Millman, S. and R. W. Kates, 1990. "Toward Understanding Hunger," Lucile F. Newman et al. (eds.) Hunger in History: Food Shortage, Poverty, and Deprivation. Oxford: Basil Blackwell, pp. 3-24.

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Toward Understanding Hunger

SARA MILLMAN AND ROBERT W. KATES

Introduction

Why does hunger persist in a world of plenty? One of the great questions of our time, this is also a question of earlier times. It is a central finding of this enquiry that plenty as well as scarcity characterized times past, and that the history of hunger is embedded in the history of plenty. We learn from our perusal of history that the causes of hunger are multiple, the conditions of hunger are several, the consequences of hunger are varied, and the effort to prevent or alleviate hunger constitutes a major, continuing strand of human history. In this chapter, we draw upon several different intellectual perspectives to develop a model of hunger, focusing on the causes, conditions, and consequences of hunger and on human responses to it.

Food is among the most basic of human needs. We define hunger simply as an inadequacy in individual dietary intake relative to the kind and quantity of food required for growth, for activity, and for the maintenance of good health. While this definition is broad enough to include voluntary forms of self-denial, our concern is with involuntary hunger.

Although the experience of hunger and its most immediate consequences are individual in nature, this experience affects the functioning of the social aggregations within which hunger occurs as well as of hungry individuals themselves. Its root causes lie in the natural environment, the growth of human populations, their social organization and technologies, and the interrelations between populations and their environments. Human responses to hunger or to the fear of hunger can serve to prevent or reduce it or its consequences. Indeed, much of what we have learned pertains to change and continuity in how people organize themselves in relation to hunger.

Perspectives

We draw on several main bodies of thought in formulating a causal structure of hunger within which to fit what we have learned. Prominent among

these are the effort to view hunger in the context of food systems, Sen's identification of the crucial role played in famine by entitlement mechanisms, and the approach to modeling represented in recent work on the causal structure of hazards.

Hunger as Food System Breakdown A diverse literature, drawing on several disciplines, attempts to place hunger and people's need for food within a larger context or food system. The essential attribute that the various approaches to food systems research share is that they focus on the complex linkages among the production, distribution, and consumption of food. To look at hunger in the context of a food system requires that one transcend the disciplinary boundaries within which hunger is often viewed as simply an agricultural problem, or a nutrition problem, or an exchange problem.

Classic studies of local food systems influenced by European colonial economies, such as Audrey Richards's (1939) study of seasonal and more chronic hunger among the Bemba, provide ethnographic examples that examine locally the ecology of food production, social rules for distribution and cultural rules for consumption, and nutritional consequences of the resulting dietary patterns. For the Bemba, the local food system is set in the larger national and international context of colonial policies that draw men off to the mines, leaving a shortage of labor for food production and enmeshing those remaining at home in a cycle of undernutrition. Thus, the sources of hunger are seen to lie in inadequate local food production, due to insufficient labor and food energy at times of peak demand for agricultural labor. Responses to hunger in this context are seen in food sharing and rationing rules, in dietary practices that confront daily hunger with coarse, bulky foods that extend the period of satiety, and in food cultivation and gathering practices that use the whole ecosystem. But the overwhelming food shortages are seen as embedded in turn in the political and economic structures that created the dearth of male labor and foreclosed other local opportunities to earn income and attract food from other areas.

UNRISD (United Nations Research Institute for Social Development) evaluations of the impact of the Green Revolution on developing countries provide a second set of examples of food systems research (see, for example, Oteiza 1987). These studies inquired into the ecological, market, socioeconomic, sociocultural, and nutritional/health consequences of the Green Revolution in Indonesia, India, Malaysia, Mexico, Bolivia, Sri Lanka, and the Philippines. The unit of inquiry, "food systems", was a departure from other evaluative studies of the Green Revolution that looked only at production, consumption, or both, but that did not look simultaneously at impacts on the distribution of resources, on the natural environment, or on the resulting vulnerability of local economies and local farmers in different social strata to international market fluctuations and/or political manipulations. Such studies as the UNRISD evaluations trace linkages through the system of interacting ecological, political, sociocultural, and nutritional health elements, and identify points of origin and response to hunger along multiple dimensions.

Hunger as Entitlement Failure A crucial concept from a different source is a useful complement to the tradition of food systems research, helping to elucidate some of the implications of production and distribution systems for consumption possibilities, and thus for hunger. In the context of hunger, "entitlement" refers simply to the access to food enjoyed by a household by virtue of its socially recognized right to control certain resources (Sen, 1981). The resources on which entitlement is based may vary. Where all food is purchased, an adequate supply of cash ensures an adequate supply of food, if it is generally available. However, legitimate access to food need not always operate through purchasing power. Subsistence farmers' entitlement may be rooted in their ownership of land and of their own labor, and thus in a conventionally accepted right to dispose of what they grow. Sharecroppers earn a share of their crop while the rest goes to their landlords. In such cases the household may be able to command adequate food supplies in the absence of any cash income. In some other settings, social security arrangements guarantee a minimal level of access to food (in the form of food stamps, for example) to those for whom other resources are lacking.

