

The Concept and Definition of Hunger and Its Relationship to Food Insecurity

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INTRODUCTION

In 1984, the President's Task Force on Food Assistance reported that hunger "has come to mean rather different things to different people" (President's Task Force on Food Assistance, 1984, p. 34). Unfortunately, the struggle of defining hunger, especially as it relates to food access, still exists two decades later.

Food access is connected to the health and well-being of American citizens (Hamelin, Habicht, & Beaudry, 1999; Holben & Myles, 2004; Olson & Holben, 2002; Pheley, Holben, Graham, & Simpson, 2002; Stuff, Casey, Szeto, Gossett, Robbins, Simpson, Connell, & Bogle, 2004); in fact, objectives related to food access are included in Healthy People 2010, a comprehensive set of health objectives to increase quality and years of healthy life and eliminate health disparities in the United States (U.S.) (Office of Disease Prevention and Health Promotion, U.S. Department of Health and Human Services, n.d.). However, defining, measuring, and assessing access to food by individuals and households is difficult.

The 1990 Life Sciences Research Office (LSRO) Report on Nutritional Assessment (Anderson, 1990) defined terms associated with food access, including food security, food insecurity, and hunger. *Food security* implies the *ability to secure adequate food*. According to the LSRO report, it is

"access by all people at all times to enough food for an active, healthy life. Food security includes at a minimum: (1) the ready availability of nutritionally adequate and safe foods, and (2) an assured ability to acquire acceptable foods in socially acceptable ways (e.g., without resorting to emergency food supplies, scavenging, stealing or other coping strategies)" (Anderson, 1990, p. 1598).

In contrast, *food insecurity* implies a *limited ability to secure adequate food*. Specifically, food insecurity is having "limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways" (Anderson, 1990, p. 1598).

Hunger was also defined by Anderson (1990), referring to it in two respects. First, as "the uneasy or painful sensation caused by a lack of food" (Anderson, 1990, p. 1598) and, next, as "the recurrent and involuntary lack of access to food" (Anderson, 1990, p. 1598). Hunger, that is, lacking access to food, and malnutrition were both cited as potential, although not inevitable, consequences of food insecurity (Anderson, 1990).

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In response to The National Nutrition Monitoring and Related Research Act of 1990, the U.S. Food Security Measurement Project, a collaboration among Federal agencies, academic researchers, and private commercial and nonprofit organizations, led to the development of standardized questionnaires (U.S. Household Food Security Survey Module) and methods for editing and scoring these questionnaires to produce household summary measures of food security status (Bickel, Nord, Price, Hamilton, & Cook, 2000; Economic Research Service, US Department of Agriculture, April 18, 2005). Consequently, the concept of food security has been clarified through many local, regional, and state studies, as well as several national surveys, including the Survey of Program Dynamics, National Health and Nutrition Examination Survey (NHANES IV), National Center for Educational Statistics' Early Childhood Longitudinal Study (ECLS), and Panel Study of Income Dynamics (PSID). (US Department of Agriculture, April 18, 2005). Despite this progress, the concept of hunger still lacks clarity.

The Committee on National Statistics' Panel to Review U.S. Department of Agriculture's Measurement of Food Insecurity and Hunger, in its Phase I Report (National Research Council, 2005), noted that further work is needed to refine the concept and measurement of hunger and how it relates to food insecurity. Essentially, it was asserted that the term hunger can produce images of severe deprivation and that resource-constrained hunger needs to be conceptualized from both a physiological and socioeconomic point-of-view, since it is not evident in the current measure of food insecurity with hunger (National Research Council, 2005). Therefore, the purposes of this paper are to:

1. Identify stakeholders interested in hunger;
2. Summarize possible meanings of hunger, including the identification of definitions of hunger relevant to assessment of nutritional well-being, food deprivation of the U.S. population, and U.S. policies and programs;
3. Distinguish which meanings of hunger are important to those interested in hunger;
4. Identify the concept of hunger that should be used by the U.S. Department of Agriculture to assess the nutritional well-being and food deprivation of the U.S. population;
5. Relate the proposed U.S. Department of Agriculture definition of hunger to food insecurity; and
6. Discuss possible assessment methods of hunger in the U.S. population.

STAKEHOLDERS INTERESTED IN HUNGER

As demonstrated in previous work summarizing how a variety of stakeholders use the current food insecurity and hunger measure (Wilde, 2004), many are interested in the concept of hunger. Stakeholders interested in hunger include citizens and residents of the U.S., Federal and nonfederal food assistance programs, governmental and non-governmental agencies and organizations, volunteer and advocacy organizations, politicians/policy makers, businesses, business/corporation-related foundations, and the media. Table 1 provides examples of groups and organizations interested in food access and hunger.

DEFINITIONS OF HUNGER

Defining hunger, at first glance, seems like a very straightforward and simple task. However, hunger “has come to mean rather different things to different people” (President’s Task Force on Food Assistance, 1984, p. 34). Definitions of the term vary widely, which may not be surprising, considering that there are both physiological and socioeconomic aspects of hunger. Clarifying the term hunger, its relationship to food insecurity, and its prevalence in the U.S. will improve the current measure of food insecurity and hunger and facilitate monitoring of health and/or programmatic outcomes in the U.S., ultimately advancing the health and well-being of Americans. Thus, clearly defining hunger, and its relationship to food insecurity, is vital.

