Symposium: Advances in Measuring Food Insecurity and Hunger in the U.S.

Measuring Food Insecurity and Hunger in the United States: Development of a National Benchmark Measure and Prevalence Estimates[1]

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ABSTRACT   Since 1992, the U.S. Department of Agriculture Food and Nutrition Service (FNS) has led a collaborative effort to develop a comprehensive benchmark measure of the severity and prevalence of food insecurity and hunger in the United States. Based on prior research and wide consultation, a survey instrument specifically relevant to U.S. conditions was designed and tested. Through its Current Population Survey (CPS), the U.S. Bureau of the Census has fielded this instrument each year since 1995. A measurement scale was derived from the data through fitting, testing and validating a Rasch scale. The unidimensional Rasch model corresponds to the form of the phenomenon being measured, i.e., the severity of food insufficiency due to inadequate resources as directly experienced and reported in U.S. households. A categorical measure reflecting designated ranges of severity on the scale was constructed for consistent comparison of prevalence estimates over time and across population groups. The technical basis and initial results of the new measure were reported in September 1997. For the 12 months ending April 1995, an estimated 11.9% of U.S. households (35 million persons) were food insecure. Among these, 4.1% of households (with 6.9 million adults and 4.3 million children) showed a recurring pattern of hunger due to inadequate resources for one or more of their adult and/or child members sometime during the period. The new measure has been incorporated into other federal surveys and is being used by researchers throughout the U.S. and Canada.   J. Nutr. 129: 510S–516S, 1999.

KEY WORDS: • *U.S. hunger prevalence* • *U.S. hunger measurement* • *U.S. food security*
 • *food-security scale* • *Rasch measurement*

During the 1990s, the U.S. Government undertook for the first time the development of a comprehensive national measure of the severity of food insecurity and hunger in the United States. The time was ripe for such an effort, given the extensive research and field experience in the private sector during the prior decade and the growing awareness of the need for such a measure on the part of policy makers at all levels of government.

Hunger in the United States, although linked to poverty as a condition reflecting inadequate resources to obtain food, does not compare in severity to Third World hunger or poverty. Largely hidden and seldom resulting in overt signs of malnutrition, "first-world hunger" (Riches 1998) requires different observational methods to detect and measure. As early as 1984, in enquiring "How much hunger is there in America?," the Report of the President's Task Force on Food Assistance emphasized the distinction between "hunger as medically defined" and "hunger as commonly defined." The latter, social concept of hunger was viewed by the Task Force as relevant to contemporary U.S. experience in a way that severe, prolonged food deprivation and malnutrition are not: *In this sense of the term, hunger can be said to be present even when there are no clinical symptoms of deprivation, a situation in which someone cannot obtain an adequate amount of food, even if the shortage is not prolonged enough to cause health problems, the experience of being unsatisfied, of not getting enough to eat. It is easy to think of examples of this kind of hunger: children who sometimes are sent to bed hungry because their parents find it impossible to provide for them; parents, especially mothers, who sometimes forego food so that their families may eat; the homeless who must depend on the largess of charity or who are forced to scavenge for food or beg; and people who do not eat properly in order that they save money to pay rent, utilities and other bills* (Report of the President's Task Force on Food Assistance 1984).

The 1984 Report thus identified the nature of poverty-related hunger relevant to U.S. conditions and policy concerns and suggested that food sufficiency to fully meet basic needs is broader than simply the avoidance of hunger. Although the term was not used in the report, this is the concept now recognized as food security: assured access at all times to enough food for an active healthy life (World Bank 1986 et seq: Cohen and Burt 1989, Leidenfrost 1993, Life Science Research Office 1990, Margen and Neuhauser 1987 and 1989, Maxwell and Frankenburger 1992). Finally, the Report noted the absence at that time of any agreed-upon measure or method of estimating the extent of domestic hunger—or its broader condition, food insecurity—in this socially defined meaning.

