United States Department of Agriculture

Food and Consumer Service

Office of Analysis and Evaluation

Household Food Security in the United States in 1995

Summary Report of the Food Security Measurement Project

September 1997

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ACKNOWLEDGEMENTS

The analyses presented here build on the work of a great many people, carried out over several years. In particular, the members of the Federal Interagency Working Group for Food Security Measurement were the architects of the Food Security Supplement to the Current Population Survey, the foundation on which the present analysis rests. The participants in that interagency group are listed in Appendix G of the report.

For the analysis project itself, the project team benefitted from the contribution of staff in several federal agencies, as well as members of the project's expert review panel. Gary Bickel, Margaret Andrews, and Steven Carlson (USDA, Food and Consumer Service) provided guidance, support, spirited debate, and detailed critiques throughout the project. Thoughtful review and commentary came also from Mark Nord, Donald Rose, and Victor Oliveira (USDA, Economic Research Service), Ronette Briefel (DHHS, Centers for Disease Control and Prevention, National Center for Health Statistics), and Richard Bavier (Office of Management and Budget). Finally, we are especially grateful for the time and effort devoted by the members of the expert review panel listed below, most of whom participated in a group review meeting in Washington and many of whom also provided insightful written reviews.

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EXECUTIVE SUMMARY

In April 1995, the U.S. Bureau of the Census conducted the first Food Security Supplement to its regular Current Population Survey (CPS). With about 45,000 household interviews, the Food Security Supplement provides the basis for the first comprehensive measurement of food insecurity and hunger in a nationally-representative sample of U.S. households. This survey is the cornerstone of the food security measurement project begun in 1992 to carry out a key task assigned by the Ten-Year Comprehensive Plan for the National Nutrition Monitoring and Related Research Program (NNMRRP). The task is to develop a standard measure of food insecurity and hunger for the United States, for use at national, state, and local levels.

This project has been a cooperative undertaking by the responsible federal government agencies under the leadership of the Food and Consumer Service (FCS) of the U.S. Department of Agriculture jointly with the National Center for Health Statistics/Centers for Disease Control and Prevention (NCHS) of the Department of Health and Human Services. Academic and other private-sector research experts in the field of food security and hunger measurement have aided the project from its beginning, achieving a substantial public/private partnership in the effort to develop a state-of-the-art food security survey questionnaire, statistical measurement method, and food insecurity and hunger measures and prevalence estimates for the nation.

The present study reports the first of these national prevalence estimates for food insecurity and hunger for the 12-month period ending in April 1995, based on the CPS data and applying a sophisticated statistical measurement method that creates a detailed scale for measuring the underlying level of severity of food insecurity and hunger experienced in U.S. households. Based on this food security scale, a simpler measure is constructed that classifies households into several broad ranges or levels of severity, defining four categories of food security status for U.S. households:

- food secure,
- food insecure without hunger,
- food insecure with moderate hunger, and
- food insecure with severe hunger.

The categorical measure allows one to estimate the number of American households that experience food insecurity and hunger within each of the broad levels specified. The measure is

designed to be useful primarily for monitoring changes in prevalence over time, and comparing prevalence across groups within the population, on a sustained, consistent basis.

Background and Definitions

Food security has been defined briefly as "assured access to enough food for an active, healthy life." The household should have access to enough food, the food should be nutritionally adequate, it should be safe, and the household should be able to obtain it through normal channels. Although all of these dimensions of food security are important, the measure presented here focuses on whether the household has "enough" food, as perceived and reported by adult members of the household. When food insecurity on this central dimension reaches severe levels, actual hunger for household members is the result.

Hunger is defined briefly as "the uneasy or painful sensation caused by a lack of food." The CPS Food Security Supplement aims to measure only that hunger which results from the financial resource constraint of the household—from being unable to afford enough food. The survey does not measure hunger that results from being too busy to eat, from voluntary fasting, from illness, or from any other cause except lack of financial resources. Thus, food insecurity and hunger measured here are clearly related to general income poverty. They focus, however, on only one area of household circumstances, rather than on the general problem of whether resources are adequate to cover all areas of need.

Interest in measuring food insecurity and hunger springs from two sources. First, food security is an important dimension of basic individual and family well-being, analogous to health or housing. Food insecurity and hunger are undesirable in their own right, and possible precursors to more serious health and developmental problems. Monitoring food security is important for understanding one fundamental component of the well-being of the American population and for identifying geographic or other subgroups with particularly undesirable and high-risk conditions.

Second, numerous public and private food assistance programs attempt to ameliorate food insecurity and hunger. Accurate measurement of food insecurity and hunger are important for program planners and policymakers to assess adequately the effectiveness of these programs in meeting their intended objectives. This need for concrete indicators of program outcomes takes on new importance for federal agencies under the mandate of the 1993 Government Performance and Results Act (GPRA), which requires agencies to give increased, explicit attention to such indicators.

The government's food security measurement effort was built upon extensive private-sector research in the late 1980s that expanded and sharpened the understanding of 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, which were published by the Life Sciences Research Office (LSRO) of the Federation of American Societies for Experimental Biology (Anderson/AIN/LSRO, 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."

These definitions underlie the CPS Food Security Supplement and the new measurement scale discussed below, with the one additional qualification, already described, that only resource-constrained or poverty-linked food insecurity and hunger are intended to be captured by the measure.