As reviewed in the introduction, hunger has been referred to as “the uneasy or painful sensation caused by a lack of food” (Anderson, 1990, p. 1598) and “the recurrent and involuntary lack of access to food” (Anderson, 1990, p. 1598). These definitions are the basis of the current measure utilized in the U.S. As noted by the Economic Research Service (2005) on their *Food Security Briefing Room* website, “The physiological phenomenon of hunger is defined as an uneasy or painful sensation caused by a lack of food. As measured and described in the U.S. food security measurement project, ‘hunger’ is involuntary hunger that results from not being able to afford enough food. People are not counted as ‘hungry’ for these statistics if they were hungry only because they were dieting to lose weight, fasting for religious reasons, or were just too busy to eat” (Economic Research Service, 2005, ¶4). In spite of this, as summarized by Radimer (2002), the definitions of food security, food insecurity, and hunger published by Anderson (1990) broadened the term from hunger to food insecurity and limited the term hunger to its physiological meaning, even though it is a social issue (Radimer, 2002).

Complicating the issue further, despite providing a clear definition of hunger for the purposes of the U.S. food security measurement project, some misinterpret or misrepresent U.S. food security and hunger concepts and estimates (Wilde, 2004). In fact, some have reported that hunger has been defined, or has been perceived to be defined, as only being able to buy inexpensive food or being uncertain about where the next meal is coming from (*Economist*, 2003).

Examining definitions of the term in both lay and scientific literature can give insight into the concept of hunger. This section summarizes definitions from commonly-used references, groups and organizations concerned with food access of people, and nutrition, medical, and other scientific literature, as well as definitions used by the U.S. Department of Agriculture.

Definitions from Commonly-Used References

When there is a lack of understanding about the meaning of a particular term, many turn to a dictionary or another reference for assistance. Definitions of hunger from commonly-used conventional and electronic references include:

- Need or craving for food (noun); strong desire (noun); feel hunger (verb) (*Webster’s New World Pocket Dictionary, Third Edition*, 1997);
- Need for food, the uneasy sensation felt when one has not eaten for some time (noun); a strong desire for something (noun); to feel hunger (verb) (*Oxford American Dictionary*, 1980);
- A physiological need for food; the consequence of food deprivation; strong desire for something (noun); feel the need to eat; have a craving, appetite, strong desire for; be hungry; go without food (verb) (WordNet, n.d.).
- Discomfort, illness, weakness, or pain caused by a prolonged, involuntary lack of food (Future Harvest Centers, 2004);
- A desire or need for food; any appetite, strong desire, or craving (Dirckx, 2001); and

- A sensation resulting from lack of food, characterized by dull or acute pain referred to the epigastrium or lower part of the chest (*Taber's Online*, 2005; Thomas, 1989). Usually accompanied by weakness and an overwhelming desire to eat. Hunger pains coincide with powerful contractions of the stomach. Hunger is distinguished from appetite in that the latter is a pleasant sensation based on previous experience that causes one to seek food for the purpose of tasting and enjoying it; to have a strong desire (Thomas, 1989).

Apart from the use of hunger as a strong desire for something (e.g., hungering for power), these sources primarily capture the physiological aspect of hunger, that is, “the uneasy or painful sensation caused by lack of food” (Anderson, 1990, p. 1598). Repeatedly, the need for food, as evidenced by a physical sensation was noted. However, the socioeconomic aspects of the term, “the recurrent and involuntary lack of access to food” (Anderson, 1990, p. 1598), were addressed as well. Use of phrases like, prolonged, involuntary lack of food, and go without food speak to this aspect of hunger.

Both physiological and socioeconomic ideas were reflected in the *Report of the President's Task Force on Food Assistance* (1984), which included two working definitions of hunger - a scientific, clinical definition that would be used by the health professional [“weakened, disordered condition brought about by a prolonged lack of food” (President's Task Force on Food Assistance, 1984, p. 34)], and another that would address the socioeconomic aspects of the issue, “Hunger as Commonly Defined” (President's Task Force on Food Assistance, 1984, p. 36). The task force stated,

“To many people hunger means not just symptoms that can be diagnosed by a physician, it bespeaks the existence of a social, not a medical, problem: a situation in which someone cannot obtain an adequate amount of food, even if the shortage is not prolonged enough to cause health problems. It is the experience of being unsatisfied, of not getting enough to eat. This, of course, is the sense in which people ordinarily use the word. It is also the sense in which the witnesses before us and many of the reports and documents we have studied have spoken of hunger. This alternative definition of hunger relates directly to our communal commitment to ensure that everyone has adequate access to food, and to the nation's endeavor to provide food assistance” (President's Task Force on Food Assistance, 1984, p. 36).