OBJECTIVES AND PROCESS IN DEVELOPING THE NEW MEASURE

Beginning in 1992, the Food and Nutrition Service (FNS)[4,5] of the U.S. Department of Agriculture (USDA) took the lead, jointly with the Centers for Disease Control and Prevention, National Center for Health Statistics (NCHS) of the U.S. Public Health Service, in convening an interagency federal working group on the measurement of food insecurity and hunger. The formal basis for this was the National Nutrition Monitoring and Related Research Act of 1990. The 10-Year Comprehensive Plan for the National Nutrition Monitoring and Related Research Program (NNMRRP) assigns FNS and NCHS the following joint responsibility: *recommend a standardized mechanism and instrument(s) for defining and obtaining data on the prevalence of "food insecurity" or "food insufficiency" in the U.S. and methodologies that can be used across the NNMRRP and at State and local levels* (NNMRRP 1990).

It was apparent early on that the elements for creating a national measure of food insecurity and hunger already existed, developed within the nutrition community over the preceding decade. Two major contributions stood out, the work of the Community Childhood Hunger Identification Project (CCHIP), sponsored by the advocacy organization Food Research and Action Center (FRAC), and the research program carried out at Cornell University Division of Nutritional Sciences. CCHIP had developed, tested and validated a measurement instrument for hunger and risk of hunger among children of low income families. The project eventually coordinated more than 20 local, regional and state-level standardized sample surveys throughout the country over the period 1985–1995 (FRAC 1991 and 1995, Wehler 1989, Wehler et al. 1992).

The Cornell work developed several different food-security scales at both household and individual levels through an explicit grounded-research approach and detailed examination of several of the dimensions of food insecurity. It clarified and documented the conceptual basis of the approach and confirmed the value of self-reported survey data in this use (Campbell 1991, Radimer 1990, Radimer et al. 1990 and 1992).

Subsequent work validated the Cornell measures (Frongillo et al. 1997, Kendall et al. 1995 and 1996).

Two other sources contributed key insights into the nature of the phenomenon to be measured. One was the authoritative 1990 report of the Life Sciences Research Office (LSRO) of the Federation of American Societies for Experimental Biology, Core Indicators of Nutritional State for Hard-to-Measure Populations. The other was the economic analysis by Basiotis (1992) of the validity of the self-reported household food-sufficiency indicator included in all recent USDA food consumption surveys, completed in 1983 and known within USDA but not published until 1992.

The conceptual basis of the new measure and the working hypotheses guiding its development contained three key elements, the first two expressed in LSRO (1990) and the third in Basiotis (1992). From LSRO came a focus on the direct physical experience of hunger, "the painful or uneasy sensation caused by a lack of food," qualified only as resulting from insufficient resources to obtain food. Second, LSRO located this direct experience of resource-constrained hunger as "a potential, although not necessary, consequence of food insecurity," i.e., as a relatively severe manifestation of the broader, poverty-linked condition of food insufficiency experienced relative to need.

The third key element provides the general framework linking the other two. It recognizes the experience of food insecurity and hunger as a sequence of stages reflecting increasingly severe deprivation of basic food need and characterized by a managed process of decision making and behavior in response to increasingly constrained household resources (Bickel et al. 1996, Rose et al. 1995). This is the "economic" perspective, in which the experience of resource inadequacy to fully meet basic needs and the pattern of chosen behavioral responses revealed by the household in seeking to cope with this constraint on diets exemplify individual and household economizing decisions and behavior generally. From this perspective, food insecurity may be seen as varying through a range of severity levels and thus quantifiable in the dimension of the degree of basic need deprivation experienced.[6] The phenomenon, although intrinsically multidimensional, also is measurable by a unidimensional scale of severity. This insight into measurement of the economic-behavioral aspect of the phenomenon is nicely captured in the metaphorical phrase "hunger is a managed process" (Radimer 1990).