The Food Security Scale

The Food Security Supplement contains a large battery of questions asking respondents about various aspects of food sufficiency in their households. Taken individually, none of these questions can provide a measure of the severity and extent of food insecurity or hunger. Taken together, a systematic set of 18 of the CPS questions (those with strong statistical properties identified by the measurement method) do provide such a measure. The CPS questions ask about five general types of household food conditions, events, or behaviors:

- Anxiety that the household food budget or food supply may be insufficient to meet basic needs;

- Perceptions that the food eaten by household members was inadequate in quality or quantity;

- Reported instances of reduced food intake, or consequences of reduced food intake (such as the physical sensation of hunger or reported weight loss) for adults in the household;

- Reported instances of reduced food intake or its consequences for children in the household; and

- Coping actions taken by the household to augment their food budget or food supply (such as borrowing from friends or family or getting food from emergency food pantries).

All of the CPS food security questions explicitly condition the event or behavior identified as being due to financial limitation (such as "... because we couldn't afford enough food" or "because there wasn't enough money to buy food.") Each question addresses an explicit time frame, either the past 12 months or the past 30 days. Several key items include follow-up questions on how often the event or condition occurred within the past 12 months or the past 30 days.

Two separate measurement scales were developed, one for the severity of food insecurity within the 12-month period, the other for the 30-day period. The 12-month scale covers a broader range of severity levels of food insecurity and hunger, because fewer questions were asked in the 30-day time frame. The more comprehensive 12-month measure is expected to be the more useful, both for research and policy purposes, and is the focus of discussion in this report.

The scaling methodology began with exploratory linear and non-linear factor analyses to determine the number of distinct factors that should be represented. Scales were estimated using a Rasch measurement model, a form of non-linear factor analysis in the family of Item Response Theory models.[1] Most food insecurity and hunger questions met the statistical criteria for inclusion in the models, although the resource augmentation questions did not. The final 12-month food security scale is based on answers to 18 questions, including some from each of the first four types of questions identified above.

Key findings during the scaling analysis were as follows:

- The results are consistent with previous research characterizing food insecurity as a "managed process" through several stages or levels of severity (Radimer *et al*., 1992).

[1] IRT models are a form of statistical measurement model developed in educational testing, where test items vary systematically in difficulty and the overall score measures the level of difficulty that the tested individual has mastered. In the present application, the severity of food insecurity that the household has experienced is analogous to the level of test difficulty that an individual has mastered.

In this process, households first note serious inadequacy in their food supply, feel anxiety about the sufficiency of their food to meet basic needs, and make adjustments to their food budget and food served. As the situation becomes more severe, adults experience reduced food intake and hunger, but they spare the children this experience. In the third stage, children also suffer reduced food intake and hunger and adults' reductions in food intake are more dramatic.

The severity ranking of questions in the measurement scale proceeds generally in this order. At the same time, it shows that all three stages fit well in a single scale, which means that the level of severity of food insecurity can be measured as an essentially unidimensional aspect of the food insecurity/hunger phenomenon.

- The measurement models were tested with three different population groups: households with children; those without children but with one or more elderly members (age 60 or older); and those with neither children nor elderly members. Tests showed that a single scale can be used with all three populations.

- An extensive series of tests found the food security scale to have good reliability, including good internal (or content) validity and good external (or construct) validity.

Defining Levels of Severity of Food Insecurity and Hunger

Four categories of food security status are defined, based on the distinct behavioral stages associated with the managed process of food insecurity and hunger:

- ***Food secure*** — Households show no or minimal evidence of food insecurity.

- ***Food insecure without hunger*** — Food insecurity is evident in households' concerns and in adjustments to household food management, including reduced quality of diets. Little or no reduction in household members' food intake is reported.

- ***Food insecure with moderate hunger*** — Food intake for adults in the household has been reduced to an extent that it implies that adults have repeatedly experienced the physical sensation of hunger. Such reductions are not observed at this stage for children in the household.

- ***Food insecure with severe hunger*** — Households with children have reduced the children's food intake to an extent that it implies that the children have experienced the physical sensation of hunger. Adults in households with and without children have repeatedly experienced more extensive reductions in food intake at this stage.

Each household is classified into one of the four food security status categories on the basis of its value on the food security scale; Exhibit ES-1 illustrates the process. Households with zero scale score are those reporting no indications at all of food insufficiency or insecurity. Households

with low scale values are those reporting very slight experiences of food insecurity. Both these groups are classified as food secure. At the other extreme, households with high scale values are those who report experiencing all or nearly all of the conditions covered by the scale, and are classified as food insecure with severe hunger. A household classified into a particular category must normally have experienced all of the conditions associated with the less-severe categories, plus at least two or three of the conditions associated with the assigned category.

The Prevalence of Food Insecurity and Hunger in the United States

The large majority of American households were food secure in the year ending April 1995. About 88.1 percent of the approximately 100 million households in the United States are classified as food secure over that period, as illustrated in Exhibit ES-2. About 11.9 million households, however, experienced food insecurity at some level during that year.

Most of the food insecure households are classified as food insecure without hunger (7.8 percent, or 7.8 million households). About 4.1 percent, however, are classified as food insecure with hunger. Thus, one or more adult members of some 4.2 million American households are estimated to have experienced reduced food intake and hunger as a result of financial constraints in the year ending in April 1995.

