more than a billion people--or about a sixth of the world's population--chronic hunger and nutrient deficiencies are an ever-present part of daily life. For them, hunger means a dietary intake that does not provide the kind and quantity of food that is needed for growth and activity and the maintenance of good health. As biologically- defined in this way, hunger comes in many guises, four of which serve as indices of hunger in compiling global estimates. *Starvation*, the near absence of dietary intake suffered in the course of famines, can be contrasted with *undernutrition*, which is the chronic or seasonal absence of needed food proteins and caloric energy. There is also the hidden hunger of *micronutrient deficiencies*, of which three dominate: dietary shortages of iron, iodine and Vitamin A. And there are *nutrient-depleting diseases*, in which dietary intake may not be absorbed, or is wasted by fever or parasites that are carried in the body. As described in these four ways, hunger, as used here, encompasses not only a shortage of food, but also the lack of food of adequate nutritional quality.

WHO IS HUNGRY?

No one really knows how many hungry people there are in the world. Nor should we be surprised that only minimal resources have been devoted to the measurement and reporting of hunger, as compared to the measurement of population, for example, or economic activity. Depending on political context, hunger may be over- or under-estimated. But partly in response to current debates over the impact of governmental and economic restructuring on the world's poor, there is a significant effort now underway, through more consistent national surveys, to improve the way that hunger is documented.

Overall, the varied faces of hunger are estimated in at least three quite different ways: by numbers of those who live in food or nutrient- short areas; by

prevalent symptoms of inadequate growth or increased illness; and by such indirect measures as dietary intake, food purchases, or access to food. Global data sets, which are prepared by the United Nations Food and Agricultural Organization, are aggregates of national or regional data, and they are acutely dependent on the quality of national reporting systems. These data are assembled annually for each nation, but for only one indicator--dietary energy supply. All other indicators make use of selected regional, national, or local data samples extrapolated to global proportions. [Table 1](#) gives the most recent estimates for each of the four faces of hunger.

THE FOUR FACES OF HUNGER

Starvation

Starvation often occurs in the course of famines, where there is an absolute shortage of food within a bounded area, caused by crop failure or destruction. Recent cases include the droughts of 1983-85 in the Sahelian countries of Africa, and wartime sieges or blockades, such as the continuing warfare in Afghanistan, Angola, and the Sudan. But widespread hunger and starvation can occur even when food is available, if large numbers of people lose their ability to purchase, exchange, or receive food--as was the case in the great famines in Bengal, India (1943), China (1958-60), Ethiopia (1972-73), and the Soviet Union (1932-34). In such instances, a sudden rise in food prices, drop in laborers' incomes, or marked changes in government policy can create hunger for millions, even in the absence of the more familiar causes of food shortage, such as droughts, floods, pests, or armed conflict.

Because famines are such dramatic events, they are often equated with hunger by both the news media and the public, yet they constitute but a very small fraction of hunger in the world. Despite the widespread attention focused on recent famines, only about 15-35 million people, or less than 1 percent of the global population, are at risk of famine in any recent year. Indeed, there has been a consistent decline in the last fifty years in the number of people who are so affected ([Fig. 1](#)). The decline was quite dramatic as the focus of famine shifted from large, heavily-populated countries, such as China and India, to smaller and more sparsely populated nations such as Ethiopia and still smaller countries such as Somalia and Rwanda. There are also no consistent data on the numbers who starve to death in famine situations. One recent estimate concluded that throughout the 1990s deaths due to starvation will average from 150,000 to 200,000 per year, with a likely value for 1995 of 250,000.

Undernutrition

The major hunger problem is that of undernutrition, in which needed food proteins and caloric energy are chronically or seasonally absent. The extent of undernutrition is estimated indirectly as the number of people who live in households that cannot provide food sufficient for health, moderate physical activity, and children's growth. Over time, the methods used and the criteria employed in making estimates have changed, but the most recent United Nations' estimate, for 1990, found 786 million people, worldwide, in such households. By this measure, the numbers of hungry people have decreased by 17 percent over the last two decades, and the proportion of hungry people has almost halved, despite the addition of about 1.4 billion people. But the decline has taken place primarily in China and southeast Asia; over these two decades, hunger in absolute numbers has risen in Africa, Latin America, and South Asia ([Table 2](#)).