Given the degree of understanding and practical experience already achieved and reflected in the research described, the appropriate government role at this stage was to synthesize and build upon the available work and to help bring into sharper focus the consensus that was emerging within the nutrition community. To this end, FNS and NCHS convened a 2-day working Conference on Food Security Measurement and Research in January 1994 (USDA 1995), bringing together leading experts in the field and seeking their active advice and participation in the project. This collaboration was particularly valuable in the critical next stage: selecting the best available operational forms, i.e., the specific questionnaire items, to provide comprehensive potential indicator variables

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[4] Abbreviations used: CCHIP, Community Childhood Hunger Identification Project; CPS, Current Population Survey; CSFII, Continuing Survey of Food Intakes by Individuals; FNS, Food and Nutrition Service; FRAC, Food Research and Action Center; IRT, item-response-theory; LSRO, Life Sciences Research Office; NCHS, National Center for Health Statistics; NHANES, National Health and Nutrition Examination Survey; NNMRRP, National Nutrition Monitoring and Related Research Program; PSID, Panel Survey of Income Dynamics; SLAITS, State and Local Area Integrated Telephone Survey.

[5] The name of the agency from 1993 to 1997 was Food and Consumer Service (FCS).

[6] This measurement construct is applicable, in principle, across a wider range of severity than that observed in the U.S. or other wealthy countries. Development of a universal scale of food-insecurity/hunger severity, diversified as needed for cognitive variation across cultures, would enable more meaningful comparisons than those now possible of severity and prevalence of food deprivation relative to need on a common basis across countries at widely differing stages of development and income. For the relevance of this form of food-security scale in a Third World setting, see Maxwell (1995).

for all levels of severity of food insecurity and hunger throughout the full range of severity observed in U.S. conditions and suggested by the recent literature.

As working material for the conference, the interagency group developed a draft questionnaire incorporating a large set of indicator items drawn largely from the CCHIP and Cornell work. Some 30 workshop participants critically assessed and reworked this draft, providing continuing advice and assistance throughout 1994. The revised questionnaire was given to the U.S. Bureau of the Census Center for Survey Methods Research for cognitive evaluation, pilot testing and recommendation of further revisions (Singer and Hess 1994). Simultaneously, FNS engaged the Cornell Division of Nutritional Sciences team and CAW and Associates, the CCHIP technical team, to provide analytic work based on their respective food-security data sets. Each group had collected data containing both the main Radimer and CCHIP indicator items, plus the established food-sufficiency question used in USDA surveys since 1977. These two data sets thus offered a unique resource for testing the feasibility of a unified survey instrument incorporating both types of indicators. Through adapting and coordinating the analytic results and recommendations received (Anderson et al. 1995, Ohlson et al. 1995, Scott et al. 1995, Wehler et al. 1995) and the survey-method recommendations from the Census Bureau, a finished questionnaire was completed for fielding by the Bureau as a supplement to the regular Current Population Survey (CPS) in April 1995.

The use of the CPS for collecting regular national data on food security offers unusual strengths, including: large sample size at moderate cost; exemplary sample design, data collection and quality-control procedures; assured consistency and regularity of collection; and a high level of competency in all operations. The April 1995 CPS produced detailed food-security, food-expenditure and food program-participation data for a nationally representative sample of 44,730 households.[7] Supplement nonresponse was 16.7% of households completing the CPS basic questionnaire, which in turn had nonresponse of 7.1% of the underlying sample. Item nonresponse occurred in 274 cases, of which 83 were deemed deficient enough to drop from analysis. Subsequent rounds of food security data were collected in September 1996, April 1997 and August 1998. Current plans are for USDA to sponsor collection of comparable food-security data by the Census Bureau annually, alternating between the April and September CPS.

DEVELOPING THE STATISTICAL MEASUREMENT MODEL

In September 1995, FNS contracted with Abt Associates (Abt) to analyze the CPS food-security data in a cooperative venture with FNS staff and other researchers involved in developing the questionnaire. The Abt team was selected because of an innovative analysis design that applied state-of-the-art scaling methods developed and used most widely in the educational testing industry. (Hamilton et al. 1997a and 1997b and Price et al. 1997 give technical details of the scale estimation.)

