

Conceptualization and Instrumentation of Food Insecurity

Jean-Pierre Habicht, Gretel Pelto, Edward Frongillo, Donald Rose
Cornell University, Tulane University

Paper prepared for National Academy of Sciences workshop, 15-16 July 2004

13 July 2004

1. Introduction

This paper is concerned with the constructs that underlie the measures used in the Food Security Supplement. We examine the implications of these theoretical, methodological and cultural constructs for data collection, data analyses and for deriving inferences. In this discussion, we also draw attention to the limitations and constraints of our current approaches and offer suggestions for future research.

Hunger, malnutrition, and undernourishment

The conceptual basis for measuring food insecurity can be traced to its emergence as a construct. The history of science is replete with examples of the progressive differentiation of a general idea in response to an increasing understanding of what it entails. The general idea of food scarcity, with all its dangers for survival and serious physical and psychological discomfort, have been part of human experience and human culture from the earliest inception of language and thought. Indeed, the very development of religious activity is closely allied with human efforts to ensure the food supply. It is also probably safe to assume that a word or phrase for hunger occurs in virtually all languages, but with considerable latitude about its referents. The concept of hunger covers a spectrum from the short-term physical experience of discomfort to chronic food shortage to severe and life-threatening lack of food.

With the establishment of the modern science of nutrition, the concept of malnutrition as a condition brought about by insufficient intake of nutrients to meet biological requirements became a focal construct. Technically the grammatical modifier, “mal” refers to both over- and under- intake, but the usual association, and until relatively recently, the bulk of research on malnutrition has been directed to understanding inadequate intakes of macro- and micro-nutrients. The measures of central concern are observed through analysis of biological tissues (e.g. serum), observation of well-established physical (e.g., anthropometric) and clinically (e.g., xerophthalmia) observable consequences and by inference from data on intake.

As malnutrition acquired a central role in scientific conceptualization, it was often mentioned jointly with the idea of hunger, to the point that the two became virtually synonymous. Nutritional scientists as well as social advocates therefore sought to describe the inequalities of access to adequate food and its consumption. One approach, based on scientifically defined biological principles, was to use established standards of dietary intake, such as the Recommended Dietary Allowances. The RDA standards, first developed in the US to address in the 1940's to address optimal nutrition of soldiers, were set at levels to ensure that

nearly all individuals in the population would fulfill their nutritional requirements if they ingested the recommended levels of nutrients.

There are some problems with using the RDA-based approach, which stem, in part, from its conceptual underpinnings. In order to include the upper extremes of the population distribution, the standards were set at a very high level. Consequently, a large proportion of the population in a well-off country, such as the US, consumes less than the RDAs but does not have an inadequate diet. Another problem is purely technical. It is difficult to use a single interview to assess nutrient intake in a biologically meaningful fashion. For instance, Vitamin A intake is very variable over time and only the mean intake over a period of months is meaningful nutritionally because Vitamin A is stored and body reserves buffer the variability of intake. Further technical problems relate to the accuracy of reported intake and the accuracy of the information used to translate food intake into nutrients.

As a consequence of the foregoing problems, the method of assessing nutritional adequacy through interviews and analysis of the record in relation to the RDA is no longer considered appropriate (National Academy of Sciences 1986). However, one might, nonetheless, divorce this approach from the biology, and claim that those who do not meet the RDA's for some proportion of some kinds of nutrients are food deprived in some social sense. This approach has not been utilized because recent approaches seem conceptually more logical, have less measurement problems and are easier to use.

The United Nations Food and Agricultural Organization (FAO) took a different biologically based approach to define "undernourishment" as not ingesting enough food to meet energy needs. Operationally the FAO indicator is calculated from national energy balance sheets. These balance sheets estimate the total energy available for human consumption nationally by adding total energy produced plus energy imported plus the change in stocks minus energy exported, energy wasted, and energy used for other than human consumption. FAO then creates a synthetic distribution of energy consumption for each country in which the mean is total energy available (from the balance sheets) and the variance is taken from another source, typically a nationally representative household expenditure survey minus energy exported and energy used for other than human consumption (Naiken, 2003). The results are prevalence estimates that have an almost perfect correlation with the national food energy balances when national population size is taken into account (Smith ref). However, national food availability is unevenly distributed to such different degrees across countries, that one would not expect this perfect correlation. Thus the two measurements, those from the energy balance sheets and the prevalences of "undernourishment" are redundant.. A recent conference on this method revealed that the FAO prevalence estimates of undernourishment were used, appropriately, for the same decisions as national food energy balance data. Inappropriately, it was thought that the "undernourishment" prevalence provided confirmatory evidence for decisions made using the balance data.

Food insecurity

The discovery that people who frequently did not have enough to eat according to accepted cultural norms created a conceptual crisis. Either the food problems of poor people

were imaginary or other concepts were needed to describe and measure them. A clearly intuitively understandable construct was “hunger,” defined as a physical pain. This word has typically and historically been used not only to refer to the physical sensation, but also to a feeling of weakness from not eating. However, beginning in the 1960s, the word began to take on a wider meaning. It was expanded to encompass issues of access to food and socio-economic deprivation related to food. Perhaps because these expanded referents seemed less compatible with the intuitive meaning of hunger, other constructs were needed. It is in this context that the phrase “Food Insecurity” came into use in the US.

Internationally, the phrase Food Insecurity was already current. Originally, it was used to describe the instability of national or regional food supplies over time. It was then expanded to include a lack of secure provisions at the household and individual level.