Fluctuating terms of trade governing the exchange of one resource for another alter the relative access of different groups to food supplies, so that even if the sets of resources they control are unchanging, the food supplies to which these sets give them access may not be. In this view, food shortages operating through higher prices are certainly one cause of entitlement failure and thus of hunger. If available supplies decline, then for at least some households, the amount that can be commanded must fall. However, the loss of access to food may affect different people, depending on the particular causes of shortage. Furthermore, certain groups may lose their access even in the presence of abundant food: Sen (1981) documents several famines in which overall shortage either was absent or at least played a relatively minor role, while the failure of specific entitlement mechanisms created widespread and severe hunger for the particular households that had depended on them. Careful consideration of the various bases of entitlement is essential in understanding who is likely to be hungry under what conditions.

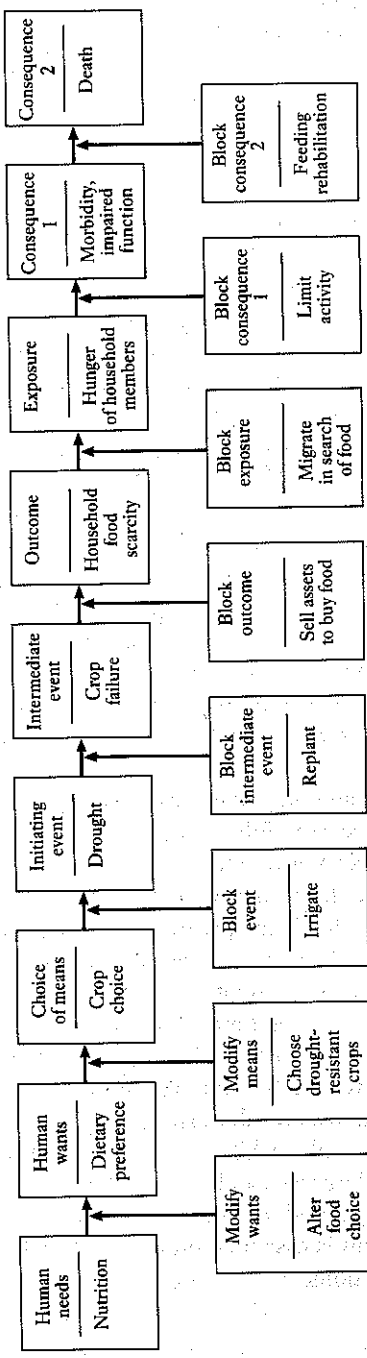

Figure 1.1 Hazard sequence representing the situation of a subsistence farm household faced with drought. Note the range of possible control interventions.

Hunger as a Hazard Our third major theoretical source is recent thinking on modeling and managing hazards. If hazards are broadly defined as "threats to humans and what they value" (Kates et al., 1985:21), hunger surely qualifies. A threat is distinct from its realization, and current approaches to risk assessment distinguish between them. Further, the process by which threat is actualized is separated into a logical sequence of causally related occurrences. These causal chains link an activity, exposure, or accidental failure to harmful consequences, and can be expanded to include the context of the activity and several orders of consequences.

Several aspects of these recent efforts to model hazards seem particularly applicable to the problem of hunger. First, as a tool for management, the emphasis is on how a potentially dangerous situation develops. A simplified presentation trades off the attempt to capture the full complexity of causation against the value of clarity. Identification of the logical sequence of causally related occurrences facilitates thinking about options available to prevent or reduce the hazard at each stage, even if no method is currently available. Strategies for hazard management may include attempts to avoid hazardous events by interference in the stream of occurrences leading to them, to limit their impact, and to repair the damage when they occur. Such strategies often involve a sort of anticipatory reaction to some threat of effects that have not yet occurred.

In figure 1.1, we show an example in which this approach is applied to the situation faced by a subsistence farmer when drought occurs. It is important to understand that this diagram represents only one in a wide range of sequences which could lead to hunger; clearly there are many other possibilities. Households may find themselves with insufficient food for reasons other than crop failures, and hunger often occurs even in families that do have enough food. The specific scenario shown could be extended, for instance, to consider consequences for households and for larger aggregations as well as for individuals, or to add feedback loops (such as death of a household member, and thus loss of earnings, reinforcing the household's difficulty in obtaining enough food). The power of this analytic approach, however, lies largely in the simplification that focuses on a single sequence of events rather than modeling causation so thoroughly that every possibility is covered. In particular, note the series of intervention possibilities that emerge as a result of asking oneself what it would take to prevent each step in the sequence from leading to the next.

Population and Production Three additional theoretical perspectives bearing on the relationship between population growth and the growth of production in general are highly relevant to any long-term analysis of hunger. These are the work of Thomas Malthus and Ester Boserup, and of Karl Marx, whose view of the causes of human misery sharply rejected the Malthusian analysis.

Malthus, writing late in the eighteenth century, was the first to focus on limits to population growth imposed by the natural environment. Starting from the basic assumptions that population is capable of growing geometrically (exponentially) and the means of subsistence only arithmetically (linearly), he concluded that the superior power of population to expand must in general tend to be kept in check by requirements of food and other necessities whose production cannot be increased so rapidly. The necessary balance between population and the means of subsistence could be maintained either by the "preventive checks" of fertility limitation (which, with the exception of delayed marriage and lifelong celibacy, he found morally abhorrent) or by the "positive checks' of mortality, including famine, pestilence, warfare, and so forth. In this view, hunger and other forms of human poverty and misery are an inevitable consequence of the pressure of population growth on limits of productive capacity.