Standard linear and nonlinear factor-analysis techniques were first applied in a systematic examination of the 1995 data. Nonlinear modeling showed that, with one major exception, nearly all indicators fit a unidimensional measurement scale. A few items failed to meet goodness-of-fit criteria and were dropped. However, one general type of item also did not fit the model, i.e., indicators of coping strategies that a food-insecure or at-risk household might use to improve its food supply from emergency sources, such as obtaining food from a food bank or borrowing money for food. Such coping items correlate with measured food insecurity and are useful coincident indicators; however, since households do not all face the same set of options for coping with an inadequate food supply, it is understandable that such indicators are not captured by the unidimensional measurement model fitted to the data.

Once it was established that a core set of food security and hunger items could be scaled along a single dimension, subsequent analyses used the Rasch model, the most basic form within the general class of item-response-theory (IRT) statistical scaling models. Rasch measurement fits the type of phenomenon that varies through some range of intensity, with each discrete level identified by one or more dichotomous indicator variables. It provides a true measure in the sense that the intervals between items as well as their order are meaningful (Wright 1977 and 1983, Wright and Linacre 1989). The model was fitted independently to data subsets including households with children ($\leq$17 y of age), those with elderly members ($\geq$60 y of age) but no children, and households with neither elderly nor children. Analysis showed that a single Rasch scale, with strong statistical properties and good fit to the data, was robust across these three household types (Hamilton et al. 1997a and 1997b). Research is required to test the fit of this national baseline scale for diverse population subgroups. Preliminary work by Derrickson (1998) in cognitive testing of the scale in focus groups of Samoan, Philippino and native Hawaiian populations is promising in this regard.

The 18 scale items are shown in abbreviated form in **Table 1**, numbered as in CPS but ordered by severity level as determined by the overall pattern of response to these items by the sampled households. The least severe items, both conceptually and in response frequency (Q53 and Q54), ask if the respondent has worried about or experienced a situation within the past 12 mo in which household food was running out and there was no money to buy more. Subsequent items indicate experiences or perceptions of inadequate food intake in terms of both quality and quantity (Q32, Q55, Q56, Q57 and Q58) and fall in the low-to-intermediate range of severity measured by the scale. Items indicating reduced food intakes and hunger for adults (Q24, Q25, Q35 and Q38) fall in the intermediate range, and those indicating reduced food intakes and hunger for children (Q40, Q43, Q44, Q47 and Q50) or more severe hunger for adults (Q28 and Q29) fall, both conceptually and in response pattern, at the severe end of the measured range.

All items refer to the 12-mo period preceding April 1995 and all ask respondents to report only experiences, perceptions or behaviors resulting from inadequate financial resources. Thus, instances of hunger or meals skipped due to dieting, illness or busy schedules are excluded by design. Each household received a scale score determined by its particular pattern of response to all 18 items, with a linear transformation applied to express the values on a scale from 0 to 10. These estimated household scale values (not shown) measure the discrete levels of severity of food insecurity as experienced by U.S. households across the full range of severity captured by the measure.

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[7] The April 1995 CPS Food Security Supplement data available on the Census Bureau web site (http://www. Bls. Census. Gov/cps/cpsmain. Htm) include a total sample of 44,647 households. Among 18,453 households that passed the food-security screener, 191 showed some level of item nonresponse. Among these, 83 answered fewer than half of the food-security/hunger items and thus were deemed survey noncompletions and deleted from the analysis sample (n = 18,370). The data file includes survey weights developed by the Census Bureau to adjust for survey nonresponse in the April 1995 basic CPS and Supplement combined.