Exhibit ES-1
THE FOOD SECURITY STATUS CATEGORIES

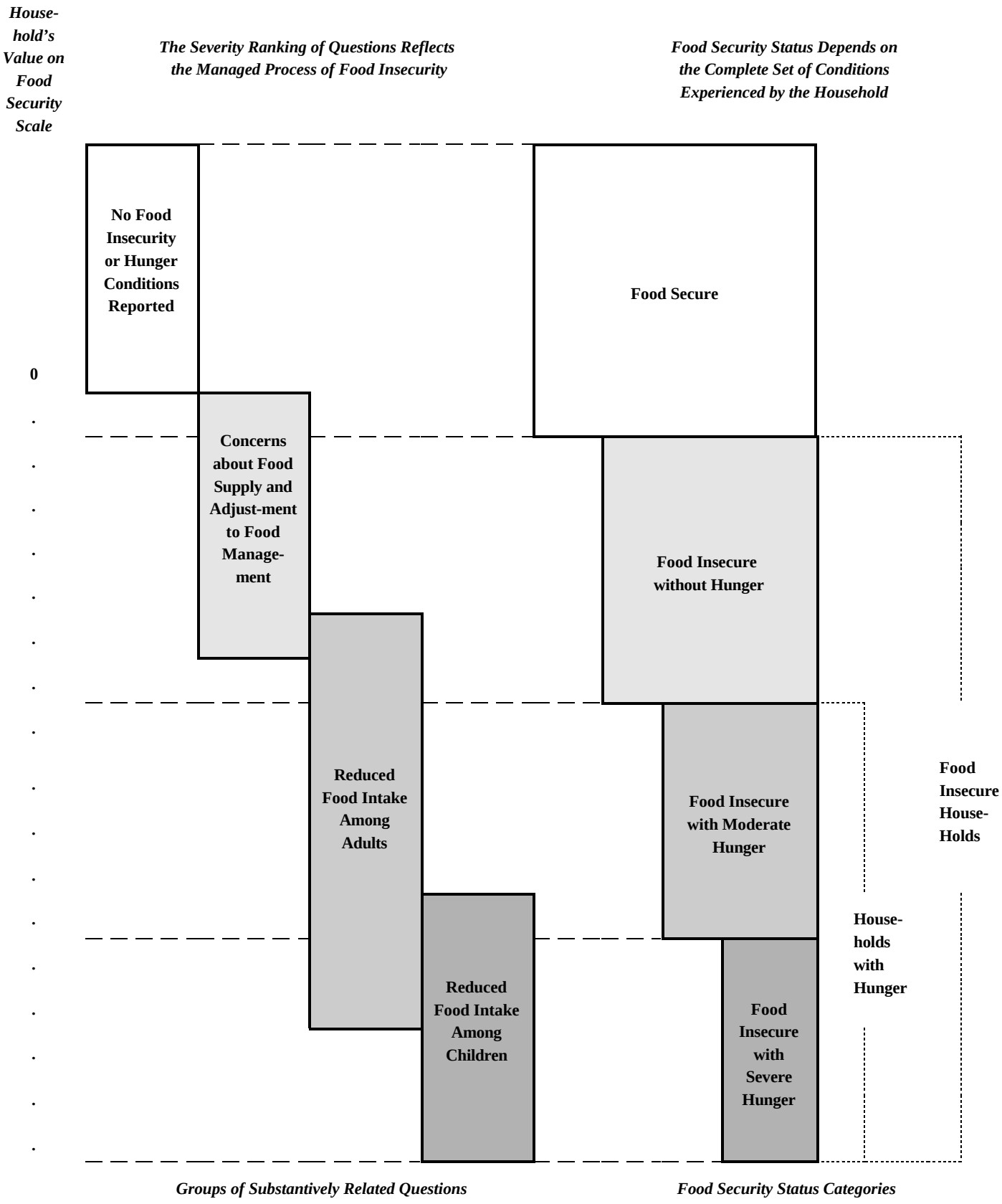
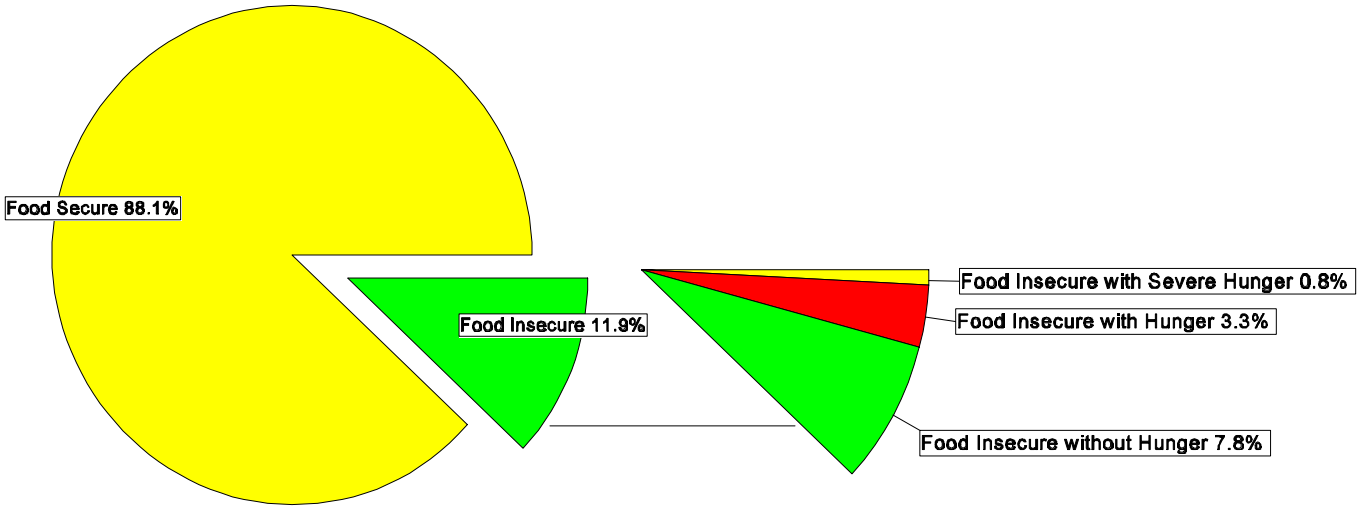


Exhibit ES-2

PREVALENCE OF FOOD SECURITY AND HUNGER, 1995



Among the households experiencing some level of hunger, about 800,000 (0.8 percent) are classified as food insecure with severe hunger. In these households, children as well as adults experienced reduced food intakes and hunger. Adults in these households had very substantial reductions in food intake, such as not eating for a whole day because of lack of money.

