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The Effectiveness of a Short Form of the Household Food Security Scale

Stephen J. Blumberg, PhD, Karil Bialostosky, MS, William L. Hamilton, PhD, and Ronette R. Briefel, DrPH, RD

A B S T R A C T

Objectives. On the basis of an 18-item Household Food Security Scale, a short form was developed to assess financially based food insecurity and hunger in surveys of households with and without children.

Methods. To maximize the probability that households would be correctly classified with respect to food insecurity and hunger, 6 items from the full scale were selected on the basis of April 1995 Current Population Survey data.

Results. The short form classified 97.7% of households correctly and underestimated the prevalence of overall food insecurity and of hunger by 0.3 percentage points.

Conclusions. The short form of the Household Food Security Scale is a brief but potentially useful tool for national surveys and some state/local applications. (*Am J Public Health.* 1999;89:1231–1234)

Despite adequate supplies of food in the United States, people in some households lack access to enough food to fully meet their basic needs. The term coined to refer to this phenomenon is *food insecurity*. According to the generally accepted definition offered by the Life Sciences Research Office, "food insecurity exists whenever the availability of nutritionally adequate and safe foods or the ability to acquire acceptable foods in socially acceptable ways is limited or uncertain."[1] Food security, then, is assured access to nutritionally adequate and safe foods "without resorting to emergency food supplies, scavenging, stealing, and other coping strategies."[1]

Food insecurity can lead to malnutrition and hunger (in the medical sense, "the physiological effect of extended nutritional deprivation"[2]), but malnutrition and hunger are not necessary components of food insecurity.[1] Nevertheless, when food insecurity is severe, hunger is likely to be present. Households can thus be categorized either as food secure or as falling into one of several designated ranges of severity of food insecurity, such as food insecure without hunger, food insecure with moderate hunger, and food insecure with severe hunger. On the basis of these categories and of data from the April 1995 Current Population Survey[3,4] (CPS), 11.9% of US households were judged to be food insecure in 1995. Of these, 65.1% (7.8% of all households) did not show evidence of hunger, 28.0% (3.3%) showed evidence of moderate hunger, and 6.9% (0.8%) showed evidence of severe hunger.[3,4]

The 18-item scale derived from the CPS data and used to produce these estimates (see Table 1) represents the culmination of a great deal of collaborative work between public and private institutions.[1–11] The present research has been conducted to determine whether an abbreviated version (i.e., a short form) of this scale is sufficiently valid for implementation when time and financial constraints preclude the use of all 18 items.

Methods

The 18-item scale was developed with a nonlinear factor analysis technique that created a unidimensional scale in which all items load equally upon the single factor.[3,12] Because of this equivalence, traditional linear scaling techniques that identify items most strongly related to the latent construct could not be employed. Instead, the selection of a potential subset of items from the 18-item full scale was based on a few guiding principles.

Stephen J. Blumberg, Karil Bialostosky, and Ronette R. Briefel are with the National Center for Health Statistics, Centers for Disease Control and Prevention, Hyattsville, Md. William L. Hamilton is with Abt Associates, Inc, Cambridge, Mass.

Requests for reprints should be sent to Stephen J. Blumberg, PhD, National Center for Health Statistics, Division of Health Interview Statistics, 6525 Belcrest Rd, Room 850, Hyattsville, MD 20782 (e-mail: swb5@cdc.gov).