TABLE 1

Food-security measurement scale: Scaled indicator items, estimated item severity levels, and scale ranges of designated food-security status categories

Food-security indicator items, ordered by estimated severity level	Estimated severity[a]	Household status[b]
Negative response to all items	0.0	Food secure
Q53 Worried food would run out	0.9	
Q54 Food bought didn't last	2.0	
Q55 Unable to afford balanced meals	2.2	Food insecure:
Q58 Child(ren) fed few, low-cost foods	2.5	hunger
Q24 Adult(s) cut size or skipped meals	3.6	not evident
Q56 Couldn't feed child(ren) balanced meals	3.7	
Q32 Respondent ate less than felt s/he should	3.8	
Q25 Adult(s) cut, skipped meals in 3+ mo	4.5	Food insecure:
Q57 Child(ren) not eating enough	5.0	with moderate
Q35 Respondent hungry but didn't eat	5.3	hunger
Q38 Respondent lost weight	6.4	
Q40 Cut size of child(ren)'s meals	6.5	
Q28 Adult(s) not eat for whole day	6.6	Food insecure:
Q47 Child(ren) hungry	6.6	with severe
Q29 Adult(s) not eat for whole day in 3+ mo	7.2	hunger
Q43 Child(ren) skipped meal	7.5	
Q44 Child(ren) skipped meal in 3+ mo	8.0	
Q50 Child(ren) not eat for whole day	9.2	

[a] Item-severity levels and household scale values (not shown) are jointly determined by maximum-likelihood estimation of the joint probability distribution relating (1) the probability of each item achieving any given severity level, given the overall response pattern of all hh's to all items, and (2) the probability of each hh achieving any given severity level, given the specific response pattern of that hh to all items.

[b] Households classified to food-security status categories based on designated ranges of estimated hh scale values.

DEVELOPING THE CATEGORICAL VARIABLE FOR PREVALENCE ESTIMATES

The scaled measure provides much information about the nature of food insecurity, but is too detailed for a useful measure of prevalence. For this purpose, conceptually meaningful subranges of severity were identified and a simpler, categorical measure constructed based on these specified ranges. The main role of the categorical measure is to establish a consistent basis for comparison of food insecurity and hunger prevalence over time and across population groups. As such, the category boundaries (scale-score cutpoints, in operational terms) should define ranges of severity that are pertinent to ongoing and anticipated issues of policy discussion and debate. At the same time, they should reflect any clear conceptual distinctions seen to exist among the several broad stages of severity in the phenomenon being measured.

FNS worked with Abt and other collaborators to develop the categorical measure, which then was used to classify households by food security status. In contrast to the underlying scale estimation, which is fully determined by the measurement model and the data, locating the designated category boundaries on the scale involved judgment concerning how many indications of a given severity range should be present and over how wide a range of severity they should be observed. Determining the initial threshold of each designated severity range was done by identifying the second or third item in sequence that, conceptually, indicates the conditions characterizing the category, i.e., food insecurity without evidence of hunger (severity level 1), with evidence of adult hunger during the period (level 2), or with evidence of child and/or severe adult hunger sometime during the period (level 3).

The four status categories are illustrated in Table 1. House-

holds were classified as food secure if the respondent answered affirmatively to <3 of the 18 questions, whereas three or more positive responses placed the household in the food-insecure range.[8] For households with children (and 18 relevant scale items), those with 3–7 positive answers were classified food insecure without hunger, those with 8–12 as food insecure with moderate hunger, and those with ≥13 as food insecure with severe hunger.

The operational rule of thumb described above, identifying the second or third item in sequence of severity within each broad, conceptually designated severity range to serve as the initial or "threshold item" for the range, may be considered an element of methodological conservatism in locating the category boundaries. A household is classified into one of the designated categories only upon answering at least two or three of the items directly reflecting the conceptual basis of the category, in addition to all of the less severe items. **Figure 1** illustrates the contrasting patterns of item response among the four household groups, the patterns that determine each household's classification. The proportion of affirmative responses to each scale item is projected for each group separately onto the vertical axis.

The meaning of the categorical severity ranges at a deeper level, e.g., as potential indirect indicators for significant variations in the nutritional and health effects of food insecurity and hunger, will become evident when research using the new measures determines what are the actual health implications for the various levels of severity experienced and measured by the scale. For early work in this vein with a sample of low-income Canadian women, see Tarasuk et al. (1998).