Although population plays no central role in the Marxist analysis, the reaction to the Malthusian view is noteworthy. Marx disagreed vehemently with Malthus, finding the roots of hunger and other forms of human misery in relations of oppression and exploitation tied to the organization of production. Marx's theory of population is specific to the capitalist mode of production. Within such productive systems, the rapid accumulation of capital reduces the need for labor, creating a relative surplus of labor, an "industrial reserve army," condemned to unemployment or underemployment, low wages, miserable living conditions, and persistent hunger. It is the fact that the organization of production excludes some from full participation that generates this hunger-prone group, rather than any inadequacy of production possibilities relative to consumption requirements for the population as a whole.

Boserup, in contrast, sees population growth as a force favoring the adoption and diffusion of technological innovation. While in the short run this technological "progress" may only permit maintaining a larger population at a similar standard of living by virtue of harder work, in the long run it generates a momentum which, together with achievement of sufficient population density to support the infrastructure of transportation and communication essential for trade, yields real increases in per capita production. Although the Boserupian analysis makes no claim to universal applicability, it does identify a means by which population growth, instead of perpetuating poverty, may contribute to rising living standards.

A Conceptual Framework for Hunger

We draw upon these perspectives in describing a model of hunger that serves to organize the many themes of this volume. Like others using a food systems approach, we try to link hunger to its broader context in nature and society. Specifically, we adopt three levels of interacting hunger situations: regional or societal, household, and individual. We examine how the locus of causation and human response changes between levels over time and how the context widens.

Seeing the proximate causes of hunger in terms of entitlement loss or failure is central to our understanding of the causes and persistence of hunger. It provides a common language to connect the insights of those who view hunger as a product of food shortage and those who see hunger as caused by broader socioeconomic forces.

Finally, we draw on the tradition of hazard modeling. The importance of distinguishing between hunger itself and its causes and consequences is manifold. First, the distinction introduces a helpful level of analytic precision to the difficult questions we are addressing. It is necessary to identify and document plausible chains of causation to explain the persistence of hunger. Second, the distinction introduces a probabilistic element that mirrors the complexity and uncertainty of the real world. Not all food shortages lead to hunger; not all hunger results in starvation; not all starvation causes death. Third, by identifying a chain of causation with multiple links, we can see more clearly the opportunity each link offers to break or to interrupt the chain by taking deliberate action to prevent or limit hunger or to reduce its consequences. Fourth, for many periods in our study, direct evidence of hunger is missing or sparse. Understanding the forward and backward linkages between hunger itself and its causes and consequences permits us to draw inferences regarding the extent of hunger from evidence of its causes or consequences even when direct measures of hunger itself are lacking.

Causes

We begin with the causes of hunger. If the ultimate causes lie in human nature and the laws of physics or even metaphysics, our explanatory framework starts at a later step: the causes we focus on are the underlying and the immediate, and their story is inseparable from the history of plenty.

Underlying Processes The history of hunger is interwoven with the history of plenty. The central long-term thread is the growth of food productivity and a system of food security. This begins with the origins and diffusion of agriculture, intensifies with technological development and social organization, expands with greater storage and transport of food products, and extends ties of responsibility and interdependence to connect increasingly diverse and distant groups.

Over time, this growing capability to create a surplus above that needed to reproduce crops and their producers supports population growth and permits massive change in social organization. Since proportionately fewer people are required in agriculture, increasing numbers are freed to engage in other activities. Urban concentrations become possible, and the sheer existence of surplus which can be appropriated permits the development of hierarchically stratified societies.

Hunger arises in the interstices of these strands of greater productivity, growing population, economic specialization, and surplus appropriation, and their uneven unfolding and interaction over time, against a background of natural variation in the resources and hazards affecting food production. Thus in particular places and in particular times, productivity falters, numbers increase too rapidly, exchange mechanisms necessitated by an increasingly complex division of labor fail, and the extractions of the powerful exceed the capabilities of the producers.

Immediate causes Within this framework of long-term structural change in productivity, in numbers, in division of labor, and in appropriation, specific occurrences of natural variation and disease, intentional deprivation by war or appropriation, and incidents of mismanagement and failed adjustment serve as the immediate causes of hunger. Environmental variations of climate and diseases of plants, animals, and people stress the productivity system or people's ability to absorb food. Sieges and blockades employ hunger as a weapon. Social systems as varied as slavery, feudalism, capitalism, and socialism maintain significant populations at the margins of survival. Greed, corruption, ignorance, and ineptitude lead to mismanagement of the food production and security system. And adjustment systems, intended to buffer natural variation in production and distribution, prove inadequate.

These immediate causes of hunger can be generalized by function and linked to scarcity of food at various levels. They limit food availability, appropriate an excessive share of production, reduce individual food absorption, and are compounded by failed adjustments. Thus the deaths, food crises and shortages, famines, and widespread hunger and starvation that so mark the history of hunger are in the main linked to production losses brought about by natural hazards and acts of war exceeding the capability of the society to buffer such losses. These bear most heavily on those close to the margin of existence even in the best of times. Chronic hunger, malnutrition, and undernutrition, affecting certain households even at times of plenty, are due primarily to inadequate access to resources for food production or food exchange or to direct excessive appropriation of food supplies. Disease limits intake and restricts food absorption, creating

hunger and under-nutrition. Customs of fasting and other forms of self-denial, or selective deprivation of particular categories of individuals, keep some hungry even within households with adequate access to food.