Definitions from Groups and Organizations Concerned with

Food Access of People

In the U.S., in addition to the Federal food assistance programs, private food assistance and other relief programs exist, which are an important aspect of the food and nutrition safety net in the U.S., as well as to the safety nets of other countries. Routinely, these groups define concepts that are relevant to the mission and goals of their organization. Considering statements from some food assistance, relief, and advocacy organizations concerned with hunger, apart from the U.S. Department of Agriculture, definitions include:

- The experience of having an empty stomach; it should be distinguished from undernutrition, the process whereby a person fails to consume adequate nutrients and/or the clinical state, which follows such a failure. (U.S. Agency for International Development, n.d.);
- Any caloric intake below the minimum established by the World Food Program (United Nations) of 2000 kcal/day (Action Against Hunger, n.d.); and

- The uneasy or painful sensation caused by a lack of food; the recurrent and involuntary lack of access to food (Olson & Holben, 2002; Center on Hunger, n.d.; Food Research and Action Center, n.d.).

As shown above, several organizations use the definitions of hunger reported by Anderson (1990). Others, especially those that focus their work outside the U.S., relate hunger to caloric intake. One of those groups, Action Against Hunger, also asserted that, while using a calorie-related measure is objective, hunger has a subjective sense, in that, “one can be hungry and well fed, or on the other hand, a malnourished child may feel no hunger” (Action Against Hunger, n.d., ¶3).

The Food and Agriculture Organization (2004) also considers calories when reporting world hunger statistics; however, their 2004 hunger report provided no overt definition of hunger. Overall, their estimates capture food deprivation for each country by examining three parameters: 1) the average amount of food available per person; 2) the level of inequality in access to that food; and 3) the minimum number of calories required for an average person (Food and Agriculture Organization, 2004).

U.S. Agency for International Development (n.d.), which focuses on countries outside of U.S. borders, emphasizes the physiological aspect of hunger, having an empty stomach. Yet, rather than using caloric intake to define hunger, U.S. Agency for International Development (n.d.) cautions that hunger should be distinguished from undernutrition, bringing to light the possible consequences of lacking access to food, including suboptimal caloric intake or poor clinical state.

Evaluating the consequences of hunger is relevant to better examining hunger in the U.S. Overall, these definitions bring to light socioeconomic aspects of hunger, in addition to relating hunger to calories or the amount of food consumed per person. Equitable food access and the voluntary or involuntary nature of hunger were also both conveyed.

Definitions from the First Comprehensive U.S. Food Security Survey

In the review of literature from physiology and clinical nutrition research, as part of the technical report for the first comprehensive survey examining food security in the U.S. (Hamilton, Cook, Thompson, Buron, Frongillo, Olson, and Wehler, 1997), four definitions of hunger were noted from the work of Mattes and Friedman (1993):

- Operationally defined in terms of experimental or external conditions, such as the number of hours of food deprivation, or the size of the last meal. Emphasis is on attempting to make the term more objective or operational.
- Refers to an intervening motivational state, or drive, that links experimental treatments or antecedent conditions (e.g., food deprivation) with behaviors aimed at obtaining food. Intensity of hunger is then inferred from either verbal reports of the desire for food or willingness to perform a task for food.
- Used to describe the subjective sensations associated with the need for food. The focus here is on the experience of various bodily states, sensations, or feelings, not on their causes.
- Viewed as a physiological or metabolic state that results from a lack of energy or nutrients. This deficit state, which is detected by the nervous system, can modify eating behavior and food intake, and produce various subjective sensations collectively referred

to as hunger. The emphasis with this usage is on physiological cause(s), not on the somatic manifestations of the need for food.

Overall, the latter two definitions were cited by Mattes and Friedman (1993) as appearing to be the most relevant to basic research and clinical practice concerns. However, the second definition also appears to be relevant to more clearly defining the concept of hunger since it relates to food access. Household or individual conditions are antecedent conditions that illicit a behavior aimed at obtaining food.

As previously noted, the technical report for the first comprehensive survey examining food security in the U.S. (Hamilton et al., 1997) used the physical sensations caused by lack of food definition of the term, based upon physiological and clinical nutrition research. Overall, it was summarized that reduced food intake typical of resource-constrained households appears to lead to physical sensations of pain, with sensation intensity being positively associated with food deprivation, except under prolonged fasting, when the sensations diminish in intensity or are extinguished completely. It was also cited that the sensation of hunger may be reduced or masked among older adults, which could lead to this group underreporting their experience of hunger.

Others have measured and reported physiological symptoms of hunger in adults. Hunger symptoms varied widely; however, the most common symptoms or discomforts included emptiness, ache, urge to eat, rumbling, and hollowness (Harris and Wardle, 1987). Finally, Mattes & Friedman (1993) summarized several physiological factors related to the sensation of hunger – reductions in gastric distention, metabolic signals transmitted from the liver and small intestine, and sensory input from the oral cavity.