In the US, the national nutrition monitoring effort was authorized in 1990. As part of this effort, the US Department of Agriculture and the Department of Health and Human Services held a workshop in January 1994 in Washington to examine the conceptual and instrumental basis for understanding and measuring food insecurity. People attended this workshop from government, academia, non-governmental organizations, and other interested institutions. During the workshop, a consensus was reached that the salient concept to be assessed was food insecurity, but the concept of hunger was held to be important by some, especially those interested in advocacy. During the next year, a team of six people led by Abt Associates worked with the Department of Agriculture to develop a questionnaire to measure food insecurity that was fielded for the first time in the Current Population Survey in April 1995. The data from this survey were analyzed by the Abt team, and a set of items was chosen for the Household Food Security Survey Module (HFSSM) (Hamilton et al., 1997), which are now fielded each year in the Current Population Survey and also in several other government surveys. The Current Population Survey provides the data on the prevalence of those food secure, those food insecure without hunger, and those food insecure with hunger (Bickel et al., 2000; Nord et al., 2003).

The preceding discussion is summarized in two appended figures. Figure 1 depicts the relationship between determinants and consequences of nutritional state established at the commencement of the US national nutritional monitoring system (Anderson, 1990). Figure 2 depicts the relationship between the concepts of food insecurity, hunger, undernourishment, and malnutrition in developed and developing countries.

Uses of food insecurity information

An historical review of the evolution of measures of food insecurity reveals that the major motivation for developing a quantifiable measure in the US has been to estimate its prevalence. To date there has been very little application for another potential use: screening households or individuals for some intervention. One may expect that this latter use may become more common as the validity of the measures is more widely accepted. However, this will require more research, especially related to the positive predictive value of the screening tool. (In the case of food insecurity, the positive predictive value refers to the proportion of those who are correctly labeled “food insecure” among all those screened.) The positive predictive value depends on the specificity and sensitivity of the screen, as well as on the true prevalence of food

security. Because there has been little research on the positive predictive value of food insecurity measures, we restrict our discussion in this paper to the conceptual issue of estimating the prevalence of food insecurity, and using the measure in research directed to understanding its determinants and consequences.

2. Establishing the reality of food insecurity

The historical evolution in thinking about hunger, malnutrition, inadequate dietary intake, and food insecurity has established these as separate, and not necessarily overlapping, constructs. It is now recognized that food insecurity occurs in developed countries without hunger and malnutrition. However, this abstract development of the construct, food insecurity, required an empirical substantiation of its reality.

Insights from the ethnography of food insecurity

From the first stages of research on food insecurity, there has been attention to describing the concept from the perspective of the individuals who experience it -- those who find it difficult to feed themselves and their families. Research that seeks to describe phenomena from an experiential perspective can be characterized as ethnographic in nature. It utilizes in-depth interviewing, augmented by observation, as primary methodological tools. (Pelto 1978) This methodological approach, which is often referred to as qualitative research, is intended to yield data on the perceptions and behaviors of individuals whose experiences one is trying to understand.

A general principle of ethnography is that the technical procedures that are employed to obtain data from respondents (interviewees) are designed to maximize the elicitation of individuals' views and descriptions of their behaviors, and minimize the danger that the interviewer will impose his or her own conceptualizations about an issue or problem (Strauss et al., pending). Rather than a pre-structured questionnaire, the investigator obtains narratives that consist of peoples' descriptions of their experiences, their responses to specific conditions, their feelings, emotions and interpretations. The data that are obtained in this fashion can be characterized as "emic." Emic is a technical term in anthropology (Pelto 1978) to refer to the social and cultural constructs that are used by the people who are the subjects of an ethnographic inquiry. This term contrasts with the label, "etic," which refers to the constructs or analytic framework of the investigator. The ethnographic studies of food insecurity utilized in the construction of the food insecurity scales did not use the phrase "food insecurity" in the work with respondents, because the people who were interviewed did not use this construct to describe or characterize their situation. That is, they did not label their situation with the single etic construct "food insecurity."

In the following observations, we have drawn only on those ethnographic studies in which the ethnography was conceptualized, from its inception, as a first step in the development of a quantitative measure. In addition to these studies, other ethnographic research in developed countries has included descriptions of food management strategies and experiences that could also be subsumed under the etic label of "food insecurity."

The original Cornell University study was the first to ethnographically examine food insecurity as a construct separate from hunger and malnutrition (Radimer et al., 1992). This study worked with mothers in Upstate New York. The participants in this study were mostly white, English speaking, and of Anglo-Americans culture. They were interviewed in agency offices or in their homes. The agencies provided nutrition services to self-selected mothers of young children and pregnant women whose incomes were less than 185% of the US poverty line or other nutritional or educational services.

Another ethnographic study was conducted in the city of Quebec (population of 200,000) and its immediate surroundings. The participants, drawn from both single and two-parent families, were French-speaking. They were primarily descendants of seventeenth and eighteenth century French colonists. A third set of two studies, conducted by Cornell investigators, examined emic perspectives of food insecurity among three ethnic groups of elders (Wolfe et al., 1996, 1998, 2003). A fourth set of studies has added to our understanding of the experience of food insecurity by elders (Quandt et al., 1999, 2000, 2001).¹

There were important similarities in the results from the ethnographic studies, which cut across cultural and age differences. Each identified a similar pattern, which can be described in terms of an evolution of responses from less to more severe. This pattern begins with anxiety, and then as food insecurity evolves, progresses as follows: lack of stored food (shortage of food in the home), then a decrease in the quality and diversity of the diet, then cutting back on the quantity of food eaten per meal, and, finally, skipping meals and going hungry for a day or more. Another common feature in the ethnographies was the clear distinction respondents made between the behavioral changes they made themselves compared to the changes they instituted in their children's diets. Here, too, a consistent sequence was also discernable: parents buffer their children from food insecurity. Thus, there is a slower evolution to the final level of response for children than for their parents. A third dimension was identified in the Quebec and elderly studies, where it was investigated. This dimension concerns the psychological component of food insecurity in which expressions of social alienation and loss of self-esteem predominate. From the ethnographies it appears that this dimension does not progress in parallel to the behavioral changes, but is present across the spectrum of severity.