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First, because the short form should work equally well for households with and without children, the 8 items that were applicable only to households with children were excluded (see Table 1, items 4, 6, 9, 12, 14, and 16–18). Next, because many surveys with time and resource constraints may not have sufficient sample sizes to make precise population estimates for the most severe level of food insecurity, the short form does not distinguish between the 2 most severe categories of food insecurity, and the 2 most severe adult-focused items (13 and 15) were excluded. We then excluded the least severe item (1) because of its presumed lack of discriminability; this item was only weakly related to total scores on the full scale (with extreme scores excluded, $r = 0.206$).[12]

These exclusions resulted in 7 remaining items to distinguish food-secure households and food-insecure households and to address 2 levels of food insecurity: insecure without hunger and insecure with hunger. Because the full scale categorized households into 1 of these 2 levels only if they experienced 2 or 3 of the conditions associated with the category,[3,12] we felt that a subset of 6 items (3 conditions × 2 categories) was the minimum permissible length for this abbreviated measure. To choose 6 items from the 7 remaining, we first took advantage of the Guttman-like properties of the full scale; that is, of all household respondents who answered any item affirmatively, 40.0% endorsed a more severe item *only* after endorsing *all* less severe items. Because of this inherent structure, we concluded that the least severe item clearly identifying each category of food insecurity should be included; these are items 3 and 8. Because item 8 is asked only after an affirmative response to item 5, the latter item must be included with the former. Finally, to create the 6-item subsets, 3 additional items had to be chosen from the remaining 4 (items 2, 7, 10, and 11). These 3 additional items could be chosen in 4 combinations, and 4 subsets of items were therefore tested.

Data for evaluating the subsets were an implicit part of the data collected from 44 647 households who completed the Food Security Supplement to the April 1995 CPS. The CPS, conducted by the US Bureau of the Census, is a nationally representative monthly survey of US households that uses a state-based, complex, multistage probability sampling design.[13]

TABLE 1—Items in the Household Food Security Scale Listed by Increasing Severity Level[a]

Level and Item	Question
Food Secure	
1.	"[I/We] worried whether [my/our] food would run out before [I/we] got money to buy more." Was that often, sometimes, or never true for you 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 often, sometimes, or never true for you in the last 12 months?
Food Insecure Without Hunger	
3.[b]	"[I/We] couldn't afford to eat balanced meals." Was that often, sometimes, or never true for you in the last 12 months?
4.	"[I/We] relied on only a few kinds of low-cost food to feed the children because [I was/we were] running out of money to buy food." Was that often, sometimes, or never true for you in the last 12 months?
5.	In the last 12 months, since (*date 12 months ago*), 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?
6.	"[I/We] couldn't feed the children a balanced meal, because [I/we] couldn't afford that." Was that often, sometimes, or never true for you in the last 12 months?
7.	In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food?
Food Insecure With Moderate Hunger	
8.[b]	[*Ask only if #5 = YES*] How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?
9.	"The children were not eating enough because [I/we] just couldn't afford enough food." Was that often, sometimes, or never true for you in the last 12 months?
10.	In the last 12 months, since (*date 12 months ago*), were you ever hungry but didn't eat because you couldn't afford enough food?
11.	Sometimes people lose weight because they don't have enough to eat. In the last 12 months, did you lose weight because there wasn't enough food?
12.	In the last 12 months, since (*date 12 months ago*), did you ever cut the size of any of the children's meals because there wasn't enough money for food?
Food Insecure With Severe Hunger	
13.[b]	In the last 12 months, since (*date 12 months ago*), did you (or other adults in your household) ever not eat for a whole day because there wasn't enough money for food?
14.	In the last 12 months, were the children ever hungry but you just couldn't afford more food?
15.	[*Ask only if #13 = YES*] How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?
16.	In the last 12 months, since (*date 12 months ago*), did any of the children ever skip a meal because there wasn't enough money for food?
17.	[*Ask only if #16 = YES*] How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?
18.	In the last 12 months, since (*date 12 months ago*), did any of the children ever not eat for a whole day because there wasn't enough money for food?

[a]Reprinted with modifications from Hamilton et al.[4(p25),12(p47)]
[b]Indicates threshold items in the scale. For each designated range of severity comprising the categorical food-security variable, the subset of indicators beginning with the threshold item and continuing through the successively more severe indicators, up to the next identified threshold, serves operationally to define and characterize that designated range.