Food insecurity is clearly related to income and poverty, but the relationship is not exact. Not all poor households are food insecure, and only a small percentage of households with below-poverty incomes experience actual hunger (13.1 percent). The percent of households estimated to experience food insecurity is somewhat less than the poverty rate for individuals in the same period (12 percent *vs.* 15 percent). More than a third of poor households are classified as food insecure, whereas only 8 percent of households with above-poverty incomes are food insecure, and most of those have near-poverty incomes. Public and private food assistance programs may account for the fact that so many poor households are food secure, but this hypothesis has not yet been analyzed.

Even though food insecurity does not exactly follow income lines, food insecurity tends to be concentrated in population groups that have comparatively high poverty rates. For example, food

insecurity rates are higher than average in female-headed households, in households with children (especially young children), in Black and Hispanic households, and in central city areas.

Next Steps

The present analysis represents an important step in the measurement of food security, food insecurity, and hunger, but much more lies ahead for the food security measurement project. A task for the immediate future is to identify subsets of the questions in the CPS Food Security Supplement, and appropriate scaling procedures, so that smaller survey efforts can approximate the scale presented here with reasonable reliability. Another ongoing effort is to refine and strengthen the Food Security Supplement itself, so that the annual surveys planned for the future will yield comparable and increasingly reliable information. In the longer term, FCS and the larger research community will be undertaking several lines of data collection and analysis to understand better the phenomenon of food insecurity and to apply that understanding in the design and implementation of nutrition policies and food assistance programs.

CHAPTER ONE

FOOD SECURITY AND HUNGER MEASUREMENT IN THE UNITED STATES

Introduction

One of the basic aims of U.S. public policy in the latter half of the 20th century has been to assure that all Americans have enough to eat. The President's Task Force on Food Assistance stated the theme in its 1984 report:

> *It has long been an article of faith among the American people that no one in a land so blessed with plenty should go hungry. . . . Hunger is simply not acceptable in our society.* — Task Force Report, p. 2

The commitment to reduce and ultimately eliminate poverty-linked hunger in the United States has been expressed in the allocation of public resources to major public programs of food assistance targeted to families and persons in need. Beginning in the 1960s, food assistance programs grew to be an important part of the general social safety net of government-aided programs aimed at reducing poverty. By 1996, some $35.6 billion of federal funds were devoted to food assistance to American families and single persons. Nevertheless, despite the amount of these resource transfers, either as direct emergency food aid or financial means to obtain food through normal channels of trade, food insecurity and hunger due to lack of adequate financial resources continues to be a problem for some Americans.

In order for the policies and programs aimed at reducing food insecurity and hunger to be directed effectively, it is important to be able to measure with some degree of confidence the conditions that the policies and programs are intended to affect. Lack of reliable measures with which to gauge their impact may hamper the effectiveness and appropriateness of the policies and programs themselves; at the least, lack of such measures leaves policymakers and the public in doubt as to the actual effect of food-assistance programs. The 1984 Task Force Report noted the lack, up to that time, of any authoritative measure of the number of people in the U.S.

experiencing poverty-related hunger, and the problem for policy making caused by this lack of a reliable hunger measure.[1]

Food Insecurity and Hunger Measurement—Background

In 1977, the federal government began collecting information on food sufficiency in American households through a single question included in the periodic national food consumption surveys conducted by the U.S. Department of Agriculture (USDA). In the 1980s, additional questions on food insecurity and hunger were included in the Third National Health and Nutrition Examination Survey (NHANES III) conducted by the Department of Health and Human Services, National Center for Health Statistics/Centers for Disease Control and Prevention.

The challenge implicit in the 1984 President's Task Force Report—to develop a valid and reliable measure of the severity and extent of hunger in the U.S.—was taken up most actively by scientists and researchers in the private sector, both in academia and under sponsorship by concerned social-policy and policy-research organizations. These private-sector efforts to develop and implement technically competent, scientifically grounded measurement of the conditions of food insecurity and hunger in the U.S. in the latter 1980s, demonstrated the feasibility of developing such measures.[2] This body of research and field survey experience produced methodologically sophisticated, empirically grounded measurement scales for food

[1] "While we have found evidence of hunger in the sense that some people have difficulty obtaining adequate access to food, we have also found that it is at present impossible to estimate the extent of that hunger. We cannot report on any indicator that will tell us by how much hunger has gone up in recent years. .... Since general claims of widespread hunger can neither be positively refuted nor definitively proved, it seems likely that the issue of hunger will remain on our national policy agenda for an indefinite future." (Task Force Report, Chapter 5: How Much Hunger is There in America?—Conclusion, p. 39.)