SUMMARY OF PRINCIPAL FINDINGS FROM THE 1995 CPS DATA

Findings on statistical properties of the measure. In fitting the Rasch model to the CPS data, various reliability

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[8] Two groups of households were classified as food secure on the basis of zero scale scores, i.e., higher income households (>185% of poverty line) screened from the food-security portion of the Supplement on the basis of consistent negative responses to three broad food-security screening questions, and households at any income level that passed the screener but then gave no affirmative response to any scale item. Households with missing responses received computed scale scores, adjusted to reflect the severity of the missing items(s); these diverge slightly from the 19 discrete scale scores (including zero) of households with children and complete responses, or from the 11 discrete scores of households without children and with complete responses.
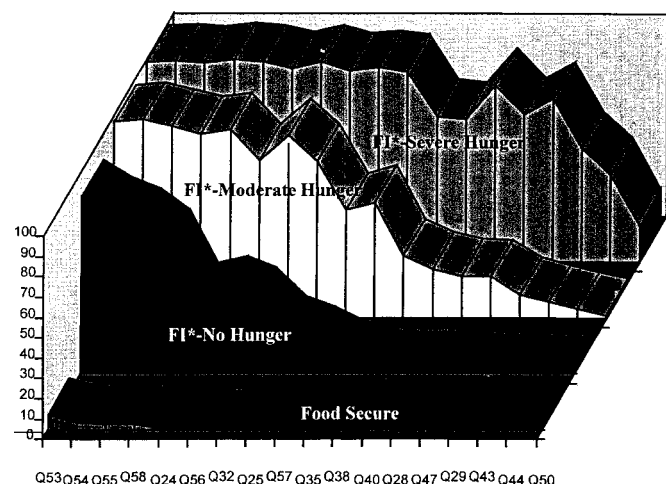

FIGURE 1 Item response patterns for food security status groups. FI, food insecure.
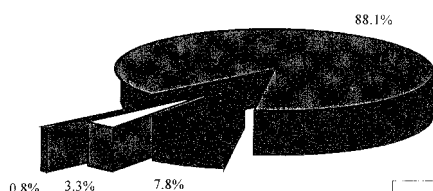
FIGURE 2 Distribution of U.S. households by food security status level, 1955; □, food secure; ■, food insecure/no hunger evident; □, food insecure/moderate hunger; □, food insecure/severe hunger.

statistics were calculated and found to be within accepted ranges. A discussion of potential sources of error in the measure is presented in Abt's Summary Report (Hamilton et al. 1997a) and a more extensive treatment is provided in the Technical Report (Hamilton et al. 1997b). On the basis of three traditional measures of reliability (Spearman-Brown and Rulon's split-half reliability estimates and Cronbach's α), the estimated reliability values ranged from 0.86 to 0.93 for the 12-mo scale. [An additional truncated scale on a 30-d basis also is described in Hamilton (1997b).] Because the distribution of household scale scores is highly skewed (56.5% of households passing the income and food-security screener had zero score), a dichotomized split-half test also was performed, collapsing the split-half scales into the dichotomous variable "answered all questions negatively" and "answered one or more questions affirmatively." On this test, the level of agreement between paired subscales was 84.8 and 85.8% for households with and without children, respectively. The corresponding κ statistic, showing the extent of agreement beyond mere chance, was 0.70 and 0.69 for the respective household types.

Item-response stability measures for individual items on the scale and for the overall scale were judged to be acceptable by the Census Bureau using data from 1100 quality control reinterviews conducted in the week after the regular April 1995 survey (McGuinness 1997). In this analysis of response variance, 17% of the continuous-variable and 9% of the categorical questions with enough cases to be analyzed exhibited "low" variance, 75 and 68% showed "moderate" variance, and 8 and 24% showed "high" variance, respectively. Thus, 76–92% of the two question types exhibited low-to-moderate response variance, whereas the food-insecurity scale overall showed moderate response variance. The author noted, "(t)his distribution is typical of response variance results for household surveys" (McGuinness 1997).