The most serious effects of undernutrition are on children--limiting their growth, affecting their capabilities for movement and cognition, and increasing their vulnerability to illness. Statistics on children's undernutrition are usually obtained directly, made by measuring their weight and height and comparing these with age-related values for well-fed children in industrialized countries. By such a standard, 184 million girls and boys under 5 years of age--over a third of the world's children--were estimated in 1990 to be underweight. The number has risen in the course of increased population growth, even though the proportion of children who are underweight has declined since 1975. Over half of these underweight children live in Bangladesh, India, and Pakistan, and a lively debate persists as to whether such numbers are accurate or overestimated. Compared to the data that pertain to entire households in these countries, including adult members, the proportions of children who are undernourished are more than two times larger. These differences--that tell of undernourished children in households that are capable of providing sufficient food--may reflect differences in vulnerability as well as measurement techniques.

Micronutrient deficiencies

Dietary shortages of iron, iodine and vitamin A constitute the hidden hunger of micronutrient deficiencies. Iron deficiency is due largely to the relatively low content and poor availability of iron in most foods of plant origin, including grains, legumes, and vegetables. It is frequently precipitated by intestinal blood loss due to hookworm, *schistosomiasis* (a severe endemic disease in much of Asia, Africa, and South America), and malaria. Some 40 percent of the world is anemic, with higher rates in women. Mild to moderate iron deficiency lowers mental performance, impairs immunity, increases susceptibility of infection, lowers physical work capacity, and leads to increased morbidity and mortality.

Needed iodine comes from seafood or seaweed or from plants grown on soils that were once the floor of ancient seas. Thus the soils of high mountain areas and of many flood plains are deficient in this essential micronutrient. Upwards of 12 percent of the world's population suffer from disorders resulting from iodine deficiency during pregnancy. These range from feeble-minded dwarfs known as cretins to a range of less obvious neurological disorders including deaf-mutism, lowered intelligence, and simple goiters.

Vitamin A is readily obtained from animal foods and from leafy green, red, and yellow vegetables and fruits. These foods may be only seasonally available, or are sometimes not usually fed to young children. A deficiency in vitamin A leads to eye diseases that affect up to 14 percent of small children, and to blindness, and death. In some countries it doubles mortality in young children.

Nutrient-depleting illness

Hunger also occurs in the form of nutrient-depleting diseases such as diarrhea, in which food that is eaten may not be absorbed; by measles or malaria, in which it is wasted by fever; or when it is shared with parasitic worms. Almost five million small children die each year from such disease, and the growth of tens of millions more are affected by bouts with these all-too prevalent maladies.

THE EXTENT OF HUNGER

There is hunger in the United States, and indeed much hunger relative to the country's overall wealth. But with some important exceptions, it is different from that of developing countries. Estimates of the number experiencing some hunger within a given year have been as high as 13 percent of our population, or 30 million Americans. These estimates, based both on household income and self-reporting surveys, do provide evidence of a real difficulty in getting access to needed food, in even an affluent nation. But they are in no way comparable to the extensive evidence of biological deprivation found in the developing countries of the world.

In sum then, in the 1990s, famine persists, but almost always in connection with armed conflict, as in Liberia and the Sudan. Three-quarters of a billion people--one of every eight who live on the planet--are in households that are too poor to obtain the food they need for sustenance and light activity. One child in six is born underweight, and almost two in five children are underweight by age five. About five million die each year of nutrient-depleting disease. Hundreds of millions of people suffer diet-related anemia, goiter, or impaired sight, or die from diets with too little iron, iodine, or vitamin A.

These different faces of hunger overlap, but it is likely that more than a billion of the world's 5.8 billion people experience some form of hunger during the year. If this is so today, what are the prospects for tomorrow, in the rapidly changing world of the next century?