Food Scarcity and Levels of Aggregation

We find it useful, in considering the causes of hunger, to distinguish three levels at which a scarcity of food may manifest itself. These are the bounded region, the household, and the individual. First, we define *food shortage* as the insufficient availability of food within a bounded region. Here sufficiency or insufficiency is defined relative to the usual or expected supplies to the area. Second, we define *food poverty* as the situation in which a particular household cannot obtain supplies of food that are adequate to meet the needs of all members given the customary pattern of allocation within the household. Researchers in different disciplines employ a wide variety of definitions for the term "household." For present purposes, the defining characteristic of a household is that it is the smallest organizational unit within which individuals routinely share food. While households defined by this criterion are likely to overlap considerably with those alternatively identified in terms of coresidence or kinship, the correspondence need not be perfect. Third, *food deprivation* refers to the inadequacy of individual intake relative to individual need. In the final analysis, if there is no food deprivation there is no hunger. Food poverty generates hunger only to the extent to which it translates into the individual deprivation of some or all household members. Similarly, food shortage leads to hunger only if it first pushes certain households into food poverty and thus some individuals within these households into food deprivation.

At each level of aggregation, factors other than actual scarcity may also operate. Thus, changes in the inequality of access to food may increase or decrease the number of households that cannot obtain adequate supplies even while availability within the region as a whole remains unchanged. Conflict and competition between groups, and intergroup differences in relations to the means of production, are central to the questions of how many and which households cannot command enough food for their members' needs. Factors affecting the relative viability of different forms of entitlement to food may lead to shifts in both the number and the identity of households in food poverty. Indeed, shifts in the distribution of entitlement across households may either dampen or amplify the translation of food shortage into actual hunger, and shifts in the allocation of food within households may reinforce or partially counter the tendency of food poverty to generate food deprivation.

Food Shortage In general, food shortages occur when the mechanisms by which a region is normally provisioned fail. Over time, the size and scale of such regions change. In an increasingly interconnected world, boundaries are increasingly permeable. At a global scale, in a world of overflowing granaries and mountains of butter, there is never any shortage.[1] Indeed, for the world as a whole, food supplies have been sufficient since the early 1960s to provide an ample although near-vegetarian diet to all if distributed according to need (Kates et al., 1988).

Historically, harvest failures are perhaps the most obvious causes of food shortages. These may entail reduced production either of food itself, or of cash crops traded for food. For areas importing any substantial portion of their food supplies, disruption of the flow of imports may cause shortages. We see such disruption as a function of war and other hostile actions and of shifts in the terms of trade that make foreign exchange needed to purchase food imports (or imports of goods used as inputs to agricultural production) less available. Shortage also occurs, in previously dominant centers, through loss of control over areas from which surplus food production has been extracted, or in areas dominated, through appropriation of too high a proportion of the food produced or goods exchanged for food.

Food Poverty When food shortage does occur, it is not likely to have the same impact on all households in the affected area. In general, we may expect that those households whose access to food is barely adequate in normal times will no longer be able to obtain needed supplies, while the relatively well-off will be less likely to suffer. Exactly who is most affected, however, is likely to be a function of the specific cause of the shortage as it relates to the various bases of household entitlement to food. Thus, those who grow their own food will be relatively mildly affected by a shortage rooted in import problems which reduces the amount of food available for sale and drives food prices sharply upwards; in this form of shortage, those who must buy their own food, and who barely have enough income to do so in normal times, will be more severely affected. In contrast, if drought or flood causes harvest failure, those whose only form of entitlement is subsistence agriculture are likely to bear the brunt of the shortage. They will have no alternative but to buy food. Their entry into the market may drive up prices for all, but at least others have some income to trade for food on the market. For the subsistence agriculturalist, buying food may require sale of productive assets such as land or livestock, or of future crops or labor. Thus a household's bases of future entitlement may be traded off for food supplies during a crisis in which these bases are temporarily devalued. If this occurs, food poverty for the household may persist long after the shortage which precipitated it is over.

Food poverty may be seen at levels beyond the household, such as ethnic, caste, or social class groups, or in marginalized aggregations of households within an area. It is, however, experienced in the household. Unfortunately, for many households, food poverty is an everyday condition despite the absence of shortage. Those households are unable to command adequate supplies of food even when it is locally available. Whether causes for such marginality are viewed as idiosyncratic or deeply rooted in social structure, it is a secure basis of entitlement that is lacking.

Food Deprivation Within households, some individuals may experience food deprivation despite adequate household food supplies. Diseases that reduce absorption of nutrients can cause malnutrition even if intake is normal, while disease-associated loss of appetite can cause inadequate intake even if plenty of nourishing food is available to the individual. Differential access of individuals to food may also be a factor. Where certain foods are traditionally viewed as inappropriate for certain categories of individuals (for example, high-protein foods for pregnant women), the quality of the diet may vary sharply among household members.

Since individual needs do vary, meeting the needs of all household members may require some differentiation in access to food. For example, caloric requirements are less in old age than for those in the prime of life, while the constraint a child's small stomach places on the volume of food it can consume calls for a higher concentration of calories and protein than an adult would need. If we think of an equitable allocation of food within the household as one in which the ratio of nutrients consumed to those needed is the same for all members, departures from equity may result either from incomplete understanding of this variable need or from deliberate decisions to favor some members over others. Incomplete understanding of need may well lead to malnutrition in individuals with special needs (such as small children or reproductive-aged women) even when the household is experiencing no scarcity. In contrast, we speculate that deliberate decisions to give some members less than they are perceived as needing may be precipitated by the great stress of food poverty.