The observed sequence and intervals among scaled items reflect the underlying commonality of response to the set of indicators among otherwise diverse households. Households with responses exactly matching the predominant pattern were termed "modal." Within this group, households answering positively to any given scale item also answered affirmatively to all less severe items. For the entire CPS sample, 68% of households with children and 82% of those without children (76% overall) were modal in this sense. For the subset of households with at least one positive response, smaller proportions fit the modal pattern, i.e., 32 and 48% of households with and without children, respectively. The response patterns among nonmodal households tend to cluster near the predominant pattern, as indicated by the acceptable levels of fit statistics observed in fitting the Rasch model to the data.

Findings on prevalence of food insecurity and hunger. By classifying survey responses according to food-security status and applying household weights provided by the Census Bureau, Abt used the supplement data to estimate the prevalence of food insecurity and hunger in U.S. households for the 12 mo

preceding the 1995 survey. As illustrated in Figure 2, the large majority of American households (88%) were found to be *food secure* in the year ending April 1995.

About 11.9 million (of ~100.2 million) U.S. households experienced food insecurity as a consequence of limited resources during that period. Among these, 7.78 million households were *food insecure without hunger*, meaning that they reported concerns about the adequacy of their food supply, substituted cheaper and fewer foods and reduced the quality and variety of diets, but without significantly reducing food intakes. There were 3.34 million households classified as *food insecure with moderate hunger*, for which some reduction in food intake due to inadequate household resources was evident for one or more members, mainly adults. An additional 817,000 households were identified as *food insecure with severe hunger*. In each of these households, reductions in food intake were observed for both children and adults and one or more adult was reported to have experienced a substantial reduction, i.e., going a whole day without food, at least sometime during the period, due to inadequate resources. For the modal group, children's hunger indicators do not appear until the severe-hunger range of household-level food insecurity is reached. Among nonmodal households, however, evidence of children's hunger appears within the less severe categories as well. Further analysis of the CPS data will identify the extent of such cases.

As can be seen in **Table 2**, household food insecurity is more prevalent among African-American and Hispanic households (almost twice the levels for non-Hispanic whites), households with children, households under the poverty level and households in central-city metropolitan areas.

The number of households in which hunger due to inadequate resources was experienced during the period can be estimated by combining the number of households with the two most severe levels of food insecurity. This yields an estimate of 4.16 million households in which one or more members, mainly adults, experienced some level of hunger due to inadequate resources in the 12 mo preceding April 1995.

The number of individuals affected by hunger is not easily extrapolated from these estimates. Because the data were collected in a household survey, homeless persons are not included. Moreover, for many households, i.e., those with more than one adult or with more than one child, the structure of the questionnaire does not enable the food-security status of each adult or each child in the household to be determined. An upper-bound estimate of the number of individuals experiencing resource-constrained hunger during the period is given by the total population living in households classified into the two most severe food-insecurity categories. This was 11.2 million persons in 1995, including 6.9 million adults and 4.3 million children. Further detail on household and individual estimates for 1995 is provided in Hamilton et al. (1997a).

NEXT STEPS IN FOOD SECURITY MEASUREMENT AND RESEARCH

To the extent possible, the new measure is being implemented at the national level by all federal agencies cooperating in the National Nutrition Monitoring and Related Research Program. The current plans of the USDA are to continue annual collection of the data needed for replicating the baseline measure through regular supplements to the CPS. The core set of scale questions is planned for inclusion in the Fourth National Health and Nutrition Examination Survey (NHANES 4) and the next round of USDA's Continuing Survey of Food Intakes by Individuals (CSFII),