Developing a quantitative tool for measuring food insecurity

To move from ethnographic description to a more efficient tool for measuring food insecurity required a series of research operations. In the first Cornell study, the investigators identified a set of 30 individual items that appeared to be important in differentiating between respondents who reported behavioral and psychological characteristics that could be subsumed under the label of food insecurity in contrast to households with consistently adequate food. These items corresponded to the above described components; anxiety, low stores of food, changes in quality and quantity of food and number and frequency of meals.

¹ In addition to these studies in North America, there have now been three ethnographic studies of the experience of food insecurity in developing countries, one in Burkina Faso (Frongillo and Nanama, 2003) and two in Bangladesh (Frongillo et al., 2003; Webb et al., 2003).

Using a database created through a quantitative survey, the individual items were coded for each respondent. It was then possible to order the items in terms of their frequency of occurrence in the sample (percentage of women who reported affirmatively). This list of items, and their sequence, is the basis for the scales that were then developed as a survey instrument. To further the development of the Food Security Component for USDA, the Abt Associates study (Hamilton et al., 1997) conducted a test of a preliminary survey instrument. It used yes/no answers to questions that were formulated on the basis of the phrases that were elicited during the original Cornell study (Radimer et al., 1992). Other items were added to the questions from another survey instrument, the CCHIP instrument (Wehler et al., 1992), which was already in use before the Cornell study. The scales were then refined on the basis of USDA survey trials using these questions. This resulted in culling the questions resulted in deleting questions on household food availability (food stores), so the “USDA Measure of Food Insecurity and Hunger” measures the evolution from less to more severity without the first step of decreased availability. It includes the construct that parents buffer their children against food insecurity. Besides not including the first steps towards food insecurity, the “USDA Measure of Food Insecurity and Hunger” also does not include items that are specific to the elderly, which related to difficulties in meeting the nutritional demands of disease (above all diabetes) and in shopping and preparing food. The alienation and “loss of esteem” constructs are also missing from the USDA Measure.

Factor analysis of survey results from New York and Quebec identified four independent factors, which were the same in both surveys (Radimer et al., 1992; Hamelin, in preparation). The four factors explained two thirds of the total variance of the set of items (i.e., the sum of standardized variances for the items) in both surveys. The first factor called a household factor, was made up primarily of items that captured anxiety. The next three factors validated the adult-child differences and the quality factor. The manner in which the questions are formulated ensures that the respondent understands that they are being asked within the context of not being able to afford to eat properly.

Conceptually, creating a severity scale based simply on decreasing frequency in the percent of people reporting the behaviors does not prove that the scale captures the progression of severity revealed for these items in the ethnographic survey. A progressive or accretional scale must show that a person who reports a more severe item also reports all the less severe items. Such a scale is said to have Guttman scaling properties. Abt used a logistic technique to examine the scaling properties of the items within the scale and discarded those items that did not scale well. The final scale, the “USDA Measure of Food Insecurity and Hunger,” was tested in the Quebec study with the Guttman scaling technique and shown to scale well in the French-speaking population, but not perfectly (Hamelin, in preparation)

The measure used in the Food Security supplement scores a gradient according to how many of the 18 items are answered affirmatively. The Guttman properties of the scale substantiate this scoring method. The higher the score, the more severe is the food insecurity. If the scale did not have Guttman properties, an identical score could be obtained by counting the same number of affirmative answers no matter where the items were counted on the scale. For instance, all the items might be at the severe end of the scale and none at the beginning. That would violate the

Guttman properties that ideally require for an individual that, if a more severe answer is answered affirmatively, all the less severe items must also be answered yes.

In reality, even though the USDA Food Insecurity Measure has good Guttman properties, there is considerably variability in the pattern of responses. For example, some mothers may take the extreme step of skipping meals in order to avoid having to change their child's diet in any way. In such a case, the expected sequencing of responses is abrogated, and, technically speaking, that family introduces an error in the database. The question then is whether deviations from Guttman scaling are due to conceptual inadequacies or solely to error of measurement. Little work has yet been done in understanding deviations from the scale, which might reveal new constructs or inconsistencies in our present constructs.

Given that the scale is valid conceptually, it should be possible to devise measures of uncertainty around the measure. This remains to be done, and is necessary in interpreting analyses of the consequences of food insecurity.

All of the above discussion presumes that a uni-dimensional Guttman scale such as that used in the Food Insecurity supplement can satisfactorily explain food insecurity. In fact this may not be true and food insecurity may have constructs that do not progress the same as the USDA Food Insecurity scale. For instance, a scale of alienation may not fit into the food insecurity scale.

3. Counting the Food Insecure to Estimate Prevalences

USDA has selected 2 cutoff points on this scale to estimate the prevalence of food insecurity in the US. The first cutoff is intended to identify and count families who are experiencing food insecurity. The second cutoff is designed to identify and count, within the larger food insecure population, those who are experiencing severe food insecurity. Using the items in the food insecurity scales, the most severe is characterized by an adult cutting the size or skipping meals for three or more months. The less severe state is characterized by a report that the respondent is unable to afford balanced meals.