GLOBAL CHANGE

Environmental change, population growth, and increasing connectedness and diversity are currents of global change that run as deep and strong as those that

thread the oceans. A child born today has a world- average life expectancy of 65 years, in the course of which he or she will experience a probably warmer and more crowded, more connected but more diverse world. These currents will impact the task of ending hunger in different ways.

Unless there is some basic flaw in our present scientific understanding, a child born today will grow up in a warmer world. The most recent consensus estimate finds that a likely doubling of atmospheric carbon dioxide concentrations and increases in other trace gases will raise the average surface temperature by 1 to 3.5° C (about 2 to 6° F) by the end of the next century. The resulting changes in evaporation, precipitation, sea level, and extremes of weather will likely be accompanied by two other major human-induced changes in local and regional environments, particularly in developing countries. The first of these is an increase in pollution: particularly acid rain in the atmosphere, heavy metals in the soils, and chemicals in the ground water. The second is a massive assault on native plants and animals, that can lead to deforestation in the tropical and mountain lands, desertification in the dry lands, and species extinction, particularly in the tropics.

There is much that is not known about such a warmer, environmentally-stressed world. What is known suggests that the impacts might be very different in different parts of the Earth, and that at any given place there may be offsetting phenomena. Thus the carbon dioxide that will warm the climate may also enhance the growth of some plants. The sulfate aerosols that create acid rain may also reflect the Sun's heat and thus diminish the warming trends. Indeed, several major studies of the effects of climate change on world agriculture and food security find that when averaged over the globe, the changes are small for a doubling of carbon dioxide. But there will be winners and losers, for the same studies find large differences in impacts. Crop yields in developed countries are likely to increase with global warming, while in developing countries the yield may diminish by 10 to 20 percent. The poor will grow poorer in a warmer world, while the rich may become richer, or at least find themselves no worse off.

The children born today will live their lives in a world of many more people. Most demographers who make long-term population forecasts have projected a world population of between 8 to 15 billion, with a medium-range expectation for 2150 of 11 to 12 billion (compared to today's 5.8) that will stabilize sometime within the next two centuries. In that more crowded world, the proportion of people who live in what is now considered the developing world will have grown from the 77 percent of 1990 to more than 85 percent. More than half of the world's population will live in urban areas, and the populations of many of the world's cities will likely grow into the tens of millions, of which there are but few today. These trends will weigh most heavily on the children yet to be born. In an extraordinarily short time enormous numbers of clinics, day care centers, schools, and jobs will need to come into being. To supply an improved and more varied diet (but not so rich as the U.S. diet of today) to so many mouths will require at least a tripling of food production, given current means of production and distribution.

These children of the future will also be much more closely connected by ties of communication, economic production and consumption, interlinked technologies, and migration. Food, remittances, and opportunities for work will flow more freely, and by the end of this decade, at least three major common-market, free-trade blocs are likely to emerge: in East Asia, Europe, and North America, each with associated blocs in Southeast Asia, Africa, and Latin America. These economic linkages will further reduce the threat of famine. At the same time they will also make millions of people more vulnerable to far-away food supplies, fluctuating prices and exchange rates, and new and unfamiliar diets.

New information technologies and mass communication techniques will continue to penetrate many different geographic, temporal, linguistic, cultural, and political barriers. However, such connectedness will not necessarily make us all alike; they may well increase the diversity of people as well as the availability of products and ideas. Places of wealth or opportunity towards which people and products are drawn tend to become more diverse, as in the case of Los Angeles or New York City, and in developing countries these more varied urban places are consistently less hungry than their rural counterparts. But in response to increased connectiveness, strong counter currents arise that emphasize ethnic, national, and religious distinctions. It is precisely these ethnic and religious differences that give rise to many of the disturbing conflicts of today, and they make an end to famine a far more difficult task.