Definitions from Nutrition, Medical, and Other Scientific Literature

The nutrition, medical, and other scientific literature, which is diverse in scope, often has definitions of hunger that vary by discipline. Definitions of hunger include:

- One of the three components of appetite. Describes the sensations that promote food consumption. A multidimensional attribute with metabolic, sensory, and cognitive aspects (Mattes, Hollis, Hayes, & Stunkard, 2005);
- Opposite of satiety, which may refer to the appetite for a meal. Whereas desire to eat may refer to a milder, pleasant feeling of appetite for a snack (de Graaf, Blom, Smeets, Stafleu, & Hendriks, 2004);
- Stressor that represents a homeostatic emotion, evoking a motivational drive to forage and consume food in order to eliminate the feeling of hunger, replenish the nutrients necessary for survival, and achieve satiation (LaGraize, Borzan, Rinker, Kopp, & Fuchs, 2004);
- Sensation that occurs when one does not eat to satiation or satiety (Alaimo & Froelich, 2004);
- Recurrent, involuntary lack of access to food, which may produce malnutrition over time (Dietz & Trowbridge, 1990);
- Condition resulting from chronic under-consumption of food and/or nutritious food products (Lenhart & Read, 1989);
- Not having enough to eat, not eating for an entire day, and not eating because of lack of money to buy food. Preceded by food insecurity. (Biros, Hoffman, & Resch, 2005; Jones & Richardson, 1996); and

- Inability to acquire or consume an adequate quality or sufficient quantity of food in socially acceptable ways, or the uncertainty that one will be able to do so. Levels and components of hunger are quantitative, qualitative, psychological, and social in scope. For the individual, the quantitative aspect relates to insufficient intake, while at the household level, it relates to food depletion. Nutritional inadequacy of the individual and unsuitable food for the household illustrate the qualitative aspects of hunger. Psychologically, individuals have a lack of choice and feelings of deprivation, while at the household level there is food anxiety. Finally, from a social standpoint, individuals exhibit disrupted eating patterns, and households acquire food in socially unacceptable ways (Radimer, Olson, Green, Campbell, & Habicht, 1992).

From these definitions, several concepts emerge. First, hunger describes the physical sensations that promote consumption of food. Next, organisms appear to maintain a homeostatic balance necessary for survival, which is disrupted when food is deprived, inducing a drive to maintain physiological stability and survival (LaGraize et al., 2004). Yet, environmental conditions, including severe reductions in food access, may interfere with this drive. For example, the wasting and starvation resulting from famines, war, and natural disaster has been called acute hunger (Sanchez & Swaminathan, 2005), which garners a great deal of media coverage and attention.

To continue, hunger is an involuntary lack of access to food preceded by food insecurity. According to Radimer et al. (1992), hunger has several components which are quantitative, qualitative, psychological, and social in scope. Finally, as previously noted, in the *Report of the President's Task Force on Food Assistance* (President's Task Force on Food Assistance, 1984), the task force members had two working definitions of hunger – hunger as commonly defined, as previously discussed, and a scientific, clinical definition that would be used by the health professional, “Hunger as medically defined” (President's Task Force on Food Assistance, 1984, p. 34).

“The medical definition of hunger would be a weakened, disordered condition brought about by a prolonged lack of food. In adults the result of such hunger is a loss of weight leading eventually to reduced physical strength or impaired function. In children, the effect of prolonged lack of food is slower growth, or halted growth if the lack is severe enough, and loss of weight” (President's Task Force on Food Assistance, 1984, p. 34).

Summary of Hunger Terms

In the technical report for the first comprehensive survey examining food security in the U.S. (Hamilton et al., 1997), as previously noted, hunger was defined as the “uneasy or painful sensation caused by lack of food,” consistent with the LSRO report (Anderson, 1990, p. 1598). Based upon the literature reviewed above, the physiological and socioeconomic aspects of hunger are consistently mentioned across disciplines. Generally, it appears that scientists and medical professionals emphasize the physiological aspects of the term, while advocacy groups emphasize the socioeconomic aspects of the term. Citizens and residents of the U.S. also appear to use the word hungry to communicate a physical sensation, yet they also use the term to describe an individual, family, or household who is in need of or lacks access to food.

Specifically, for those interested in biological aspects of appetite, hunger, and functioning of the human body, including scientists, physicians, nutritionists, registered dietitians, and other professionals in metabolic, cognitive, and related specialties, it appears that use of the term hunger is most commonly associated with the physical sensations related to lacking food. However, physicians (and undoubtedly other medical professionals, including registered dietitians and nu-

tritionists) are also interested in the socioeconomic aspect of hunger, as evidenced in the principles of both the modern and classical versions of the Hippocratic oath (Tyson, 2001), which emphasize the importance of being concerned with the social and economic welfare of patients, along with the other aspects of medicine.

For food assistance, advocacy groups, and citizens and residents of the U.S., the use of the term hunger speaks primarily to the social problem discussed in the President's Task Force on Food Assistance (1984). However, as previously noted, most individuals communicate the physiological need for food using the word hungry.

Definitions of Hunger Relevant to Nutritional Assessment, Food Deprivation of the U.S. Population, and U.S. Policies and Programs

Definitions of hunger relevant to assessment of nutritional well-being, food deprivation of the U.S. population, and U.S. policies and programs can be garnered from the literature. Some definitions cited that hunger is preceded by food insecurity; however, this was not consistent across disciplines. Regardless, this is a necessary assumption to be made, in order to facilitate the defining of resource-constrained hunger, or its measurement in the U.S.