From the perspective of using these cutoffs to estimate the prevalence of food insecurity, a conceptual issue that needs to be addressed is how to validate the cutoff point decisions. It may be that the scale is valid overall, but the characterization of food insecurity at the cut-off is not. In the case of food insecurity measurement, the most realistic method would be to compare survey data to a gold standard based on expert judgment. This is how the investigators who carried out the original ethnographic work on food insecurity developed their classifications, which served as the gold standard for developing the food insecurity scales. Furthermore, two studies explicitly developed a gold standard for the purposes of assessing validity (Frongillo et al., 1997; Frongillo, 1999; Hamelin et al., 2002). In these studies the criteria developed in the ethnographic studies to distinguish between food secure and food insecure individuals were much more inclusive than the USDA cutoffs. Consequently, their assignments cannot be used, and new classification criteria need to be developed.

A major conceptual difficulty is keeping in mind the difference between a point on a scale (e.g., a cut-off point) and the individuals who have a food insecurity severity score which is severe enough to be above that point. For programs and policy purposes one is interested in the persons. The heterogeneity in the characteristics of those persons' food insecurity cannot be understood if one thinks only of a scale. This heterogeneity relates not just to characteristics of food insecurity, including measures not now included in the USDA Measure, but to the determinants and consequences of food insecurity, which can be modified. For instance, the route to food insecurity may be different for different households. Usual multivariate analyses are unlikely to pick up this heterogeneity.

The development of a gold standard for the cut-offs, which takes into account the heterogeneity of individuals, fulfills three validation purposes. First, it relates the scale to the reality of food insecurity. It is therefore crucial that developing this gold standard takes into account the full range of constructs that underlie food insecurity, not just those now contained in the USDA Food Insecurity Measurement. The second purpose of the gold standard is closely related to the first. It gives face validity to the cut-off point. Face validity refers to the credibility of the construct to those who make decisions based on the prevalences of food insecurity. The third purpose is to correct the prevalences estimated using the cut-off point to that of those identified by the gold standard. The reason to be concerned about this third validation is that in large-scale population descriptions, measurement error can significantly affect the magnitude of estimates. These, in turn, have policy and planning implications. Therefore, it is important to correct for measurement error by employing sensitivity and specificity correction factors relative to a gold standard. For estimating prevalences, only errors around the cut-off points are important so that one should concentrate on reducing these errors. Errors due to lack of sensitivity and specificity can increase or decrease the absolute values of the prevalence estimates relative to changes in the gold standard (Habicht 1980). The magnitude of this bias needs to be understood to determine whether it affects inferences for public policy and action.

A gold standard for estimating prevalence is possible even if it turns out the food insecurity is multidimensional, because one could declare that a specific combination of food insecurity characteristics is of concern, and develop the gold standard for that combination. For instance, a construct that is not captured at all in the present USDA Measurement of Food Insecurity becomes apparent when thinking about measuring prevalence. Prevalence is the product of incidence times duration. Persons with short durations of food insecurity may be different from those with longer durations. The present period prevalence estimates do not differentiate between these two kinds of food insecurity or estimates of those with cyclic food insecurity. Only a couple of the items in the HFSSM ask about frequency and these are not analyzed to differentiate among those with different durations of food insecurity.

Monitoring changes in the prevalence of health and social issues is usually done to decide if all is well or whether something including further investigation is needed. For this purpose interpreting monitoring data with the USDA Measure of Food Insecurity and Hunger, depends on what level of insecurity one wishes to follow. There is no problem if the cut-offs chosen do not correspond to the level of severity of concern, so long as the distribution of different levels is constant, relative to each other. This can be verified largely by examining whether the ratio of the severe to less severe prevalences now being monitored remains constant over time. If the

ratio is not constant, this is strong evidence that the different levels have different determinants, or different mixes of individuals with different determinants of food insecurity. For instance, it is likely that changes in short-term, long-term and cyclic food insecurity have different implications and should therefore be monitored separately.

In practice, one usually worries less about these errors in monitoring change than in estimating absolute prevalences because these errors always decrease the magnitude of change of the estimate relative to the change in the gold standard (Habicht 1980), and therefore the effect is more predictable than the effect on the absolute values.

4. The epidemiology of determinants and consequences of food insecurity

This section raises some issues concerning uncertainties in the conceptualization and measurement of food insecurity that affect investigations into its determinants and consequences. Studies of the determinants of food insecurity are crucial to identify preventive interventions for public policy and program planning. Investigations into consequences are crucial for public policy, because they establish the societal and public health importance of food insecurity, beyond the argument that food security is a human right. In this context importance can also be defined in terms of health and other social costs to society. Included within such costs are short and long term health impairments, including premature death. Such consequences are generally thought to be undesirable, even by those who do not feel that food security is a human right. Investigations into the consequences of food insecurity are also essential for program planning to design remedial interventions directed toward those consequences.

Use of the scale for investigating determinants and consequences implicitly presumes that all of the levels of food insecurity are associated with the same determinants and the same consequences. This conceptualization permits a straightforward approach to investigating determinants and consequences. However, this conceptualization is likely to be incomplete because of heterogeneity of determinants and consequences. Three kinds of heterogeneity require conceptual development in for the analyses of the determinants and consequences of food insecurity: heterogeneity across cultures, heterogeneity of individuals within a same culture, and heterogeneity of constructs with in the Guttman scale.