Overlying these deeper currents of global change are alternating waves of cyclical phenomena or fashion that include short-term recessions, multiple-year

fluctuations in climate, decades-long swings of the political spectrum, and the half-century waves of technological growth and decline of the world economy. These, in turn, are punctuated by the unanticipated undertows, riptides, and storm surges--such as natural disasters and regional conflicts: the surprises that shatter conventional expectations. Any or all of these can retard or accelerate efforts to end hunger. Nonetheless, as uncertain as the future may be, we can still define what will be needed to end the longtime scourge of hunger.

REQUIREMENTS FOR ENDING HUNGER

A world without hunger can be prescribed using the same criteria that describe its effects. Hunger could virtually disappear except, perhaps, for some irreducible minimum. Famine--like smallpox--could become an affliction of the past. Less than 1 percent of the world's population could experience extremes of seasonal or chronic undernutrition. Endemic micronutrient deficiencies could almost vanish, and most nutrient-depleting illness could be prevented or controlled. Nearly everyone, I suspect, would wish for such a world.

What must we do to make it happen?

There are at least five major requirements: (1) a worldwide acceptance and implementation of food as a basic human right; (2) a rapidly growing food supply; (3) adequate household income; (4) regional and international systems to provide for famine prevention, emergency assistance, and special needs; and (5) an ability to cope with surprise, by achieving resilience and flexibility.

The Right to Food

A world without hunger is one in which adequate food is a human right, like air to breathe or water to drink: the minimum expectation for any who live in any country, upheld and enforced by all, for all. As utopian as this may sound, there are continuing trends in this direction. The elements for an international recognition of a human right to food coexist today in the form of the 1948 Universal Declaration of Human Rights, the 1966 International Covenant on Economic, Social, and Cultural Rights, and for armed conflict, in the 1977 protocols to the Geneva Conventions of 1949. The most widely accepted right to food is the provision of humanitarian assistance in cases of widespread disasters that are caused by natural or technological hazards, or war. This has been further extended, albeit not always implemented, to civilians in zones of armed conflict, even when such conflicts are within national borders or are condoned or encouraged by national governments, as in Bosnia, northern Iraq, Sudan, and Somalia. There is growing agreement that no nation, governmental authority, or faction has the right to starve its own or neighboring people.

A Growing Food Supply

A world without hunger has food enough for all. It is generally accepted that today there is more than enough food in the world. Hunger, it is argued, is a problem of distribution: a matter of access to the available global food supply. This certainly seems to be the case for a nutritionally-adequate, primarily vegetarian diet, for which production today is sufficient to feed 120 percent of the world's population. At the same time, there is only enough food produced at present to meet the nutritional desires of about three-quarters of the world's present population, were everyone given access to the widely preferred diet that contains a modest amount of products from animals that are fed with cereal grains. With increased income, most poor people want to spend some of what they have gained for a more diverse diet, that includes animal products, where these are not proscribed by religious doctrine. Thus how many people the world can feed depends very much on what they eat.

Economists and others rightly point out that the world has much unused capacity for producing food. If poor countries and poor people had greater purchasing power, they argue, then more food would be produced and made available. But would there be enough for the doubled, or as some fear, the possibly tripled population of a warmer and more crowded world? The answer is yes, if something close to the historic (1934-1989) rate of growth of food

production of 2.1 percent per year can be sustained. But recent trends have raised questions as to whether and how long we can maintain this rate of annual increase in food production.

Analysts cite a litany of concerns that might constrain the continued growth in food production. In terms of the natural resources that are required for food production, there are losses of farmland, limits to freshwater supplies, erosion and degradation of soils, and declining genetic diversity. For agriculture, there are biological limits to yields, diminishing returns, and associated problems from the extensive use of fertilizers and pesticides. As hazards, there are new plant and animal diseases, increased ultraviolet radiation, air pollution, climate change, and sea-level rise. There are also socioeconomic constraints of inadequate markets, infrastructure and research investment, and limited access by poor farmers to land, capital, and technology.

As alternatives to these specific biophysical and socioeconomic limitations, agricultural scientists are quick to point out at least four major opportunities for increasing the food supply: (1) the unrealized potential to increase yields from the application of current techniques and technologies; (2) the possibilities provided by the biotechnological revolution that is now underway; (3) the development of organic and sustainable agriculture techniques; and (4) the opportunity to reduce food losses and to increase efficiency in the preparation and use of food. Trebling or quadrupling global food production is within the range of the possible. But to do so, much that is different will need to happen in farmers' fields, in research institutions, in agricultural markets, and in the households that consume the food produced.