In sum, there is a chain of causation that begins with the long-term trends in productivity, numbers of people, economic specialization, and surplus appropriation. The chain leads via specific instances of interference with food supply or failure of access to supplies (the immediate causes) to hunger for individuals, groups, or entire populations. In figure 1.2 we illustrate the relations among these underlying processes and immediate causes, the situations of food shortage, poverty, and deprivation, and the consequences of hunger for individuals, households, and regions. We turn next to a discussion of these consequences. These include, at the individual

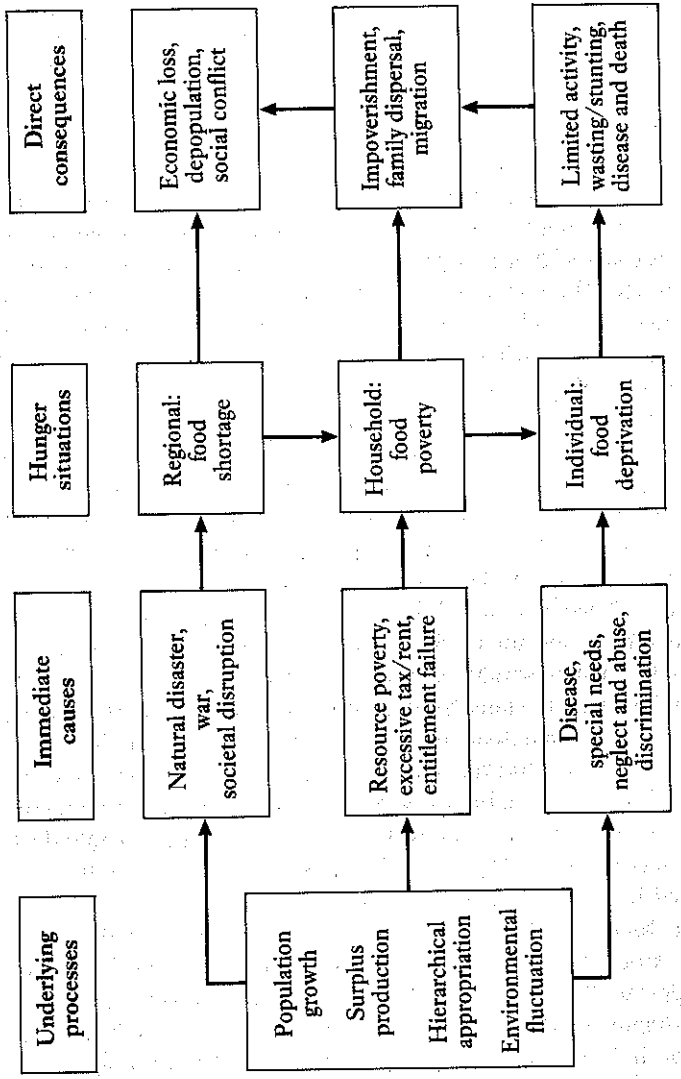

Figure 1.2 A causal structure of hunger

level, limits on development and activity, illness, and death; and for households and other groupings, a range of impacts that include but are not limited to the sum of the direct impacts of each individual member's own hunger on himself or herself. To cope with these consequences, societies develop adaptations that affect the long-term trends, and short-term adjustments that include use of alternative foods, stocks, other sources, exchanges, and gifts.

Consequences

In our discussion of the consequences of hunger, we focus first on the effects of undernutrition and malnutrition on individuals in general, and then on those with special needs. The direct physiological effects have implications for morbidity and for the demographic processes of mortality and fertility, as well as for behavioral and cognitive functioning, which in turn may condition social, economic, and political processes for groups. Some of the links in this chain are relatively well established; others remain somewhat speculative at this time.

Common Individual Consequences The specific experience of hunger depends on which essential nutrients are deficient and on the duration and extremity of this deficiency. Inadequate intake of some vitamins, such as A, B_1, or C, or trace minerals, such as iodine or zinc, can bring about very specific disease states, as discussed in chapter 13. The most common form of hunger, however, is an insufficient intake of dietary energy (calories), sometimes compounded by protein deficiency.

When less energy is consumed than is usually expended, energy is conserved by reducing expenditure. In part this occurs through a behavioral mechanism, the curtailment of physical activity. This behavioral shift has an emotional analog in apathy and sometimes irritability. Some physiological adaptation to scarcity also occurs: the basal metabolic rate, or use of energy to power such basic and essential life processes as respiration and circulation, is reduced.

Energy expenditure may also be maintained by metabolizing reserves in the form of stored fat, the outcome we seek when we diet. Lean body mass in the form of muscle and eventually even organ tissue will also be consumed if inadequate intake persists long enough. The term "starvation" refers to this combined reduction of energy expenditure and self-consumption. If the process continues long enough, it will eventually lead to death, with intractable diarrhea often the immediate cause.

Most hunger-related deaths, however, are probably from disease rather than from starvation per se. With severe malnutrition, resistance to certain

infectious diseases (such as polio and tuberculosis) deteriorates sharply, while the social disorganization associated with widespread hunger may create conditions favoring the spread of other diseases even if individual vulnerability is not increased by malnutrition (see chapter 9). The relationship between malnutrition and disease is a reciprocal one. Disease may be a cause as well as a result of malnutrition. Effects of disease on malnutrition operate through shifts in food consumed, whether due to custom or loss of appetite; through decreased absorption, as in diarrhea; through infestation with parasites which may interfere with the processing of nutrients, as in schistosomiasis; and through increased nutritional requirements to fight off infection.