[2] Two major sustained research efforts in particular during this period provided the technical basis for the direct household-level measurement of food insecurity and hunger under working definitions relevant to the U.S. context. One is the work of Wehler and colleagues, beginning with the 1983 Massachusetts Nutrition Survey and continuing with the 1985 New Haven Risk Factor Study, the initial pilot study of the Community Childhood Hunger Identification Project, or CCHIP (Wehler, 1986; Wehler, Scott and Anderson, 1991, 1992, 1995a,b). The other is the work of Radimer and colleagues in the Cornell University Division of Nutritional Sciences, including Radimer's 1990 doctoral dissertation and subsequent work at Cornell to develop and extend this approach (Radimer, 1990; Radimer, Olson and Campbell, 1990; Campbell, 1991; Radimer *et al.*, 1992; Kendall, Olson and Frongillo, 1995; Olson, Frongillo and Kendall, 1995). A third important contribution to this body of research, focusing on food insecurity and hunger as experienced by elderly persons, is Burt, 1993, and Cohen, Burt and Schulte, 1993.

insecurity and hunger in households lacking resources to obtain sufficient food, and demonstrated the practical means of creating such measures from reasonably obtainable social survey data.

During the same period, a consensus was emerging within the nutrition community over the appropriate conceptual basis for identifying and measuring U.S. hunger, viewing it as an element or consequence of a broader condition of food inadequacy associated with poverty and identified as "food insecurity." An important step in this direction had been taken by the President's Task Force in recognizing the distinction between clinical or medical definitions of hunger, on the one hand, and "hunger as commonly defined," on the other. Simply put, the medical definitions associate hunger closely with malnutrition, "a weakened, disordered condition brought about by prolonged lack of food" (Report, p. 34), identifiable from clinical indicators such as weight loss in adults and serious underweight or stunting of growth in children. By the time hunger shows up in these clinical measures, however, the condition has persisted over a long period of time. The clinical definition and measures of hunger thus do not provide sensitive indicators of food insufficiency and hunger as these are primarily experienced in the U.S. context. Nor do they respond to the policy concern to address hunger and the risk factors for hunger—especially for children—as soon as these appear, rather than only after they have persisted for extended periods at substantial levels of severity.[3]

[3] In addressing "hunger as commonly defined," the 1984 President's Task Force helped clarify the shift from an exclusively medical definition of hunger to an alternative social definition more relevant to actual U.S. conditions. The discussion also anticipates the later attention to food insecurity, recognizing that a broader condition of food problem than hunger, as such, provides the context within which resource-constrained hunger is experienced:

> *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. . . . And in this sense, we cannot doubt that there is hunger in America. This is the sad truth. 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 forgo 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, p. 36)

Two events in 1990 mark the emergence of consensus on the appropriate concepts of food insecurity and hunger relevant for the U.S. First was sponsorship and publication by the American Institute of Nutrition (AIN) of a major report prepared by the Life Sciences Research Office (LSRO) of the Federation of American Societies for Experimental Biology, *Core Indicators of Nutritional State for Difficult-to-Sample Populations* (Anderson/LSRO, 1990). The AIN/LSRO report provides authoritative definitions of food security, food insecurity, and hunger as key areas for further development and measurement. These LSRO definitions provide the basic conceptual underpinnings for the present measurement project and guided the development of its measurement objectives.

The second event noting a coming of age of food security measurement was the passage by the U.S. Congress of the National Nutrition Monitoring and Related Research Act of 1990, mandating creation of a joint plan of action by USDA and DHHS for comprehensive nutritional monitoring of the U.S. population. Subsequently, the Ten-Year Comprehensive Plan for the National Nutrition Monitoring and Related Research Program (NNMRRP) included the task assignment to:

> *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.*

Responsibility for carrying out the development of standardized measures of food insecurity and insufficiency for the U.S. is assigned under the Ten-Year Plan jointly to the Food and Consumer Service (FCS) of USDA and the National Center for Health Statistics/Centers for Disease Control and Prevention (NCHS) of DHHS. Beginning in 1992, FCS and NCHS established a federal interagency working group to carry out the assigned task, initiating the present food security measurement project. The present report represents the first major product resulting from this continuing development effort.

Food Insecurity and Hunger Measurement—Conceptual Basis

As noted, the 1990 AIN/LSRO report presents the nutrition community's understanding, gained from the research on food insecurity and hunger up to that time, and provides the conceptual basis for the present measurement project. The report defines food insecurity and

hunger in a way that clarifies the meaning of hunger, as directly experienced, spells out the relationship between food insecurity and hunger, and makes it possible to measure them both across the full range of severity of these conditions as they are experienced. Thus, the LSRO definitions of food insecurity and hunger are critical in helping define the measurement objectives of the present project. The conceptual definitions provided by the AIN/LSRO report are referred to herein as the LSRO definitions (Anderson/LSRO, 1990, p. 1598). They are:

> ***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, as the recurrent and involuntary lack of access to food which may produce malnutrition over time, is discussed as food insecurity in this report.*
>
> *Hunger, in its meaning of the uneasy or painful sensation caused by a lack of food, is in this definition a potential, although not necessary, consequence of food insecurity. Malnutrition is also a potential, although not necessary, consequence of food insecurity* (*Ibid.*, p. 1576).

These conceptual definitions are consistent with the sequence of household food conditions and behaviors revealed in the earlier research on hunger measurement. The understanding of the phenomenon of food insecurity and hunger that they present recognizes the distinction between the medical and social definitions of hunger described in the President's Task Force Report, and clarifies the relationship of hunger to less severe conditions of food insufficiency. The LSRO definitions also reflect efforts to make scientific research findings from hunger and nutrition studies more relevant and useful in the public policy arena (Habicht and Meyers, 1991) and to reduce confusion arising from multiple definitions and interpretations of the term hunger.