Heterogeneity across cultures relates to the construct that the scale used for the Food Security Supplement evolves in a more or less systematic manner from less to more severe in all US populations. The likelihood that it evolves similarly in different sub-cultures within developed countries seems high, given that it has been tested and found to be the same across young and old, in Hispanic groups, among White elderly, and across US and French Canadian mothers. But further investigation is warranted, particularly to ascertain whether the evolution progresses at similar rates for equal levels of determinants and consequences in different population groups.

Heterogeneity across individuals relates to whether or not the determinants of food insecurity are similar enough so that their prevention can be attained by a single set of interventions. From unpublished insights gathered in the ethnographic phase, we know that this is not true. There are at least two different pathways to leading to: (a) shorter-term sudden crises, and (b) longer-term destitution, whereby a rarely leads to b. If b is usually not preceded by a, the

appropriate interventions will be quite different for these two conditions. Further investigation will reveal yet other pathways to food insecurity. In these investigations it will also be important to elicit to what degree they are due to circumstances outside of individual's control and to what degree individuals could have avoided or remedied the circumstances. This information is not only important in designing interventions – it is also likely to be important in advocating information (see below).

Heterogeneity of determinants and consequences across individuals in a population is also needs to be considered because they will have important implications for designing interventions. For example both unemployment and physical inability to prepare food may be significant determinates of food insecurity. However, usual statistical multivariate analyses do not distinguish between the joint effects on a same individual and the separate effects on different individuals. Other approaches are needed; for instance Q methodology for dichotomous variables (ref).

Another heterogeneity arises if the determinants and consequences of food insecurity are not only different in magnitude for less severe than for more severe food insecurity, but if they are also different in kind. This will occur if the constructs characterizing less severe food insecurity (e.g., anxiety) have different determinants and consequences than the added constructs characterizing more severe food insecurity (e.g., going to bed hungry). These differences will go unperceived if the heterogeneity of the constructs is neglected by using the scale as a continuous measurement.

Beyond the issues of heterogeneity there is the concern that the present scale does not take into account the issues of alienation and loss of self-esteem. This dimension may be essential for understanding determinants and consequences. Also, there may be yet other dimensions that are important for policy makers and program planners that have not yet been identified, and some of these dimensions might also be important in defining food insecurity for enumerative purposes as well as for the examination of determinants and consequences.

Figure 3 presents a conceptual framework that suggests that food insecurity can affect well-being through four pathways: dietary intake, hunger, changed family and social interactions, and distress and alienation. Thus, hunger is only one of the possible immediate outcomes of food insecurity, and only one of the possible mechanisms through which food insecurity is harmful (Alaimo et al., 2001).

5. Measurement and the assessment of the need for action

A number of considerations influence judgments about whether there is a need to intervene to reduce food insecurity in the US:

1. The problem has important effects on individuals and households
2. The prevalence is high enough to warrant public concern and intervention
3. Interventions to deal with the problem exist or can be readily imagined
4. There is a societal responsibility to address it.

The ethnographic research was crucial in describing the importance of food insecurity for individuals. It defined the experiential construct and described it in a fashion so that anyone with empathy can appreciate its importance for individuals and households. However, unless the relationship of alienation and loss of self-esteem to other indicators is encompassed in the construct and the measurements, this aspect will be lost in the population-based studies. Once this information is clearer and the components of alienation and loss of esteem are better described, it is probable that the discussion about its importance will take on a new aspect.

Assessing need and risk is insufficient for forming sound public policy. Identifying effective interventions is also required. Usual epidemiological analyses establish risk from determinants, they do not establish the potential that such risks can be prevented or attenuated. This requires analyses to identify potential to benefit from interventions (Ruel 1995, Read 1996). The magnitude of the effect modification (statistical interaction) of the intervention on the risk gives an estimate of the effectiveness of the intervention to prevent or modify the risk. In thinking about these analyses, it is important to differentiate again between statistical multivariance, which may affect the same individuals, and heterogeneity among individuals relative to risk and potential to benefit.

In assessing whether a problem needs to be addressed, there is a trade off between the implications of a problem and the political cost of dealing with it. Costs and efficiency considerations enter into the political cost debate. These issues require research on the determinants of food insecurity and interventions to prevent or ameliorate it efficiently and effectively. For instance, we believe that the ways to deal with short-term crises that lead to food insecurity will require different and more cost-effective interventions than those presently available to intervene expeditiously so that the need for food supplementation is shortened. We think that not just the sequence of events but their context will reveal how to deal with these situations more effectively than we now envisage.

Item 4 in the list above is of paramount importance in the debate about the importance of the prevalences that are monitored through the Food Security Supplement surveys. Better definition of the constructs underlying the debate about responsibility is crucial (Pelletier). The issue of individual responsibility in preventing or dealing with one's own food insecurity weighs heavily in the minds of many in considering whether public action is warranted. We believe that interventions will be politically acceptable if they address a food insecurity that is due to circumstances that might happen to any upstanding citizen. Society tends to accept the need for intervention more easily if it benefits upstanding citizens whom decision makers feel are worthy. Thus demonstration that those who suffer have done what policy makers and opinion leaders think "should have been done" to prevent and deal with the situation may therefore be important and is not currently derivable from the survey data. In this context, the considerations discussed above about the homogeneity of the food insecure population are crucial, and must also be taken into account.