TABLE 2

Prevalence of household food-security status by selected characteristics, 1995

| | Food secure | | Food insecure | | | | | |
| | | | Without hunger | | Moderate hunger | | Severe hunger | |
	n	%	n	%	n	%	n	%
All households	88,266	88.1	7783.4	7.8	3343.3	3.3	816.8	0.8
Household composition								
HH with children <18 y	31,434	82.5	4676.2	12.3	1670.6	4.4	331.9	0.9
HH with elderly but no children	26,155	94.1	1124.1	4.0	436.2	1.6	89.9	0.3
HH with no children or elderly	30,677	89.5	1983.1	5.8	1236.4	3.6	394.9	1.2
Race/Ethnicity								
White	76,129	90.0	5653.7	6.7	2298.1	2.7	534.0	0.6
Black	9104	75.8	1779.4	14.8	895.4	7.5	233.8	1.9
Other	3032	84.6	350.6	9.8	150.1	4.2	49.4	1.4
Hispanic[1]	5725	74.3	1360.2	17.7	501.0	6.5	115.6	1.5
Income-to-poverty ratio[2]								
<0.50	3,240	58.4	1365.0	24.6	688.4	12.1	270.9	4.9
<1.00	10,230	64.7	3500.7	22.1	1587.6	10.0	489.5	3.1
<1.30	14,841	68.1	4367.9	20.0	2032.7	9.3	567.7	2.6
<1.85	25,914	73.8	5952.6	17.0	2568.0	7.3	680.4	1.9
>1.85	62,352	95.8	1830.8	2.8	775.3	1.2	136.3	0.2
Area of residence								
Central city metropolitan area	20,172	83.9	2494.4	10.4	1102.5	4.6	286.5	1.2
Other metropolitan area	33,115	90.5	2244.3	6.1	976.4	2.7	265.8	0.7
Nonmetropolitan area	20,007	88.0	1906.2	8.0	802.8	3.4	161.2	0.7
Census geographic region								
Northeast	17,443	89.7	1335.6	6.9	524.6	2.7	142.6	0.7
Midwest	21,113	89.4	1614.6	6.8	743.9	3.2	150.9	0.6
South	31,311	87.5	2959.2	8.3	1244.6	3.5	285.5	0.8
West	18,399	86.2	1874.0	8.8	830.3	3.9	237.7	1.1

[1] Persons of Hispanic ethnicity can be of any race.

[2] Income and poverty status refer to household income in a recent 12-mo period, varying among rotation groups in the CPS sample.

scheduled to begin in the year 2000. The Centers for Disease Control and Prevention, Division of Nutrition (CDC), NCHS, and FNS are working together to test subsets of the 18 items that can be used to measure food insecurity and hunger in state surveillance systems such as the NCHS State and Local Area Integrated Telephone Survey (SLAITS) and the CDC Pediatric Nutrition Surveillance System.

The same food security module is included in the Census Bureau's Survey of Program Dynamics, a lower-income 5-year panel survey beginning in 1999, and the Early Childhood Longitudinal Study being conducted by the National Center for Educational Statistics of the U.S. Department of Education. The University of Michigan Panel Survey of Income Dynamics (PSID) included the food security module in a Child Development Supplement in 1997 and is considering implementation in the core PSID in 1999. FNS has collected data on food security and household food use in a national sample of food stamp participants and other low income households.

As these data sets emerge, researchers will expand beyond the basic monitoring function to explore causation and consequences of food insecurity and hunger at the levels experienced and observed in the U.S. The work of Tarasuk et al. (1998), which found significant associations between nutrient intakes and household food security status in a sample of low income Canadian women, is the first research of this kind using the new scale. However, recent results from other self-reported measures of food insufficiency, similar to the food-security scale, also suggest significant associations between food insufficiency and nutritional and health effects (Klein-

man et al. 1998, Murphy et al. 1998, Rose and Oliveira 1997a and 1997b). The relationships among the several different measures of self-reported food insufficiency now available also must be assessed, e.g., Alaimo and colleagues (1998) report food-insufficiency prevalence estimates from NHANES 3.

The greater precision and completeness provided by the food-security scale, however, may prove it to be an even stronger tool for examining these areas. It may be of particular interest to researchers concerned with detecting the subtler kinds of health and developmental effects that may occur from food deprivation at the levels and in the ways that are primarily relevant in the U.S. and other wealthy countries, especially as these affect children, the elderly and other high risk groups.

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