In this perspective, hunger has the common meaning of a physical sensation that is familiar to everyone through direct personal experience. Poverty-linked hunger, the potential object of public policy concern, is distinguished from other hunger by its primary proximate cause. The hunger identified by this definition occurs as a consequence of food insecurity, nested within that broader poverty-linked concept.[4]

The LSRO definitions clarify the relationship between the concepts of food insecurity and hunger. Hunger is a "potential although not necessary consequence of food insecurity." Recognizing this relationship opened the possibility of measuring hunger and food insecurity together, by means of a single measurement scale. In such a scale, hunger would lie in the more severe part of the range. The less severe part of the range would capture more limited food insufficiency and some of the household coping behaviors that represent responses to food insufficiency.

This idea of a coherent underlying phenomenon, varying through distinct levels of severity and revealing an orderly sequence of characteristic conditions and behaviors, provides the basis for the current measurement effort. If a comprehensive set of indicators for the various aspects of food insufficiency and associated household coping responses are found to fall in a regular, orderly sequence from recognizably less severe to more severe conditions of inadequacy, then a scaled measure is both feasible and appropriate for gauging the severity and extent of the phenomenon.

Food insecurity and hunger may also be seen as one potential facet of poverty, as manifested in this particular area of basic need. Observing the distinct conditions and behaviors that characterize food insecurity reveals the kind of economizing and coping efforts that households make in trying to manage their available resources when these are insufficient to fully cover basic needs. The identification and measurement of food insecurity and hunger may thus help provide better understanding of poverty in general. Moreover, if the observed indicators of

[4] The terminology and concept of food security and food insecurity, which originally referred to issues of community-wide food supply in lower-income countries, were found useful in describing issues of household-level food sufficiency and access in the U.S. as well. During the same period, the international literature on food security in low-income countries was also beginning to apply the concept to the household level, as a feasible and sensitive early warning indicator for potential or approaching food sufficiency problems in the general population or population subgroups. (See, e.g., Daniel G. Maxwell, *Measuring Food Insecurity: The Frequency and Severity of "Coping Strategies,"* Washington, DC: International Food Policy Research Institute, Discussion Paper #8, December 1995.)

food insecurity are surveyed and measured consistently over time, then the regular national measurement of food insecurity and hunger can provide an important supplement to the established measures of income poverty as a tool for monitoring changes over time in the well-being of the population, and differences across population subgroups.

The Hypothesis of Hunger as Severe Food Insecurity

The idea of an orderly, normal sequence of behaviors as households strive to cope with increasingly insufficient food resources, represents a central working hypothesis of the present hunger measurement project. In summary, the hypothesis is that hunger may be seen as a consequence of persistent or worsening food insecurity, appearing when the condition reaches sufficiently severe levels. Hunger is viewed as nested within the broader concept and experience of household food insecurity, and food insecurity results from an immediate lack of household income or other financial resources.

When they experience food insecurity due to limited or reduced resources, household food managers, usually mothers or female heads of household, may attempt to deal with an insufficient household food supply through a variety of coping behaviors and strategies. This management of the conditions of food insecurity may include attempts to augment household food from irregular or emergency sources, and may involve reductions in the quality and/or quantity of food available within the household. Moreover, this managed process occurs within the context of tightly constrained economic choices, likely to involve uncertainty as to future availability of adequate food. Consequently, it is identifiable in part by characteristic affective states, such as anxiety or worry about whether food or money will last, or whether more can be obtained before food supplies run out.

Under this hypothesis, if household food sufficiency declines further, efforts to manage the process eventually require reductions in food intake among one or more household members. Reduced food intake is likely to occur initially via reduced serving sizes, reduced overall meal sizes, or skipped meals. These behaviors will provide the first indication that actual hunger, "the uneasy or painful sensation caused by a lack of food," is being experienced by household members as part of the effort to manage an insufficient household food supply. In households with children, reduction of food intake is expected to occur first among adults, as they attempt to spare the children from food intake reduction.

If efforts to cope with an intensifying degree of food insecurity are not successful, reductions in food intake and hunger will also occur among children in the household. When children's hunger occurs it may be viewed as indicating a more severe condition, partly because the consequences of hunger are likely to be more damaging for children than adults, and partly because adults in the household normally will have experienced hunger for some period of time prior to the children. If household hunger persists or recurs often enough, observable signs of malnutrition will appear among either the adults or children in the household, or both (Radimer, Olson and Campbell, 1990; Radimer *et al.*, 1992; Wehler, Scott and Anderson, 1992). Before such clinical signs of malnutrition become evident, however, the quantity and nutritional quality of diets in food-insecure households will necessarily have been deficient for some extended period of time.