Developing solutions to the research issues discussed in the previous sections may all be for naught unless we understand much better the constructs of the policy decision makers, including opinion makers. Just as ethnographic work was essential to develop the measure of food insecurity, ethnographic work to understand the emic perspectives of opinion leaders and

policy-makers is also essential. Further work will then be required to produce measures and interpretations of food insecurity that the policy makers understand. Such research must take into account the great heterogeneity of motivations and perspectives among policy makers. Analysis of the expressions of policy makers in the news media may be a good starting point, and there are methodologies in the social disciplines that can do this efficiently.

Summary

Food insecurity is a concept that refers to lack of food. The concept of food security may also be important because it captures deprivation of a basic human need (i.e., food) that is not adequately captured by poverty. As developed here the concept goes beyond biological constructs to include coping mechanisms, even when food insecurity does not have immediate biological consequences. Food insecurity is usually caused by poverty, but is both more and less complex than the constructs of poverty. In particular, the construct can give insights into determinants and consequences of FI that are different from other aspects of poverty, and therefore lead to the design of better interventions to improve the nutrition of the poor.

During the development of the US Household Food Security Survey Module, a large number of candidate items (i.e., questions and statements) were included in the April 1995 Current Population Survey. Once the data were available, the development team then created the HFSSM by selecting a sub-set of items that met certain assumptions. The team assumed that:

1. the measure from the HFSSM should be expressed as a scale in a single dimension,
2. the scale should be composed of multiple items that range in severity,
3. severity should be primarily captured across items, not within items
4. the items should further have a Guttman property (i.e., affirmation of a more severe item should mean that all less severe items were also affirmed),
5. an indicator should be created by choosing cut-points along the scale, and
6. categories of the indicator should be labeled using both the terms “food insecurity” and “hunger”.

This paper has raised concerns about these assumptions, especially those regarding dimensionality, severity, the Guttman property, and the use of the term “hunger”. Also, concerns have been raised by others about the use of the term “hunger”. Hunger is a naturally occurring sensation that helps us in the regulation of food intake. The policy-relevant issue regarding hunger is not this physical sensation, but a social problem of lack of food that is not adequately understood or measured by poverty. Furthermore, the alienation component of food insecurity is not captured by the HFSSM.

The paper also raises the unexamined issue about the use of these data for advocacy. Evidence presented to the committee indicates that there is some misunderstanding among policy makers about the reality of food insecurity and its importance, which could be remedied by taking these policy makers views into account in further improvement of the Measure, in research defining the importance of the measure and in developing interventions against food insecurity.

Conclusion

The present USDA Measurement of Food Insecurity is based on firm conceptual grounds and a strong measurement methodology. Nevertheless it does not include certain key constructs., It has also not been examined for other constructs that can be envisaged, but have not been articulated. Elucidation of these constructs will probably be necessary for more widespread acceptance of the reality of what is measured, and for designing and implementing public policy.

The most urgent crucial missing information is the ethnography of decision makers as to what kinds of food security should be considered of public concern. This ethnography will be recurrent as different constructs about the reality as perceived by the food insecure is better understood, as the determinants and the individual and societal responsibilities for these determinants are elucidated, as the societal consequences of food insecurity become clearer and as interventions are conceived, designed and tested, which will prevent and ameliorate food insecurity.

References

- Alaimo K, Olson CM, Frongillo EA. Family food insufficiency, but not low family income, is positively associated with dysthymia and suicide symptoms in adolescents. *Journal of Nutrition* 132:719-725, 2002.
- Anderson, S.A., ed. 1990. "Core Indicators of Nutritional State for Hard to Measure Populations." *Journal of Nutrition* 120 (November 1990 Supplement): 1575-76.
- Bickel, G., et al. 2000. Guide to Measuring Household Food Security, Revised 2000. Alexandria VA: U.S. Department of Agriculture, Food and Nutrition Service, March. Accessed July 1, 2004 at: <<http://www.fns.usda.gov/fsec/FILES/FSGuide.pdf>>.
- Frongillo EA, Chowdhury N, Ekström EC, Naved RT. Understanding the experience of household food insecurity in rural Bangladesh leads to a measure different from that used in other countries. *Journal of Nutrition* 133:4158-4162, 2003.
- Frongillo EA, Nanama S. Development and validation of a questionnaire-based tool to measure rural household food insecurity in Burkina Faso. *Proceedings of International Scientific Symposium on Measurement and Assessment of Food Deprivation and Undernutrition*, 26-28 June 2002. Food and Agriculture Organization of the United Nations, Rome, 2003, pp. 309-310.
- Frongillo, E. A. (1999) Validation of measures of food insecurity and hunger. *J. Nutr.* 129: 506-509.
- Frongillo, E. A., Rauschenbach, B. S., Olson, C. M., Kendall, A., Colmenares, A.G. (1997) Questionnaire-based measures are valid for the identification of rural households with hunger and food insecurity. *J. Nutr.* 127:699-705.
- Habicht, J-P.: Some characteristics of indicators of nutritional status for use in screening and surveillance. *American Journal of Clinical Nutrition*, 1980, 33: 531-535.
- Frongillo EA, Horan CM. (2004) Hunger, food insecurity, and aging. *Generations* (in press).
- Hamelin AM, Beaudry M, Habicht JP. Characterization of household food insecurity in Quebec: food and feelings *Social Science & Medicine* 54 (2002) 119–132.