Results

All 4 subsets that were tested had good overall concordance, correctly identifying the

level of food security for an average of 97.1% of households. The small variability in this measure of accuracy (SD = 0.58%) suggests that these subsets did not differ dramatically. The 4 subsets also did not differ dramatically in their ability to generate accurate population prevalence estimates. Estimates of overall food insecurity were all within 2 percentage points of the estimate derived from the full scale. Similarly, estimates of food insecurity with hunger were within 0.7 percentage points of the full-scale estimate. When the absolute values of the magnitude of the bias for both of these estimates (overall and with hunger) were averaged for each subset, the subset with the smallest average bias also had the strongest concordance. This subset (items 2, 3, 5, 7, 8, and 10) was therefore selected as the best short form of the Household Food Security Scale (see Table 2).

The short form correctly identified the level of food security for 97.7% of all households, including 95.6% of all households with children (n = 16914) and 99.0% of all households without children (n = 27733). The sensitivity and specificity of the short form to food insecurity generally and to hunger specifically are presented in Table 3.

The very large proportion of food-secure households who responded negatively to all items on the full scale (92.2%) makes high levels of specificity perhaps unsurprising. For better examination of the classification power of the short form, the statistics calculated on the full sample were also calculated for a sample limited to those households in which respondents answered at least 1 item affirmatively on the full scale (n = 8003). Of all households in this limited sample, 87.2% were correctly classified by the short form. Again, the classification power of the short form was strongest for households without children (concordance = 92.3%) but was still quite substantial for households with children (concordance = 82.8%). The sensitivity and specificity of the short form with this limited sample are also presented in Table 3.

Because child-focused items were excluded from the subsets tested, it is perhaps not surprising that the classification power of the short form was slightly weaker for households with children. However, we assumed that the inclusion of child-focused items would reduce the classification power for households without children. This assumption was tested by creating 2 additional 6-item subsets that included 1 child-focused item each. The first alternative subset replaced item 2 in the short form with item 4 (see Table 1); the second alternative subset replaced item 10 with item 9.

As expected, these 2 alternatives showed weaker concordance for all households without children (97.0% and 98.5%, respectively) and for households without children who answered at least 1 item affirmatively on the full scale (77.2% and 88.5%, respectively). Specificity and sensitivity were also decreased for this limited sample; for example, the probability that a secure household was classified as secure by the first alternative subset was 54.7%, and the probability that a hungry household was classified as insecure with hunger by the second alternative subset was 74.1%. Furthermore, for households with children, the concordance associated with the first alternative (95.2%; limited sample = 81.2%) was not better than that of the short form, and the concordance associated with the second alternative (96.1%; limited sample = 84.8%) was only slightly better than that of the short form. Increases in sensitivity obtained with this second alternative for households with children were also small: 0.9 and 2.4 percentage points for determining food insecurity and hunger, respectively.

The prevalence of both overall food insecurity and food insecurity with hunger were underestimated with the short form by just 0.3 percentage points. The overall bias of the short form was greater for households with children (–1.8 percentage points for overall food insecurity, –0.4 percentage points for food insecurity with hunger) than for households without children (0.6 and –0.3 percentage points, respectively).

TABLE 2—Six-Item Short Form of the Household Food Security Scale

(*Instructions:* These next questions are about the food eaten in your family. People do different things when they are running out of money for food to make their food or their food money go further.)

Item Number[a]	Question
5.	In the last 12 months, since (*date 12 months ago*), 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?
8.	[*Ask only if #5 = YES*] How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?
7.	In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food?
10.	In the last 12 months, since (*date 12 months ago*), were you ever hungry but didn't eat because you couldn't afford enough food?

(*Instructions:* Now I'm going to read you 2 statements that people have made about their food situation. For these statements, please tell me whether the statement was often, sometimes, or never true for you [or the other members of your household] in the last 12 months.)

Item Number	Question
2.	The first statement is "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 in the last 12 months?
3.	"[I/We] couldn't afford to eat balanced meals." Was that often, sometimes, or never true for you in the last 12 months?