During nutritional assessment, a wide variety of parameters are evaluated. Possible components of core indicators of nutritional state for difficult-to-sample populations were summarized by Anderson (1990). Definitions of hunger relevant to nutritional assessment must include both physiological and socioeconomic aspects of hunger to ensure a comprehensive assessment.

Physiological Hunger

Considering the work of Anderson (1990), LaGraize et al. (2004) Mattes et al. (2005), and Thomas (1989), physiological hunger, whether voluntary or involuntary, is the physical feeling caused by lack of food. While symptoms vary widely, physiological hunger is often accompanied by weakness and characterized by an uneasy or painful sensation referred to the lower part of the chest that may be dull or acute in nature; however, these sensations may be diminished or extinguished with prolonged fasting or among older adults. This aspect of hunger is multidimensional with metabolic, sensory, and cognitive attributes.

The term physiological hunger should be used by the U.S. Department of Agriculture or others when working with subjects, patients, or clients who need to understand or describe physical symptoms related to food deprivation. This term should be incorporated into surveys, used during patient interviews when assessing symptoms, and evaluated in a variety of clinical contexts or situations. The current U.S. Department of Agriculture food security survey module would need to be modified in order to utilize this term.

Resource-constrained Hunger

Considering the work of Alaimo & Froelich (2004), Anderson (1990), Dietz & Trowbridge (1990), LaGraize et al. (2004), Mattes et al. (2005), Radimer et al. (1992), and President's Task Force on Food Assistance (1984), a more comprehensive definition that builds upon the physiological definition of hunger was developed and includes socioeconomic aspects of the concept. Resource-constrained hunger is involuntary and recurrent, chronic, or prolonged physiological hunger, including being unsatisfied after an eating occasion, due to resource constraints that negatively impact access to food, such as the inability to afford food or the inability to access transportation to obtain food, among others. Like physiological hunger, resource-constrained hunger is also multidimensional with quantitative, qualitative, psychological, and social attributes. Based upon the definition of food insecurity, "limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways" (Anderson, 1990, p. 1598), an individual, family, or household who experiences resource-constrained hunger is assumed to be food insecure.

This term should be used to describe individuals, families, or households who demonstrate involuntary and recurrent, chronic, or prolonged physiological hunger. A modification of the current measure of food insecurity and hunger may be needed in order for the U.S. Department of Agriculture to effectively utilize this term.

ASSESSMENT METHODS OF HUNGER IN THE U.S. POPULATION

The Current Measure of Food Security and Hunger

The Food Security Survey Module is currently utilized to produce summary measures of food security status in the U.S. (Bickel et al., 2000). Table 2 summarizes the items of the survey module - a series of questions about behaviors and experiences that characterize households having difficulty meeting their food needs (Economic Research Service, 2005).

The current measure of household food security status, that is, food security and involuntary hunger, in the U.S. lies on a continuum extending from food security at one end to severe involuntary hunger at the end, with that continuum being divided into ranges: food secure, food insecure without hunger, and food insecure with hunger, which is sometimes stratified by food insecure with hunger-moderate (hunger among adults but not children) and food insecure with hunger-severe (hunger among children and more severe hunger among adults) (Bickel et al., 2000, Economic Research Service, 2005). To summarize, households are assigned a scale score (continuous measure) and categorized into 1 of 3 (or 4) food security categories (categorical measure), based upon the number of positive responses to 10 survey items for households without children and to 18 survey items for households with children (Bickel et al., 2000). Essentially, since it is simply the number of positive responses that facilitate the identification of the household's food security status, a household is not categorized as experiencing involuntary hunger until a particular number of positive responses is answered on the food security questionnaire, even if a hunger-related question is answered affirmatively.

As summarized by the Economic Research Service (2005), the items of the survey module are a sequential set of increasingly severe indicators of food insecurity and hunger. Households are presumed to be food secure when no items are answered positively, while households answering one or two indicators are considered at-risk for food insecurity (Economic Research Service, 2005). As more items are answered affirmatively, more indicators of involuntary hunger are said to be present, and a household is classified as food insecure without or with hunger. Table 3 summarizes the categorical measure definitions utilized in food security status assessment.

Suggested Modifications to Refine Assessment of Hunger

In order to refine the measurement of food insecurity and hunger in the U.S., several areas need to be addressed, including:

- Defining hunger (physiological hunger) for respondents to the survey module questions (Table 2, questions 9 and 14) to ensure understanding of the question;
- Redefining of the categorical measures and/or modification of the criteria for categorical assignment;
- Modifying the current assessment strategy to facilitate the discernment of food distribution among family members and identification of severity of food restriction for household members (Alaimo & Froelich, 2004); and
- Further developing the measurement approaches to better assess household and individual behaviors and outcomes associated with food insecurity and resource-constrained hunger, including ideas or suggestions previously published – illness (physical and psychological), chronic disease management, fatigue, feeling of constraint to go against held

norms and values, stress at home, disordered eating patterns, lack of choice and feelings of deprivation, caloric intake, nutritional content of the diet, and food acquisition and management [Some of these ideas were based upon the work of Alaimo & Froelich (2004), Hamelin et al., (1999), and Olson & Holben (2002)].