- Hamilton WL, Cook JT, Thompson WW, Buron LF, Frongillo EA, Olson CM, Wehler CA. Household Food Security in the United States in 1995. Executive Summary, Summary and Technical Reports of the Food Security Measurement Project. Washington: United States Department of Agriculture, Food and Consumer Service, Office of Analysis and Evaluation, 1997.
- National Academy of Sciences: Nutrient Adequacy: Assessment Using Food Consumption Surveys. Report of the Subcommittee on Criteria for Dietary Evaluation, Coordinating Committee on Evaluation of Food Consumption Surveys, Food and Nutrition Board, National Academy Press, Washington, DC, 1986.
- Naiken L. FAO methodology for estimating the prevalence of undernourishment. Proceedings of International Scientific Symposium on Measurement and Assessment of Food Deprivation and Undernutrition, 26-28 June 2002. Food and Agriculture Organization of the United Nations, Rome, 2003, pp. 7-47.
- Nord, M. 2002. "Food Security Rates are High for Elderly Households." FoodReview 25(2): 19-24.
- Nord, M., Andrews, M., Carlson, S. 2003. Household Food Security in the United States, 2002. Food Assistance and Nutrition Research Report No. 35. Washington, D.C.: U.S. Department of Agriculture, Economic Research Service.
- Pelto, PJ and Pelto GH. 1978. Anthropological Research: The structure of inquiry. New York: Cambridge University Press
- Quandt, S.A. and Rao, P. 1999. "Hunger and Food Security among Older Adults in a Rural Community." Human Organization 58(1): 28-35.
- Quandt, S.A. et al. 2001. "Meaning and Management of Food Security Among Rural Elders." The Journal of Applied Gerontology 20(3): 356-376.
- Quandt, S.A., et al. 2000. "Nutritional Self-Management of Elderly Widows in Rural Communities." The Gerontologist 40(1): 86-96.
- Radimer, K. L., Olson, C. M., Greene, J. C. , Campbell, C. C., & Habicht, J. P. (1992) Understanding hunger and developing indicators to assess it in women and children. *J. Nutr. Educ.* 24: 36S-45S.
- Reed, B.A., Habicht, J-P. and Niamego, C.: The effects of maternal education on child nutritional status depend on socio-environmental conditions. International Journal of Epidemiology, 1996, 25(3): 585-592.
- Rose, D. 1997. Assessing Food Insecurity in the United States: Background Information for Domestic Follow-up Activities to the World Food Summit. U.S. Department of Agriculture, Economic Research Service, Food and Consumer Economics Division. ERS Staff Paper No. 9706.
- Ruel, M. T., Rivera, J., Habicht, J-P. and Martorell, R.: Differential response to early nutrition supplementation: Long-term effects on height at adolescence. International Journal of Epidemiology, 1995, 24: 404-412.
- Webb P, Coates J, Houser R. Challenges in defining direct measures of hunger and food insecurity in Bangladesh: findings from ongoing fieldwork. Proceedings of International Scientific Symposium on Measurement and Assessment of Food Deprivation and Undernutrition, 26-28 June 2002. Food and Agriculture Organization of the United Nations, Rome, 2003, pp. 301-303.

- Wehler, C.A., Scott, R.I., Anderson, J.J. 1992. "The Community Childhood Hunger Identification Project: A Model of Domestic Hunger—Demonstration Project in Seattle, Washington." Journal of Nutrition Education 24: 29S-35S.
- Wolfe, W. S., et al. 1996. "Understanding Food Insecurity in the Elderly: A Conceptual Framework." Journal of Nutrition Education 28(2): 92-100.
- Wolfe, W. S., et al. 1998. "Hunger and Food Insecurity in the Elderly: Its Nature and Measurement." Journal of Aging and Health 10(3): 327-350.
- Wolfe, W.S., Frongillo, E.A., Valois, P. 2003. "Understanding the Experience of Food Insecurity by Elders Suggests Ways to Improve its Measurement. Journal of Nutrition 133: 2762-2769.

Figure 1. Core concepts related to nutritional state (Adapted from Anderson, 1990)