Increases in agricultural yield per acre from the use of improved seeds, fertilizers, pesticides, and irrigation has now slowed in both the industrialized and the developing countries of Asia. Still, considerable opportunities exist for increasing yields particularly in Africa and in low-yield areas elsewhere through the application of readily available technology. Overall yields of cereal grains in Asia and Latin America are twice those of most African countries. It is argued that even modest increases in seed quality, fertilizer, pesticide and water use, encouraged by appropriate policies, prices and markets, could lead to a rapid increase in yields. Beyond the intensive utilization of what is already available are the new possibilities provided by the promise of genetic engineering. A new set of molecular, cellular, and whole-plant-biology techniques promise to tailor what is planted to respond more efficiently to nutrients and moisture, to tolerate heat and drought, and to resist pests.

Whether we take comfort from the technological optimists or concern from the biological pessimists, there is wide agreement that trebled food production could not be sustained under current practices, given the additional burdens of soil and water loss, pesticide and fertilizer use, and the potential for change in the global climate. Finally, the global food system is not very efficient in harvesting what is grown and in transforming raw agricultural products into usable food. Some have estimated that over half of the available food is wasted in the process--in fields and storage in poor countries and in processing and consumption in richer ones. As in the case of energy production and consumption, there are many opportunities for "food energy" conservation.

Adequate Household Income

For most of the world's hungry people, the major determinant of their hunger is poverty or inadequate household income. In 1990 this was the case for about 15 percent of the world's population, or more than 780 million people ([Table 1](#)). Inadequate household incomes also affect the size of the available food supply, indirectly, by failing to provide market incentives for greater production.

Poor countries are also among the most inequitable in terms of income distribution. While the gap between the amount of wealth commanded by the upper and lower fifths of society diminishes with rising national income--from 15 to 20:1 in poor countries to the 5 to 7:1 found in the more wealthy nations--the wheels of change turn slowly and inequitably. For the poor and hungry, trickle-down is not very efficient. This suggests that in a world of somewhat more than doubled population, national income would have to increase four to six fold (depending on the pattern of income distribution) in order to meet the food requirements and modest expectations of improved diets in the poorest households. There is, however, an encouraging synergy between increased food production and reduction of poverty. Improving the productivity of low-income agriculture in developing countries not only supplies more food, but provides broad-based income and employment opportunities.

Increasing income as a prime mode of ending hunger is also not enough. Additional income is spent in part on more diverse but costly foods, and some of it on non-food-related expenditures. From a number of studies, it appears that in general a 10 percent increase in income increases dietary calories by only 4 to 6 percent, even though the poorest households spend up to 85 percent of household income on food. Moreover, within a household there may be an inadequate distribution of food among those who live under the same roof, favoring some--often those with paid employment--and not others, as in the case of girl siblings, or children being weaned. Even after the average household income is raised above the poverty level, there is still need for a comprehensive safety net.

A Safety Net

A world without hunger will still face natural and technological disasters that require emergency assistance. Poor people--even those whose average income is above the poverty level for food--will still require occasional income maintenance and supplementation, since swings in crop production, income, illness, and family creation and loss will continue to generate a need for additional entitlement. The special needs of women and children will have to be met by responsive maternal and child care systems, as is the case in even the wealthiest countries today.

It is difficult to foretell how such a safety net might evolve and be supported decades in the future. Nor do we know whether the nation-state will continue to constitute the basis for its implementation. Still, the elements of a pervasive safety net can be foreseen, both in the prototypes that now function in many developing countries and the more advanced systems that exist in the most developed nations. They include famine prevention and emergency assistance, entitlement maintenance, and special needs programs.