The central hypothesis that food insecurity and hunger represent a coherent range of conditions and experience, that these are different and distinct from the nutritional quality of diets, and that they can be directly observed and measured, is put to the test by the attempt to develop a measure that is based on the hypothesis. Other implications of the hypothesis, however, are not addressed by the measurement itself. For example, the expected relationship between food insecurity and hunger as measured in this study and the nutritional quality of diets as measured by nutritionists can be tested only after the food security measure is available for comparison with established nutritional measures. If the food insecurity and hunger measure is found to be closely correlated with dietary quality, food insecurity and hunger measures may prove useful as simple indirect indicators of the nutritional adequacy of diets. It will be important for future research to explore the exact nature of the interrelationships among poverty-linked food insecurity, hunger, and malnutrition.[5]

The Role of Food Security Measurement

Reliable measures of food insecurity and hunger and consistent estimates of their prevalence in the population can meet the needs of policymakers in designing and directing effective policies and programs to address these conditions. Although considerable progress

[5] Several research studies have demonstrated the link between food insufficiency as experienced and nutritional inadequacy of diets. A recent example is D. Rose and V. Oliveira, "Nutrient Intakes of Individuals from Food Insufficient Households in the United States," *American Journal of Public Health* (forthcoming).

occurred during the past decade in developing technically sound, scientifically-grounded methods to measure food insecurity and hunger, accurate national measures from which consistent prevalence estimates could be derived have not been available. Inclusion of the goal to develop such measures in the ten-year comprehensive plan for the NNMRRP reflected the widely-held view within both the social policy and scientific communities of the importance of the food security of the nation's population. As a result, designing a survey instrument for collecting national data on food security and applying state-of-the-art measurement methods to create reliable and consistent national benchmark measures was identified as an explicit objective of national policy.

Accurate measurement of these conditions on a consistent basis from year to year is expected to provide a valuable tool for administrators and policymakers at several levels, state and local as well as national. Such measures can help identify those segments of the population most in need, assess the impacts of changing economic conditions and public programs on this basic element of well-being, and monitor the success of efforts to reduce poverty-linked hunger over time. For these uses, the most important aspect of the measures is their degree of reliability and consistency: the measures should provide the ability to track year-to-year changes in food insecurity and hunger at several specified, well-defined levels of severity, and provide a reliable set of standard national benchmark measures for consistent application and comparison with equivalent state and local measures.

From the standpoint of sound measurement method, the foremost concern is that the measures of food insecurity and hunger that are developed yield valid and reliable descriptive statements about the existence and extent of the phenomenon. The food security measurement project cannot determine the causes of food insecurity, nor whether its existence is a serious social problem requiring a policy response. Those judgments will be made by policymakers, advocates, and the general public. Results from the consistent and reliable measurement of food security can, however, be expected to help inform and strengthen those judgements. In the remainder of this chapter, we summarize some of the considerations contributing to incorporation of food security measurement into the national policy agenda.

Child and Adult Health Considerations. Economically, a well-prepared work force is essential to America’s success in the rapidly changing global economy. Sound physical and mental health are key factors in providing the skilled, well-educated workers demanded by

increasingly technical service-oriented domestic labor markets. Good nutrition throughout the life cycle, but especially during childhood, is a necessary prerequisite for successful physiological and cognitive development and maintenance of sound health (Munro, Suter and Russell, 1987; Duncan, Brooks-Gunn and Klebanov, 1994; Pollitt, 1994; Frazão, 1995; Kretchmer, Beard and Carlson, 1996).

Evidence from recent research in child development indicates that school performance, cumulative educational achievement, and mastery of skills are affected both by physiological factors related to adequate nutrient intake and by factors related to food security and sufficiency of food intake (Pollitt, 1994). In addition to detrimental effects on physical growth and cognitive development resulting from chronic or severe undernutrition, serious cumulative deficits also accompany chronic lack of access to adequate food (Pollitt, Leibel and Greenfield, 1981; Meyers *et al.*, 1989). Simple hunger—"the uneasy or painful sensation caused by a lack of food"—can interfere with a variety of behaviors necessary to successful learning—e.g., concentration, ability to maintain the focus of one's attention, achievement motivation, and inclination toward physical activity.

Young children especially need frequent intake of nutritionally adequate food to maintain food energy stores needed for effective activity. A child's small liver size relative to total body mass limits its capacity to store sufficient glycogen for ready conversion to energy over extended time periods. Therefore, children need to eat more frequently and regularly than adults to maintain needed levels of available energy. Moreover, most nutrient requirements increase dramatically during periods of rapid growth, further amplifying the importance of adequate nutritious food for overall healthy growth and development.

The concept of "sentinel groups," as applied to disease and nutrition surveillance systems, is prominent in public health. Sentinel groups can be predictive of future events or conditions, and are often selected for monitoring as a result. Such groups have characteristics that make them likely to be the first in the population to contract a disease or suffer from malnutrition (Anderson/LSRO, 1990, pp. 1574-1575). Knowledge of changes in conditions among sentinel groups can often enable policymakers and health officials to implement responses that help avoid widespread occurrence of more costly diseases or conditions. Food-insecure households may comprise a sentinel group in which hunger, undernutrition, and poor health are

more likely to occur (Munro, Suter and Russell, 1987; Wehler, Scott and Anderson, 1992; Pollitt, 1994; Frazão, 1995; Wehler, Scott and Anderson, 1995a,b).

Several surveys included in the NNMRRP provide information on food intake and undernutrition. The emergence of nutrient deficiencies over time, however, implies that households in which affected individuals reside are likely to have experienced what is now understood to be a progression through worsening levels of food insecurity. In this view, hunger and undernutrition are understood to occur at the more severe levels of food insecurity, whereas serious nutrient deficiencies are likely to occur only after chronic food insecurity with hunger has been experienced. The progressive and nested nature of hunger and undernutrition within food insecurity thus make measures that identify the entire range of food insecurity valuable as sensitive leading indicators for more serious health consequences. Thus, accurate and reliable measures of food insecurity at its various levels of severity will provide valuable information for informing and guiding national and state policies.