The following paragraphs expand on each of these suggestions. However, should the current measurement tool be revised to better assess hunger, guidelines consistent with those summarized by Wolfe and Frongillo (2001) for development of measurement tools should be considered.

Defining Hunger.

Two questions from the 18-item survey module include questions that directly inquire about the experience of physiological hunger; however, the term hunger is not defined for survey respondents. As previously noted, the term hunger can mean different things to different people. While the Economic Research Service clarifies hunger to readers of the estimates of hunger based upon the survey results, respondents are not provided that same definition prior to answering the hunger-related questions (Table 2, questions 9 and 14). Therefore, hunger, that is, physiological hunger, should be defined prior to each question for respondents to ensure their understanding of it.

Categorical Measures.

Currently, individuals answering affirmatively to the physiological hunger-related questions may or may not be classified as hungry. Alaimo & Froelich (2004) summarized the current conceptualization of the phenomenon of food insecurity as it is experienced by families in North America and examined the results of possible alternate ways of constructing a food security measure from the range of items available in the 1995 Current Population Survey data. Their recommendations may be a viable alternative to the current method and warrants further exploration.

Should the survey module questions remain constant, redefining the categorical measures and/or modifying the criteria for categorical assignment may better characterize food insecurity and hunger in the U.S. Adding an “at risk” for food security category appears prudent. Only households with no affirmative responses would be labeled as food secure, that is, households show no evidence of food insecurity. For at-risk households, those with one or two affirmative responses, the definition should state that minimal evidence of food insecurity with no evidence of resource-constrained hunger was present. Essentially, these households could not have affirmative responses to questions 9 or 14 from table 2.

Food insecure households without resource-constrained hunger would have a greater number of affirmative responses consistent with the current measure; however, an affirmative response to questions 9 or 14 would not be consistent with this definition. Similarly, since it would be expected that not eating for an entire day or losing weight would also be associated with resource-constrained hunger, positive responses to question 10, 11, or 15 would place households in a more severe category of food insecurity. Frequency of these experiences may need to be considered, as the measure is refined.

Finally, households identified as food insecure with resource-constrained hunger would be reserved for households with affirmative responses to physiological hunger-related questions.

Similar to the current measure, severity could be moderated through the total number of affirmative responses and experience of hunger noted among adults or children.

Food Distribution Among Family Members.

Identifying both the pattern of food distribution among family members and the severity of food restriction for household members would be valuable to better understanding resource-constrained hunger. For example, McIntyre, Blanville, Raine, Dayle, Anderson, and Battaglia (2003) studied low-income lone mothers in Canada to document whether or not lone mothers compromised their own diets to feed their children. This study confirmed that the women did sacrifice their own intake to preserve the adequacy of their children's diets. Conducting similar studies would not only involve use of the food security survey module in its current or revised form, but it would also necessitate dietary assessment among household members. This would be a difficult undertaking; however, pilot studies could be conducted, followed by larger studies. Use of the National Health and Nutrition Examination Survey (NHANES) may facilitate examination of this phenomenon.

Outcome Studies.

Interest in food insecurity is due to its potential relationship to nutritional and non-nutritional outcomes, including dietary intake, overweight and obesity, health status, chronic disease incidence and risk, school performance, and mental health (Adams, Grummer-Strawn, & Chavez, 2003; Alaimo, Olson, & Frongillo, 2001a; Alaimo, Olson, & Frongillo, 2001b; Alaimo, Olson, & Frongillo, 2001c; Alaimo, Olson, and Frongillo, 2002; Barnett & Holben, 2005; Bhattacharya, Currie, & Haider, 2004; Biros et al., 2005; Casey, Goolsby, Berkowitz, Frank, Cook, Cutts, Black, Zaldivar, Levenson, Heeren, Meyers, & the Children's Sentinel Nutritional Assessment Program Study Group, 2004; Casey, Szeto, Lensing, Bogle, & Weber, 2001; Dixon, Winkleby, & Radimer, 2001; Holben, Shih, & Manoogian, 2004; Jyoti, Frongillo, & Jones, 2005; Kaiser, Melgar-Quinonez, Lamp, Johns, Sutherlin, & Harwood, 2002; Kendall, Olson, and Frongillo, 1996; Kleinman, Murphy, Little, Pagano, Wehler, Regal, & Jellinek, 1998; Jones, Jahns, Laraia, & Haughton, 2003; Lee & Frongillo, 2001; Matheson, Varady, Varady, & Killen, 2002; McIntyre et al., 2003; Murphy, Wehler, Pagano, Little, Kleinman, & Jellnick, 1998; Nelson, Brown, & Lurie, 1998; Nelson, Cunningham, Anderson, Harrison, & Gelberg, 2001; Normén, Chan, Braitstein, Anema, Bondy, Montaner, & Hogg, 2005; Olson, 1999; Pheley et al., 2002; Rose & Oliveira, 1997; Scheier, 2005; Siefert, Heflin, Corcoran, & Williams, 2001; Stuff et al., 2004; Tarasuk, 2001; Tarasuk & Beaton, 1999; Taylor, Holben, & Melgar-Quinonez, 2005; Taylor, Melgar-Quinonez, & Holben, 2005;

Townsend, Peerson, Love, Achterberg, & Murphy, 2001; Vozoris & Tarasuk, 2003). Conducting large scale outcome studies may be difficult to do in view of the complicated nature of conducting such studies. For example, as noted in the Phase I Report (National Research Council, 2005), validating the experience of hunger through food consumption and dietary studies over a 12-month period would be difficult. Shorter time periods could be considered, however, as an initial step in improving our understanding of the experience of hunger.