Famine Prevention

In 1992-93, a major drought affected southern Africa, reducing crop yields in some countries by as much as 50 percent. Yet there was no famine. Indeed, the remarkable achievement in keeping famine from Botswana, Malawi, Mozambique, South Africa, Zambia, and Zimbabwe was further evidence for the present maturity of national and international efforts to prevent its occurrence. These efforts began in the 1980s and are designed to cope with drought, flood, war, and famine. They have also led to great improvement in the global system for providing early warning, identifying vulnerable populations, delivering emergency food aid, and providing opportunities for work and income. With improved early warning, the international community has distributed 2 to 4 million metric tons of food aid each year for emergency situations in developing countries, and an additional 1 to 2 million tons to feed a growing number of refugees and other displaced peoples. Thus it is now possible to anticipate widespread food shortages and to deliver needed food, quickly, almost anywhere in the world. It is only in zones of armed conflict that major obstacles remain in eliminating deaths due to famine.

Entitlement maintenance

Efforts to distribute or subsidize food are at least as old as the Roman Empire. Whether provided as a direct subsidy or gift, or by mandating an artificially-low consumer price, a general entitlement to food is a very costly endeavor. Still, when targeted to the truly needy, food or income maintenance can be quite effective. The best food programs utilize existing markets to distribute food through food stamps, ration shops, or specially subsidized foods. Income maintenance programs provide employment during drought and flood crises in return for labor, to construct needed agricultural infrastructure such as roads, terraces, and irrigation works. Diversifying the sources of income for the rural poor can make them less vulnerable to pre-harvest seasonal hunger or the threat of natural disaster. Self-sustaining community and women's credit programs that help start small businesses or encourage the production of handicrafts and services have also proven very effective.

For the food-poor households that still raise much of what they eat, maintaining access to land and water and what is generally needed for agriculture, herding, or fishing is the key to food entitlement maintenance. But such guarantees become increasingly difficult in the face of growing population and

competition for land. In some places there are still opportunities to redistribute land that is little used among small holders, and low-cost techniques that can be used to sustain productivity, provide fuel wood, limit soil erosion, and increase food and income are available everywhere. Small farmers, however, often have to sell at low prices in highly competitive markets, and buy farm inputs and consumer goods at high prices from relatively restricted sources. Industrialized countries, including the U.S., sought to remedy this inequality by providing some forms of support, subsidy, or minimum prices for farmers but are now phasing them out--based on arguments that they are inexpensive, ineffective, and bureaucratic, or no longer helping the intended beneficiaries. Yet this basic problem for the world's small farmers still persists, as they are buffeted by the fluctuations in price and demand in far-off markets and the cost and reliability of needed supplies.

Special needs programs

Women, children, and the sick have special needs for additional food, and programs to meet such needs are required in even wealthy countries. Immunization and low-cost treatment of diarrhea and malaria promise to reduce the impact of disease on children's health and growth, even as early as the end of this century. Efforts to encourage and maintain breast feeding have been successful in many developing countries, and the fraction of mothers who nourish their young in this way has held stable, or is even increasing. Most childhood wasting and stunting could be eliminated if infants were exclusively breastfed in the early months and thereafter received appropriate complementary feeding, in combination with measures to reduce the effects of diarrheas, parasites, and other infectious diseases. Effective low-cost systems of maternal and child health care, supported by adequate nutrition education, have already been demonstrated in a number of countries.

To prevent anemia in women, and particularly those who are pregnant, requires a regular iron supplement. In the past, problems of cost, logistics, and poor compliance due to gastric symptoms have prevented effective supplementation. A weekly supplementation has been shown to be as effective, much less costly, and more feasible and free of side-effects. The availability of de-worming drugs, as well as new research, holds considerable promise for attacking the intestinal parasites that now prevent a billion people from absorbing the full nutritional value of the food that they eat. But in the long run, basic improvements in sanitation and safe drinking water will also be necessary. While there has been much progress, the pace of sanitary improvements has not kept up with the growth of population, particularly in Africa and South Asia.