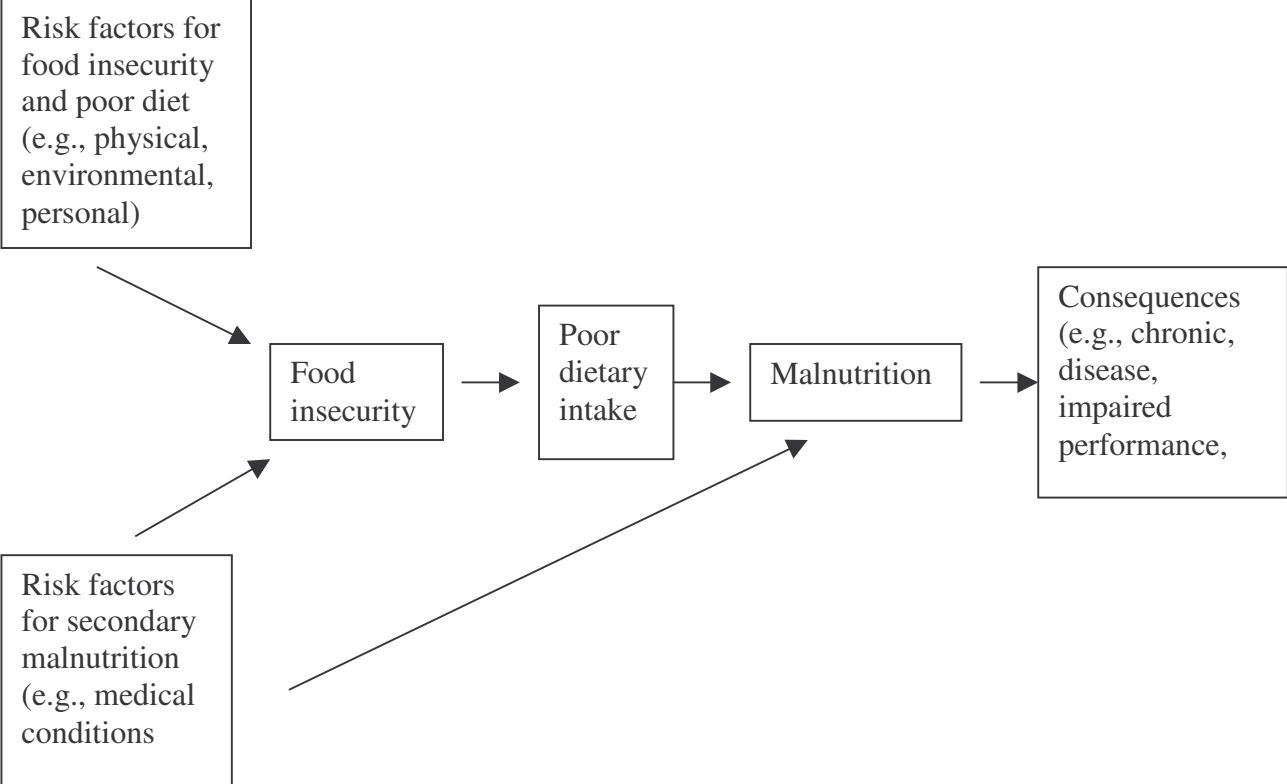


Figure 2. Relationships among concepts of food insecurity, hunger, undernourishment, and malnutrition (Adapted from Rose,1997).

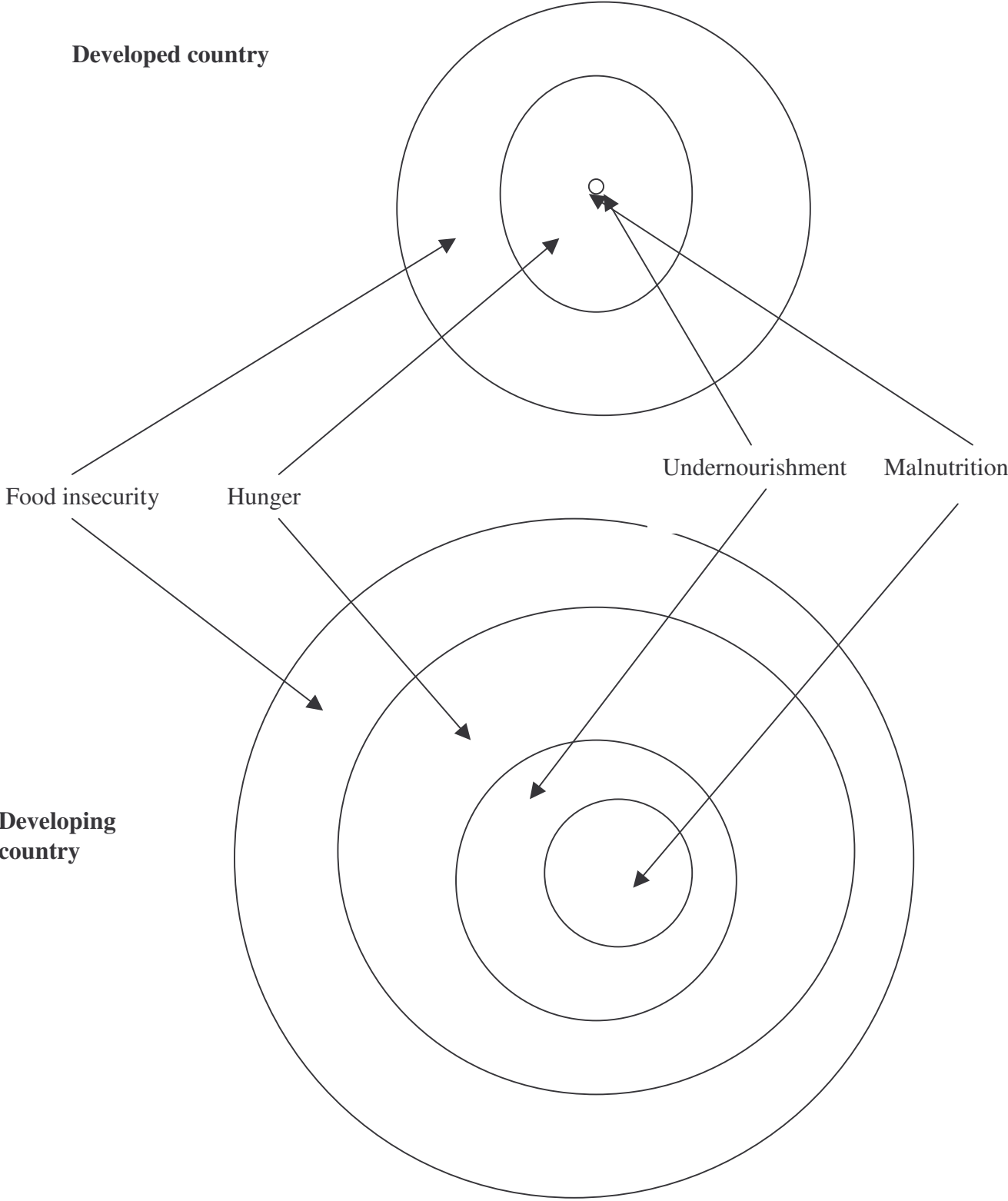


Figure 3. Determinants and consequences of food insecurity (Frongillo and Horan, 2004).