(*Scoring:* Total the number of affirmative responses. [*Often* and *sometimes* are considered affirmative responses to Questions 2 and 3; *almost every* and *some months* are considered affirmative responses to Question 8.] Two or more affirmatives indicates food insecurity; 5 or more affirmatives indicates hunger. Alternatively, for households with some item nonresponse, classifications can be obtained by anchoring the relative severity of each item to its original estimated calibration level,[12] calculating a scale value for the household, and comparing this value to the predefined ranges set when the full scale was validated.[12])

[a]Item numbers refer to Table 1.

Discussion

The results indicate that a 6-item short form created from items on the full 18-item food security scale is robust when classifying the food security of households in the general population. Given that one's research and monitoring goals permit the combination of the moderate and severe hunger categories, the short form may be adequate to identify a household's level of food security when survey resources do not permit use of the full scale. Despite its brevity, this measure maintains many of the essential indicators of food security.[7,9,14,15] For example, the short form does not rely exclusively on specific measures of intake insufficiency. Other indicators capture self-perceived nutritional inadequacy, household food depletion, disrupted eating

TABLE 3—Sensitivity and Specificity of the Short Form of the Household Food Security Scale

Sample	All Households, %	Households Without Children, %	Households With Children, %
Full sample			
Determination of overall food insecurity			
Sensitivity	92.0	99.7	85.9
Specificity	99.4	99.3	99.5
Determination of insecurity with hunger			
Sensitivity	84.7	90.3	78.4
Specificity	99.6	99.9	99.2
Sample limited to households with 1+ affirmatives on full scale			
Determination of overall food insecurity			
Sensitivity	91.9	99.7	85.8
Specificity	92.6	89.1	95.9
Determination of insecurity with hunger			
Sensitivity	84.7	90.3	78.4
Specificity	97.6	99.1	96.4

patterns, and the repetitive pattern of reduced food intake.

An additional contextual aspect necessary for the proper measurement of food security is the involuntariness of the limitations or restrictions. In focusing on financial constraints, however, the short form ignores other possible causes of food insecurity such as the communitywide unavailability of sufficient quantities of nutritious food, religious beliefs that make available food unacceptable, or the physical inability of some people to acquire food.[16] Therefore, the short form may not be appropriate for use in populations with a high prevalence of physical disabili-ties or transportation difficulties (e.g., the elderly).[16,17]

Conclusions based on the present analyses of overall concordance and bias have certain limitations related to their generalizability. For example, the analyses were necessarily influenced by the prevalence of food insecurity in the national population sampled for the 1995 CPS. As expected when the prevalence of a condition is low, the subset with the highest concordance was one with high specificity rates—that is, the one that classified the largest group (food secure) most correctly. However, because the short form's sensitivity is lower than its specificity (most notably for households with children), the concordance would have been lower if the prevalence of food insecurity had been higher in the sampled population.

Similarly, the measures of bias are likely to be sample dependent. These measures reflect the net effect of households being misclassified upward (into a more severe category than the correct one) and misclassified downward (into a less severe category). If the prevalence of food insecurity is much higher or lower than that observed in the 1995 CPS sample, the balance of misclassifications upward or downward might shift substantially. Thus, while it seems reasonable to conclude that the short form is relatively unbiased in a general sample of the national population, future researchers should note that the accuracy and bias of this measure may be quite different in special populations that deviate from the 1995 national population. □

Contributors

S. J. Blumberg and W. L. Hamilton identified the subsets to be tested, determined the analyses to be conducted, and interpreted the results. W. L. Hamilton conducted all statistical analyses. S. J. Blumberg and K. Bialostosky determined the scope of the project and wrote the manuscript. K. Bialostosky also contributed to the interpretation of the results. R. R. Briefel provided conceptual, policy, and other substantive background and supervised all aspects of the project. All 4 authors commented on earlier drafts of the manuscript, provided revisions, approved the final version, and are guarantors for the integrity of the study as a whole.

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