Functionally, we see the effect of sustained hunger largely as lethargy. Ability to carry out heavy manual labor is impaired; the periods over which substantial physical effort can be maintained are reduced. An undernourished manual worker is likely to be less productive than a well-nourished one, to need longer breaks between periods of effort, to be able to work fewer hours a day, and to need to spend more non-working time resting (Spurr, 1983). The effects of hunger on work capacity have led some to view it as a major obstacle to economic development as well as a problem in its own right. It is an unfortunate irony that those who earn their living through hard physical labor are probably on average less able to afford a given diet than those whose occupations are physically less demanding.

Even aside from performance on the job, the restriction of physical activity clearly implies a reduced quality of life. The poor quality of life associated with hunger manifests itself in subtler ways as well. In the Gambia, one unanticipated effect of an experimental program to supplement women's diets was that for the first time they sang as they worked (Whitehead, personal communication, as cited in Beaton, 1983:338). Depression and anxiety were experienced by a group of volunteers for a study of the effects of starvation, despite the fact that they were under close medical supervision and thus protected from some of the adverse consequences hunger has under less favorable conditions (Guetzkow and Bowman, 1946).

Pregnant and lactating women, and children under five years, are often identified as groups especially vulnerable to hunger. Such assertions seem to rest on one or both of two distinct kinds of arguments: that the likelihood of hunger is particularly high for these groups, and that if hunger does occur, the likely consequences for them are particularly serious. Thus, if intake is not adjusted to meet the special requirements imposed by gestation and lactation in a mother or growth and development in a small child, hunger will be more frequent for mothers and small children than for others. We focus here, however, on the second set of arguments, the more serious consequences likely to follow from hunger in these groups.

At least at the extremes of malnutrition, the physical ability to become pregnant or to carry a pregnancy to term may be reduced (see, for example, Bongaarts, 1980, and Frisch, 1978, for two perspectives on this issue). Even with less extreme deprivation, inadequate intake during pregnancy may impair fetal development – and damage may be permanent. Maternal nutrition during pregnancy is an important correlate of low birth weight; in turn, babies who are very small at birth are much likelier than others to die during infancy, while those who survive are likelier than normal-weight babies to suffer from problems ranging from respiratory disorders to mental retardation. Further, an infant who is relatively weak at birth may be unable to breastfeed, and this inability may compound the disadvantage of the child's initial weakness. The mother's ability to produce adequate amounts of high-quality milk is surprisingly robust despite shortcomings in her own diet, but at the extremes of maternal malnutrition the availability of breast milk to the infant is jeopardized. To some extent the demands of fetal development and lactation seem to take precedence over the mother's own needs, so that a woman may be able to carry a pregnancy to term, deliver a reasonably healthy baby, and breastfeed it successfully in the face of inadequate intake. But to do so, she draws down supplies of essential nutrients in her own body, and if these reserves are not built up again between pregnancies, the effect may be cumulative. One manifestation of this phenomenon, termed the "maternal depletion syndrome," is the higher prevalence of anemia among reproductive-age women than among others (ACC/SCN, 1987:38).

In childhood, hunger may interfere with various aspects of growth and development, sometimes causing permanent damage. For children as for adults, adjustments to scarcity may entail reduced energy expenditure as well as metabolism of body tissues. In children, an additional means of reducing energy expenditure is the slowing or cessation of physical growth. This will be particularly damaging if its timing coincides with crucial growth processes which simply do not occur at all if they do not occur within a narrowly delimited period. Brain development may be one such process: brain cells normally proliferate rapidly during the last part of gestation and the first months after birth, and if we can generalize from studies of rats, any failure of growth during this period results in a permanent deficit. In other instances, growth shortfalls associated with hunger episodes can be made up if subsequent nutrition is sufficient to sustain catch-up growth as well as normal requirements.

The small average stature of adults in many Third-World populations can undoubtedly be traced in large part to their limited food intake and their experience of nutritionally damaging childhood diseases during their growing years. Similarly, in this volume, secular trends in adult stature are interpreted as evidence of change in health and nutrition.

The limitation of physical activity because of hunger translates in children

into a reduction in play, exploratory behavior, and interactions with others, all of vital importance for intellectual and social development (Latham, 1974). Evidence is fairly clear that prolonged and severe childhood malnutrition is associated with impairment of social and intellectual functioning as well as with more tangible physical effects, at least during the period shortly following episodes of malnutrition. Important questions as to the permanence or reversibility of such damage, how severe or long-lasting hunger must be for it to occur, and even whether the damage is actually a result of malnutrition or of some set of factors (disease, an impoverished environment, etc.) leading both to hunger and to impaired development, remain unresolved.

Consequences for Households The consequences of hunger at the household level exceed the sum of effects of each individual member's own hunger on that individual. The hunger of breadwinners is likely to reduce the amount of bread they can win; the hunger of mothers may lead to permanent damage to unborn or breastfed children, as well as to poorer child care and household maintenance in general; the hunger of children may lead to reduced potential in adulthood in terms of physical size and strength as well as social and intellectual skills. When a household member starves to death, or dies of an infectious disease to which hunger increased vulnerability, the roles he or she played are left vacant rather than just performed less effectively. If no one else is available to step into a particularly crucial vacated role, death of a member may devastate a household in very tangible ways.

Death can seriously disrupt the household as a functioning unit or institution, but so can the migration of members in search of employment or relief, or the sale or pledging of the household's assets to buy food. Much of the marginalization of households that lose their control over productive resources, such as land, water, trees, and herds, occurs at times of hunger stress.