For evaluating the relationship of food security to particular health conditions or outcomes, using NHANES data, at least initially, especially since individual-level food security status information will be available, is suggested. As previously noted, exploring illness (physical and psychological) and chronic disease incidence and their management, incidence of fatigue,

the experience of feelings of constraint to go against held norms and values, stress within households, disordered eating patterns of individuals, lack of choice and feelings of deprivation among household members, caloric intake and nutritional content of the diet of household members, and food acquisition and management of households appears valuable.

SUMMARY

Hunger can “mean rather different things to different people” (President’s Task Force on Food Assistance, 1984, p. 34). However, it appears that physiological hunger, whether voluntary or involuntary, is the physical feeling caused by lack of food, and it has metabolic, sensory, and cognitive attributes. This term should be incorporated into surveys, used during patient interviews when assessing symptoms, and evaluated in a variety of clinical contexts or situations. On the other hand, resource-constrained hunger is involuntary and recurrent, chronic, or prolonged physiological hunger, due resource constraints that negatively impact access to food, and it has quantitative, qualitative, psychological, and social attributes. An individual, family, or household who experiences resource-constrained hunger is assumed to be food insecure.

This term should be used to describe individuals, families, or households who demonstrate involuntary and recurrent, chronic, or prolonged physiological hunger. As measurement strategies are refined, clarity regarding the incidence of resource-constrained hunger in the U.S. will be realized.

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Table 1. Examples of Groups and Organizations Interested in Food Access and Hunger^a

Organization	Website
Action Against Hunger	www.aah-usa.org
Albertson's	www.albertsons.com/defaultSSL.asp
American Farm Bureau	www.fb.org/programs/harvest/
American Dietetic Association	www.eatright.org
American Red Cross	www.redcross.org/index.html
America's Second Harvest	www.secondharvest.org/
Beta Sigma Phi	www.betasigmaphi.org/index.shtm
Bread for the World	www.bread.org/
Capital One	www.capitalone.com/indexa.php
Cargill	www.cargill.com/index.htm
Center on Hunger	www.centeronhunger.org
Centre for Studies in Food Security	www.ryerson.ca/~foodsec/
Centre for Sustainable Community Development	www.sfu.ca/cscd/default.htm
Community Food Security Coalition	www.foodsecurity.org/

Community Nutrition Institute	www.communitynutrition.org/cfnp.htm
ConAgra Foods Foundation	www.feedingchildrenbetter.org/index.jsp
Congressional Hunger Center	www.hungercenter.org/
Cooperative State Research, Education, and Extension Service, United States Department of Agriculture	www.csrees.usda.gov/ProgView.cfm?prnum=3579
The Dannon Company	www.dannon.com/dn/dnstore/cgi-bin/ProdSubEV_Cat_240865_NavRoot_200.htm
Dietitians of Canada/Canadian Dietetic Association	www.dietitians.ca/
Donald W. Reynolds Foundation	www.dwreynolds.org/

Economic Research Service, United States Department of Agriculture	www.ers.usda.gov/Briefing/FoodSecurity/
Empty Bowls	www.emptybowls.net/
Food and Agriculture Organization	www.fao.org
Food First	www.foodfirst.org/
Food for the Hungry	www.fh.org/wcn/index.html
Food, Nutrition, and Consumer Services, United States Department of Agriculture	www.fns.usda.gov/fncs/
Food Research and Action Center	www.frac.org
Ford Motor Company	www.ford.com/en/goodWorks/default.htm
Food Security Bureau	www.agr.gc.ca/misb/fsb/fsb-bsa_e.php?page=index
The Food Security Network	www.foodsecurity.net/
General Mills Foundation	www.generalmills.com/corporate/commitment/foundation.aspx
The GreaterGood	www.greatergood.com/cgi-bin/WebObjects/GreaterGood.woa/6
H.E. Butt Grocery Company	www.heb.com/welcome/index.jsp
H.J. Heinz Company Foundation	www.heinz.com/jsp/foundation.jsp
Heifer International	www.heifer.org/
Henry E. Niles Foundation	www.heniles.org/
The Hunger Project	www.thp.org/
The Hunger Site	www.thehungersite.com/cgi-bin/WebObjects/CTDSites
Hunger Web (Friedman School of Nutrition Science and Policy)	http://nutrition.tufts.edu/academic/hungerweb/
International Food Policy Research Institute	www.ifpri.org/
The Kellogg Company	www.kelloggs.com/us/
Kids Can Make a Difference	www.kidscanmakeadifference.org/
Kraft Foods	www.kraftfoods.com/kf/
Mazon	www.mazon.org/