Coping with surprise

Because of unexpected surprises, either natural or human-induced, ending hunger could prove quite different from the idealized prescription that was just laid out. While the particular surprises are unpredictable, some of their origins are readily imaginable. On the negative side, new diseases can seriously disrupt plant or animal production; on the positive, new discoveries in biotechnology can provide substantial improvements in yields and nutrition. Caring for others can be enhanced by new and revived social and religious movements, while new sources of conflict can impede the sharing of food and altruism in general. Some of today's tragedies in Africa, such as what has happened in Rwanda and Nigeria, will confound the conventional wisdom, while some developed regions may prove surprisingly vulnerable. Nature may prove to be more robust than some currently fear, but it will also respond very differently to stress than what models might foresee. For these reasons, well-intended efforts to end hunger will require a capacity to deal with surprise--to take advantage of surprising opportunities and to maintain social and technical flexibility to cope with surprising adversity.

CONCLUSIONS

About a sixth of the world's people are hungry today. But to put a lasting end to hunger requires more than donations of bags of grain and tins of milk. There must not only be plenty of food, but food produced in ways that are environmentally sustainable, and assistance in providing increased income for those who are poor. To end famine requires not only a surplus of food and a willingness to distribute it in times of emergency, but also a widespread recognition of the human right to food, and effective mechanisms to prevent armed conflict. To reduce undernutrition to a minimum, the world must not only be more wealthy, but also more willing and able to provide food entitlements as needed to poor and vulnerable groups.

To end the wasting and stunting of children and the exhaustion of their mothers requires sufficient spacing between children to allow for their own and their mothers' nutrition, and that allows for society's ability to provide the needed services, education, and jobs to support those who are born. To virtually end micronutrient deficiencies and nutrient-depleting illness requires not only more diverse diets, but also the income to support widespread access to adequate sanitation, safe water, public health and primary care services including immunization and nutritional and health education.

A permanent end to hunger will also need to address the great global changes now underway in environment, population, economy, and world order. The focus on women that has emerged from the 1994 Cairo Conference on Population and Development, discussed in the third article in this issue, can hasten the end of maternal anemia and child wasting and stunting. The painful but inexorable restructuring of the global economy may provide new sources of income to many parts of the world. The vision of sustainable development arising from the 1992 Rio Conference on Environment and Development can only encourage the effort to create a sustainable, but much enlarged food production system. The efforts to strengthen the United Nations and for collective action for human rights and international order can make the elimination of famine more feasible.

The good news is that while these great global concerns are all involved, the immediate goal of ending hunger need not await their full solution. This is the lesson of Europe in the 150 years since the Irish Famine, or of China in the 35 years since their great famine. For while poverty and hunger are closely linked, hunger can be eliminated even where poverty persists. The task is to raise the poverty floor above the hunger level, a task achieved in Europe following the Irish Famine. Even poorer countries can do so, as China has demonstrated by cutting hunger by more than half in the years following the famine loss of as many as 30 million people in 1959- 60. The rudiments of ending hunger are in place. It is only our collective aspiration to act that holds us back.

