

Appendix

Measuring Household Food Insecurity and Hunger

The food security scale assessed in this paper was developed by the U.S. Food Security Measurement Project, an ongoing collaboration among Federal agencies, academic researchers, and private commercial and nonprofit organizations. The measure was developed over the course of several years in response to the National Nutrition Monitoring and Related Research Act of 1990 (NNMRR). The Ten-Year Comprehensive Plan developed under that Act assigned to an interagency working group the task of recommending “a standardized mechanism and instrument(s) for defining and obtaining data on the prevalence of food insecurity or food insufficiency in the United States and methodologies that can be used across the NNMRR Program and at State and local levels.”

What Is Food Security?

Extensive research in the late 1980s focused on understanding household food security, food insecurity, and hunger. This work led to the development, by an expert working group of the American Institute of Nutrition, of the following conceptual definitions, published in 1990 by the Life Sciences Research Office (LSRO) of the Federation of American Societies for Experimental Biology (Anderson, 1990):

- ***Food security***—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).
- ***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.
- ***Hunger***—The uneasy or painful sensation caused by a lack of food. The recurrent and involuntary lack of access to food. Hunger may produce malnutrition over time.... Hunger ... is a potential, although not necessary, consequence of food insecurity.

Food insecurity and hunger, as the terms are used here, are conditions resulting from *financial resource constraint*. Hunger, for example, can occur for many reasons, including dieting and being too busy to eat. The measurement procedure described here, however, is concerned only with food insecurity and hunger that occur because the household does not have enough food or money to buy food. Hunger, in this perspective, may be seen as a severe stage or level of food insecurity, rather than as a distinct or separate condition.

How Is Food Security Measured?

Food security status can be thought of as lying along a continuum from complete food security to severe hunger. Each household's food security status is assessed by a series of 18 questions (10 for households without children) that ask about behaviors and experiences known to characterize households having difficulty meeting their food needs. The questions (listed in full below) ask about conditions in the past 12 months and cover a wide range of severity, from having worried about whether food would run out to going a whole day without eating because there was not enough money for food. Each question specifies lack of resources as the reason for the behavior or experience (because we couldn't afford more food," or, "because there wasn't enough money for food."). This is to ensure that the measure does not register as food deprivation any behavior associated with dieting to lose weight, fasting for religious reasons, or undergoing food shortages for any reason other than resource constraints. Because each question refers specifically to the previous 12 months, the resulting scale is sensitive to any occurrence of food insecurity or hunger during that period.¹¹ These questions have been found to reliably measure a single underlying dimension of the severity of food insecurity as experienced within U.S. households.

The food security scale, which is a graduated measure of food insecurity, is calculated from responses to the 18 food security questions by statistical methods based on the Rasch

¹¹ Three of the items, however, are based on the number of months in which a behavior occurred. Thus households with recurring reductions of food intake are more likely to be classified as food insecure with hunger than those in which the reductions occurred in only 1 or 2 months.

measurement model (Linacre and Wright, 1998). Respondent households are further classified into one of three categories (food secure, food insecure without hunger, food insecure with hunger) based on their scores on the food security scale. Thus, the categorical classifications represent successive ranges of severity on the underlying measurement scale.

Severity of Items

A key analytic tool used in this report to compare the food security scale across income groups is the concept of item (or question) severity. The severity of items is measured on the same scale as the severity of food insecurity of households. Households with severity scores below that of a given item are more likely to deny than to affirm the item, while those with severity scores above that of the item are more likely to affirm it. Households with severity scores equal to that of the item are equally likely to affirm or deny it.

The range of severity of the conditions identified by the items is intuitively evident from the items. For example, Q12 (see question listing below), *“In the last 12 months, did you or other adults in your household ever not eat for a whole day because there wasn’t enough money for food?”* references a more severe food situation than does Q8, *“In the last 12 months, did 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?”* And the latter question indicates a more severe level of food insecurity than does Q2, *“We worried whether our food would run out before we got money to buy more.”* These differences in severity are observed in two ways in the response patterns of surveyed households. First, the more severe questions are less frequently answered in the affirmative than the less severe questions. In 1995, 13 percent of households affirmed the least severe question, while only 0.2 percent affirmed the most severe question. Second, a household that affirms an item of midrange severity is likely to have also affirmed all items that are less severe. Similarly, a household that denies an item at midrange is likely to deny all items that are more severe. Note, however, that these response assumptions are only probabilistically true. That is to say, not all households follow these expected patterns exactly.