McCormick Tribune Foundation	www.rmtf.org/
National Association of Letter Carriers	www.nalc.org/
Newman's Own	www.newmansown.com/
Oxfam International	www.oxfam.org/
Publix	www.publix.com/Home.do
Samaritan's Purse	www.samaritanspurse.org/home.asp
Sara Lee	www.saralee.com/home.aspx
Save the Children	www.savethechildren.org/
Sodexo Foundation	www.helpstophunger.org/
State and Local Food Policy Councils (Drake University)	www.statefoodpolicy.org/profiles.htm
RESULTS	www.results.org/website/article.asp?id=19
Stop Hunger Now	www.stophungernow.org/main.html
The Starr Foundation	http://fdncenter.org/grantmaker/starr/
Taste of the NFL	www.tasteofthenfl.com/
United Against Hunger	www.unitedagainsthunger.org/
United Nations	www.un.org/
WBNS TV	www.wbns10tv.com/

World Hunger Education Service	www.worldhunger.org/index.html
World Food Day	www.worldfooddayusa.org/
World Hunger Year	www.worldhungeryear.org/

^aRetrieved on May 23, 2005, from the websites noted.

Table 2. U.S. Food Security Survey Module Questions^{a,b}

Question Number ^c	Question
1	“(I/We) worried whether (my/our) food would run out before (I/we) got money to buy more.” Was that <u>often</u> true, <u>sometimes</u> true, or <u>never</u> true for (you/your household) in the last 12 months?
2	“The food that (I/we) bought just didn’t last, and (I/we) didn’t have money to get more.” Was that <u>often</u> , <u>sometimes</u> , or <u>never</u> true for (you/your household) in the last 12 months?
3	“(I/We) couldn’t afford to eat balanced meals.” Was that <u>often</u> , <u>sometimes</u> , or <u>never</u> true for (you/your household) in the last 12 months?
4	“(I/We) relied on only a few kinds of low-cost food to feed (my/our) (child/children) because (I was/we were) running out of money to buy food.” Was that <u>often</u> , <u>sometimes</u> , or <u>never</u> true for (you/your household) in the last 12 months?
5	“(I/We) couldn’t feed (my/our) (child/children) a balanced meal, because (I/we) couldn’t afford that.” Was that <u>often</u> , <u>sometimes</u> , or <u>never</u> true for (you/your household) in the last 12 months?
6	“(My/our) (child was/children were) not eating enough because (I/we) just couldn’t afford enough food.” Was that <u>often</u> , <u>sometimes</u> , or <u>never</u> true for (you/your household) in the last 12 months?

7	In the last 12 months, since last (name of current month), did (you/you or other adults in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food? Yes No If yes, how often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?
8	In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food? Yes No
9	In the last 12 months, were you ever hungry but didn't eat because you couldn't afford enough food? Yes No
10	In the last 12 months, did you lose weight because you didn't have enough money for food? Yes No
11	In the last 12 months, did (you/you or other adults in your household) ever not eat for a whole day because there wasn't enough money for food? Yes No If yes, how often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?
12	In the last 12 months, since (current month) of last year, did you ever cut the size of (your child's/any of the children's) meals because there wasn't enough money for food? Yes No

13	In the last 12 months, did (CHILD'S NAME/any of the children) ever skip meals because there wasn't enough money for food? Yes No If yes, how often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?
14	In the last 12 months, (was your child/were the children) ever hungry but you just couldn't afford more food? Yes No
15	In the last 12 months, did (your child/any of the children) ever not eat for a whole day because there wasn't enough money for food? Yes No

^aSource: Bickel et al., 2000.

^bQuestions relating to children are only asked if there are children under 18 in the household. Specific guidelines for using the Survey Module, including screening techniques, can be found in Bickel et al. (2000).

^cQuestions are numbered to easily identify them and facilitate their discussion in this paper and do not correspond with Economic Research Service item numbers; however, their order is identical to that of the survey module.

Table 3. Definitions of Food Security Status Categories.

Category	Definition
Food secure	“Households show no or minimal evidence of food insecurity” (Bickel et al., 2000, p. 11).
Food insecure without hunger	“Food insecurity is evident in household members’ concerns about adequacy of the household food supply and in adjustments to household food management, including reduced quality of food and increased unusual coping patterns. Little or no reduction in members’ food intake is reported” (Bickel et al., 2000, p. 11).
Food insecure with hunger (moderate)	“Food intake for adults in the household has been reduced to an extent that implies that adults have repeatedly experienced the physical sensation of hunger. In most (but not all) food-insecure households with children, such reductions are not observed at this stage for children” (Bickel et al., 2000, p. 11).

Food insecure with hunger (severe)	“At this level, all households with children have reduced the children’s food intake to an extent indicating that the children have experienced hunger. For some other households with children, this already has occurred at an earlier stage of severity. Adults in households with and without children have repeatedly experienced more extensive reductions in food intake” (Bickel et al., 2000, p. 12).
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