Within households, hunger strains culturally defined relationships of leadership, responsibility, gender, and age. For example, when they cannot feed their families, heads of households can no longer fulfill their traditional responsibilities; their self-respect and the esteem of others may be rapidly eroded. Between households, the effect of hunger is spread as social and extended-family ties are called into play to buffer the household impact. And household formation itself is slowed as resources earmarked for dowry, bridewealth, or wedding celebrations are spent to feed the household.

Consequences for Regions and Societies Similarly, social impacts extend well beyond the sum of household effects. Kingdoms and republics alike have found themselves shaken by food crises and have evidenced a growing willingness to employ resources to prevent or alleviate them. Over time, societies show an increasing propensity to seek to prevent or mitigate famine and widespread food shortage. Public concern with food poverty has been and continues to be more of a rarity.

Preventing and Reducing Hunger

Actions may be taken at each of the levels of aggregation considered above to try to keep potential hunger events from occurring or to limit their impact. In generic terms, such actions may be described under various rubrics, such as human responses, coping actions, adaptations, and adjustments. Following the terminology conventional in hazard assessment, we distinguish between short-term adjustments and long-term adaptations to specify the duration over which a response emerges. "Adjustment" refers to short-term measures for coping with a particular actual or potential hunger event, while "adaptation" signifies a longer-term shift which might result from the experience of repeated hunger events over time. Not all such actions are successful, and actions which are successful in averting hunger or minimizing its consequences for some groups may leave others worse off.

Long-Term Adaptations Over the long term, humans have developed a complex repertoire of technological and social practices to supply their basic food needs, to prevent hunger, and to cope with hunger when it occurs. These practices become deeply embedded in culture and reflect its almost infinite variety in human history and prehistory. Thinking in terms of a simple food system of production, distribution, and consumption sectors, and distinguishing between technological innovations and the social relationships that govern them, we can describe a limited repertoire of fundamental long-term adaptations to hunger. Over time, as human numbers rise, more and different foods are demanded, and dependent populations increase; food producers intensify their collection and production of food, creating a surplus over their immediate needs. This surplus is distributed across time and space, to feed the producers when needed during hungry seasons and years, and to feed at all times non-producers. In the consumption sector of the food system, we adapt biologically and socially to a variable supply.

Four major adaptations stand out in history and prehistory for producing sufficient food to prevent hunger among producers and non-producers alike. The earliest long-term adaptation was movement to locations of natural surplus with access to multiple ecological zones and seasons of

natural productivity. Most important in the long run were the domestication of plants and animals, and the natural provision of plant and animal nutrition. This was done by locating and settling in areas of high natural productivity (flood plains, volcanic soils, etc.) and by increasing production through cultivation, irrigation, and protection from competitors. A third major adaptation in production was the induced creation of new plant and animal varieties, the artificial creation and provision of nutrients and pest protection, and the utilization of mechanical energy. A fourth is currently underway, manipulating genetic material and transforming the microenvironment of plants and animals through biotechnologies in agriculture and food science.

Equally important in the creation of surplus are those social inventions which compel or encourage surplus production. For household and self-provisioners, there is what Allan (1965) aptly called the "normal surplus," the extra production in good or average years that allows for a bare minimum in lean years. In order to encourage the additional hard work required for what is usually nonessential production in good or average years, societies evolve culturally defined flexible consumption needs – feasts, dowries, offerings – to absorb the surplus in good years and by their postponement in bad years to allow a buffer for harvest failure. As societies stratify hierarchically, the normal surplus becomes subject to appropriation, by tithe, tax, share, rent, and interest; and such extraction becomes codified by law and custom, and enforced through power. And with the evolution of markets, the creation of opportunities to exchange or sell a surplus further encourages its production.

For storage, human beings evolved a physiological energy storage capacity equivalent in the healthy adult to 30–50 days of basal metabolism. Lactating mothers provide a reserve for their infant children. Household techniques developed to store seed or other dry matter or living materials as root, tree, animal, or fish stocks, as well as processed materials such as olive oil, wine, or cheese, which ultimately became trade goods. Cities became the great storage reservoirs and redistributors for food. The birth of urban life in Mesopotamia is linked to surplus production, its storage, and the evolution of temple and palace, appropriating the surplus, storing, and redistributing it.

Long-distance food movement, as opposed to trade in precious minerals and luxury goods, awaited major innovations in transport, primarily by water, along canals, rivers, and across seas, and the social inventions of empire, mercantilist guild, and capitalist enterprise. Intricate systems of redistribution emerge through social organization: entitlement of food flows within kin-based households, stratified societies, and exchange-based systems.

We also adapt our needs to variable food supplies in more subtle ways.

Within the individual life cycle, those who experience limited nutrition early adapt by limiting growth, thus keeping requirements lower in later life. Populations in which food supplies remain scant over extended periods develop lifestyles in which discretionary physical activity is kept to a minimum, further reducing requirements. Some may also limit reproduction, although specific practices employed (such as extremely prolonged lactation) may be seen as responses to a very different set of imperatives than any concern over excessive childbearing. The latter two adaptations, restricted activity and limited reproduction, involve social and ideological adaptations as well as physiological ones, with metaphors of feast and famine in religion, folk tales, and literature reflecting needs for differential consumption.

Short-Term Adjustments In contrast to these sustained long-term adaptations, deeply embedded in biology and culture, short-term responses are for the most part intentional actions undertaken to anticipate, prevent, and reduce hunger or mitigate its consequences. In a sense, the repertoire of short-term adjustment, taken as a whole, is a long-term adaptation. Indeed, many of these practices are quite old. Adjustments primarily provide for use of alternative foods or alternative sources of foods, both from storage and other places; for exchange of labor or property for food; and for the provision of loans, gifts, charity, and relief in the form of food or exchangeable goods.