Reviewed by Per Pinstrup-Andersen and Nevin S. Scrimshaw

For Further Reading

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Reviewers

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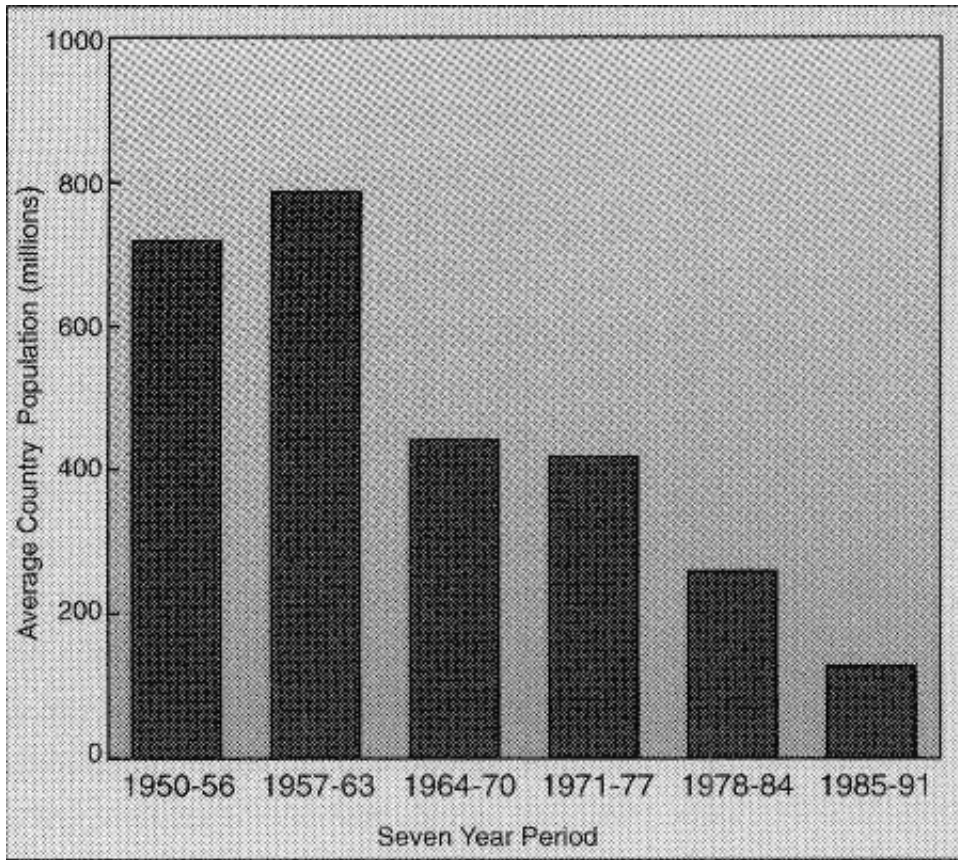
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Recent Estimates of World Hunger				
Dimension of Hunger	Population Affected		Year	Source
	(millions)	(percent)		
STARVATION!				
Famine (population at risk)	15-35	0.3-0.7	1992	WHP
Related deaths per year	0.15-0.25	<=.01%	1990s	RPG
UNDERNUTRITION (chronic and seasonal)				
Household	786	20	1988- 90	FAO
Children	184	34	1990	ACC/SCN
MICRONUTRIENT DEFICIENCIES!				
Iron deficiency (women aged 15-49)	370	42	1980s	ACC/SCN
Iodine deficiency (goiter)	655	12	1980s	ACC/SCN
Vitamin A deficiency (children under 5 yrs of age)	14	3	1980s	ACC/SCN
NUTRIENT-DEPLETING ILLNESS!				
Diarrhea, measles, malaria (deaths of children under 5)	4.7	0.7	1990s	UNICEF
Parasites (infected population) ^a				
Roundworm	785-1,300	15-25	1980s	WB
Hookworm	700-900	13-17	1980s	WB
Whipworm	500-750	10-14	1980s	WB

Table 1^a Includes those people expected to have multiple infections.

Sources: ACC/SCN (Advisory Committee on Coordination--Subcommittee on Nutrition of the United Nations); FAO (Food and Agriculture Organization of the United Nations);

RPG (Refugee Policy Group); WHP (World Hunger Program, Brown University); WB (World Bank).



The FAMINDEX: Average of the total populations of all countries in which famine was reported in successive seven-year periods in *The New York Times*, illustrating the shift in incidence from larger to smaller countries.

Undernutrition in World Regions, 1970-1990								
PERCENTAGE OF POPULATION								
	sub-Saharan Africa	Near East and North Africa	Middle Americas	South America	South Asia	East Asia	China	All
1970	35	23	24	17	34	35	46	36
1975	37	17	20	15	34	32	40	33
1980	36	10	15	12	30	22	22	26
1990	37	5	14	13	24	17	16	20
NUMBER, IN MILLIONS								
1970	94	32	21	32	255	101	406	942
1975	112	26	21	32	289	101	395	976
1980	128	15	18	29	285	78	290	846

Table 2 Source: Advisory Committee on Coordinaton-- Subcommittee on Nutrition of the United Nations, 1993