This highly regular pattern of severity ordering of the food security-indicator items is the basis of the statistical model used to calculate and assess the food security scales. The statistical model expresses and summarizes, in succinct quantitative form, the consistently ordered pattern that exists in the U.S. population of the conditions, experiences, and behavioral responses that indicate—and to some extent constitute—the phenomena of food insecurity and hunger.

Item- and Household-Fit Statistics

Item- and household-fit statistics based on the Rasch model are used in this report to assess the extent to which response patterns by households in various income categories were consistent with the severity ordering of the items and to what extent they were erratic. The statistics commonly used to assess how well responses to items correspond to the Rasch-model assumptions (or “fit” the model) are “infit” and “outfit.” After item calibrations and household scores have been estimated, the probability of an affirmative response in each cell of the household-by-item matrix is calculated. The infit and outfit statistics are then calculated for each cell by comparing the actual response to the probabilistically expected response in that cell. Infit is an “information-weighted” fit statistic for each item that is sensitive to responses by households with severity scores in the range near the severity level of the particular item. Outfit is sensitive to unexpected responses from households with severities much higher or lower than that of the item—that is, to highly improbable responses (outliers). Item-fit statistics are then calculated for each item by aggregating across households, and household-fit statistics are calculated for each household by aggregating across items. Both statistics compare the aggregated deviations of observed responses from predicted responses to the aggregated deviations that would be expected under Rasch assumptions, so the expected value of the statistics is 1. Infit and outfit values above 1.0 indicate a disproportionate share of “out-of-order” responses (i.e., affirmative responses by households with severity scores below that of the item or denials by households with severity scores above that of the item), while deviations below 1.0 indicate a smaller proportion of such responses than would be expected. The single-parameter Rasch model, which is used in creating the food security scales, assumes that all items discriminate equally sharply, so item-fit statistic values (especially infit) that are far from

unity call into question the suitability of the item for use in the scale. As a general rule, item-infits in the range of 0.8 to 1.2 are considered to be good, and 0.7 to 1.3 are acceptable. Similar standards may be applied to item-outfit statistics, but, in practice, outfits are very sensitive to a few highly unexpected observations. As few as two or three highly unexpected responses (i.e., denials of the least severe item by households that affirm most other items) among several thousand households can elevate the outfit for that item to 10 or 20.

Questions in the Food Security Survey Module

NOTE: Only the wording appropriate for the household being interviewed is read from the options in parentheses.

Transition into Module: These next questions are about the food eaten in your household in the last 12 months, since (current month) of last year and whether you were able to afford the food you need.

Now I'm going to read you several statements that people have made about their food situation. For these statements, please tell me whether the statement was often true, sometimes true, or never true for (you/your household) in the last 12 months.

Q2. The first statement is "(I/We) worried whether (my/our) food would run out before (I/we) got money to buy more." Was that often true, sometimes true, or never true for (you/your household) in the last 12 months?

Q3. "The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

Q4. "(I/we) couldn't afford to eat balanced meals." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

*Q5. "(I/we) relied on only a few kinds of low-cost food to feed (my/our) (child/the children) because (I was/we were) running out of money to buy food." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

*Q6. "(I/We) couldn't feed (my/our) (child/the children) a balanced meal, because (I/we) couldn't afford that." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

*Q7. "(My/Our child was/The children were) not eating enough because (I/we) just couldn't afford enough food." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

Q8. 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?

Q8a. [IF YES ABOVE, ASK] How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

Q9. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food?

Q10. In the last 12 months, were you every hungry but didn't eat because you couldn't afford enough food?

Q11. In the last 12 months, did you lose weight because you didn't have enough money for food?

Q12. 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?

Q12a. [IF YES ABOVE, ASK] How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

*Q13. The next questions are about children living in the household who are under 18 years old. 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?

*Q14. In the last 12 months, did (your child/any of the children) ever skip meals because there wasn't enough money for food?

*Q14a. [IF YES ABOVE, ASK] How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

*Q15. In the last 12 months, (was your child/ were the children) ever hungry but you just couldn't afford more food?

*Q16. 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?

END OF FOOD SECURITY/HUNGER CORE MODULE

*Questions about children were omitted for households with no children under 18 years of age.