Faced with the prospect of harvest failure, a producing household may replant, sometimes in more appropriate locations, plant alternative failure-resistant crops, draw down supplies of stored roots, trees, and livestock, use foods which are not normally consumed, or collect non-domesticated foods. Non-producing households use stored supplies, use foods which are not normally consumed, or draw down stocks of wealth to maintain consumption. All households redefine their needs, limiting activity and postponing celebrations, feasts, and offerings. As hunger deepens, movement ensues, in search of work, food, kin, or relief, and reproduction may cease.

Actions may be taken at the regional level to safeguard food supplies, as by emergency increases of food imports (either purchased or donated), or to protect certain groups from bearing too much of the impact of shortage. Governments which set up rationing systems or soup kitchens under such circumstances are attempting to insure some minimal level of entitlement for those who might otherwise be pushed into food poverty; these actions are sometimes taken in the absence of shortage if traditional entitlement mechanisms fail so that some specific group loses access to food despite its abundant availability.

Possible responses to shortage, or to the perceived threat of shortage, may either increase or decrease the equality of access to food. The former

occurs as a deliberate policy response of governments to prevent the shortage from pushing disadvantaged groups into food poverty, and may take the form of various kinds of rationing. Unless the shortage is so severe that there is too little to go around even with more equitable distribution, this response may keep it from causing any increase in food poverty. In contrast, individuals who foresee a food shortage may attempt to gain control over as much food as possible before the shortage materializes, whether for their own consumption or to sell at inflated prices once the shortage hits. Since only those who are already relatively well-off are in a position to stockpile, the net result of this behavior is to widen the gulf between the haves and the have-nots. Panic buying and hoarding, in fact, can push those not in a position to participate into food poverty even if the anticipated shortage fails to materialize.

Maladjustment and maladaptation Strategies to avoid hunger sometimes operate to perpetuate it, while attempts of one group to minimize hunger for itself may make the situation of others more precarious. For example, long-term productive opportunities may be jeopardized to maintain consumption during a crisis, as when starving farmers eat grain reserved for seed or are forced to sell land or livestock. These strategies may indeed stave off starvation in the present, but at the cost of increased risk of hunger in the future. Similarly, those who stockpile food at the first sign of shortage may succeed in averting hunger for themselves, but increase risk for others. Maladaptation is also possible. Thus intensification of agriculture may increase production in the short run but decrease it in the long run if methods used are environmentally damaging; subsidized imports of food to meet the needs of urban populations may reduce incentives and hence production in rural areas, while a parallel argument claims that food aid often undermines a society's capacity to provision itself in the future even as it responds to crisis in the present.

Conclusions

The history of hunger is for the most part unwritten. The hungry rarely write history, and historians are rarely hungry. There have been a few attempts to bring together what is known for some periods or from some disciplinary perspectives. Of these, the most recent (Rotberg and Rabb, 1985) assembles papers from an inter-disciplinary conference focusing mainly on the European experience of the last several centuries.

Overall, considerable ingenuity has been expended to extract from diverse materials the evidence of hunger. In a world where current estimates of the number of hungry vary by a factor of three, the evidence from the past must be carefully weighed. Indeed, there is clearly a double standard in our willingness to accept indirect evidence, small, unrepresentative samples, and large assumptions in our attempt to assemble a picture of the distant past of hunger and to apply stricter standards of evidence for the more recent past. This double standard is not unique to the history of hunger, but occurs whenever questions are addressed for which available evidence is less than ideal.

In the chapters that follow, the conceptual framework and the concepts introduced above are used to organize and interpret the evidence available at various time scales, and to fit together the insights of specialists writing on particular instances or aspects of hunger. In succeeding sections, we address the history and prehistory of hunger by periods: ages, millennia, centuries, and decades. Where possible, the editors have sought cause, disaggregated condition, elaborated consequence, and specified adjustment and adaptation. In the final chapter, we distill the changes and continuities in the history and prehistory of hunger, employing these central concepts. Our contribution to the history of hunger lies not only in the information we have assembled, but also in the development and application of an integrative model of the causes, conditions, and consequences of hunger.

NOTES

1 Our three levels of aggregation may be extended, in principle without limit, to consider multiple nested units between the household and the world, such as local community, market area, country, subcontinent, or cross-cutting units, such as ethnic groups or social class categories, representing aggregations of households within an area. Such an elaboration can usefully treat scarcities at each level as a function of entitlement failures at the same level of aggregation. Thus, for instance, shifts in the terms of trade which make food imports more expensive can be viewed as a loss of entitlement at the national level.

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Part II
Hunger in Prehistoric Societies

The prehistoric period was the period of the Neolithic Revolution, in which domestication of plants and animals and the development of agriculture occurred. The Working Group reviews the forms of evidence available over the past 20,000 years, including climatological evidence, pollen studies, the archeological excavations of ancient cities in the Near East and south Asia, and various theories of the origins of agriculture. Major changes in the environments of human food supplies are recorded in the paleoclimatic record. Mark Nathan Cohen extends the discussion specifically on the history of hunger as recorded in the bones and teeth of humans and the archeology of human habitation and irrigation. While the evidence is fragmentary, imaginative efforts at synthesis have provided a picture of major changes having taken place in modes of food production and ways of life, as agriculture replaced hunting and gathering, and previously mobile peoples settled down.