Conclusion

The new CPS food security data, and the standard measurement method for severity and extent of food insecurity based on the data, are expected to provide useful resources for research into the causes and consequences of food insecurity and hunger. The subject area of food security poses challenges and opportunities for researchers, particularly because of the overlap between public health and nutrition concerns, on the one hand, and concerns of general poverty policy, on the other. The food security measures provide new information relevant to both these fields, and to the relationship between them. The utility of the new data and measurement for research, however, is only a secondary reason for obtaining them. The primary purpose is to provide a broad new assessment and monitoring tool for policymakers and administrators of government food assistance programs at all levels.

Chapters Two through Four of this report describe the operational measurement concepts, survey questionnaire design, food security data collected, and the analytic procedures used in developing a measurement scale. Chapter Five presents the initial prevalence estimates for food insecurity and hunger in the United States resulting from the new measure. Chapter Six discusses the reliability and limitations of the measure.

More detailed explanation and documentation of the methods used in developing the food security measure are presented in the companion volume to the present report (Hamilton *et al.*, 1997).

CHAPTER TWO

THE FOOD SECURITY SUPPLEMENT TO THE CURRENT POPULATION SURVEY

This chapter briefly describes the development of the Food Security Supplement questionnaire and the subsequent data collection effort undertaken for USDA by the U.S. Bureau of the Census as a part of the Current Population Survey (CPS) for April 1995. The chapter includes a short description of the 1994 Food Security Measurement and Research Conference that preceded development of the national-level food security questionnaire for use in the CPS. The final survey instrument that emerged from this conference and the subsequent development process is described, as are the basic CPS sample and the Food Security Supplement subsample.

The Food Security Measurement and Research Conference

The Food Security Supplement instrument is based upon a synthesis of tested material reported from earlier research. Initial consensus on the content of the instrument for national use was attained during the January 1994 Food Security Measurement and Research Conference convened jointly by FCS and the National Center for Health Statistics (NCHS) of the Centers for Disease Control and Prevention. The conference was attended by nearly 100 professionals with direct experience in areas related to nutrition, health, economics of food consumption, food security policy, and hunger measurement. This working conference included presentations by the authors of the primary research related to food insecurity and hunger measurement over the previous decade.[1] The second half of the conference was devoted to identifying a consensus (with the aid of professional facilitators) among participants regarding the optimal content and form of a food security survey instrument for application at the national level.

Several key issues that had been insufficiently addressed by earlier work needed to be clarified before the LSRO conceptual definitions could be adapted for national data collection. The resolution of these issues by FCS, conference participants, and a federal interagency working

[1] Transcripts of the presentations and discussion from this conference, with background papers and participant list, were published in a volume entitled “Food Security Measurement and Research Conference: Papers and Proceedings," USDA FCS, Office of Analysis and Evaluation, June 1995).

group on food security measurement, led to the measurement approach implemented in the current study.[2] The key issues were:

- How to treat aspects of food insecurity that are not necessarily caused by a lack of adequate household income, but are relevant for households at all income levels (e.g., food safety concerns). The decision was to limit the current measure to clearly poverty-linked or resource-constrained food insecurity and hunger.

- Whether to limit operational definitions to only those aspects of food security that can be captured in household-level surveys. It was agreed that the FCS effort should limit its measurement approach to the household. It was noted that agencies involved in collecting individual-level data might develop complementary approaches for measuring food insecurity at the specific individual level, whereas issues of community food security would require a different data collection strategy and orientation, outside the scope of the present effort.

- Whether indicators of nutritional adequacy would be incorporated into the operational definition and measurement of food security. The decision was to focus on the behavioral and experiential dimensions of food insecurity and hunger, which were seen as the major gap in existing information and an essential component for policymakers.

- How to estimate the prevalence of food insecurity and hunger from the resulting data. Participants agreed on the desirability of scaling items into a single measure across all observed levels of severity of the phenomenon being measured, if feasible, and to develop a standard set of prevalence estimates at several designated levels of severity for consistent application and comparison across data sets from year to year.

During the year following the Food Security Measurement and Research Conference, the national survey questionnaire underwent extensive further development, testing, and refinement. Participants in the conference working sessions and the federal interagency working group continued their contributions to this work, along with survey method specialists from the Census Bureau's Center for Survey Methods Research (CSMR). The revised survey instrument resulting from this development process was field-tested by the Census Bureau in August 1994 with approximately 600 regular CPS sample households. These field test results were analyzed

[2] The measurement approach and its background in the research literature are described in Bickel, Andrews and Klein, 1996. Participants in the Federal Interagency Working Group on Food Security Measurement are listed in Appendix G.

by CSMR, and the instrument was further refined to incorporate a number of subsequent CSMR recommendations.

The final version of the food security questionnaire was administered by the Census Bureau as a supplement to its regular April 1995 CPS. In its final form, the questionnaire contained 58 items intended to identify three levels of severity of food insecurity, including two levels involving hunger on both a 12-month and a 30-day basis.

Questions in the Food Security Supplement

The questions in the food security questionnaire can be grouped into eight subject areas, as summarized in Exhibit 2-1. The items in Part I are included primarily for the purpose of helping validate the food security and hunger measures developed. Items in Part II are included for assessing program impacts on food insecurity and hunger. Questions in Parts III-VIII were designed to reflect the full observed range of severity of U.S. household food insecurity and hunger, and to provide potential indicator items for inclusion in scale development analyses.

Two additional dimensions are embodied in the candidate scale items in Parts III-VIII of Exhibit 2-1. All questions are asked of an adult respondent, usually the household member with greatest knowledge of the household's food shopping and consumption, and relate generally to the household unit as a whole. Some questions ask specifically about conditions or circumstances of the respondent, others ask about the adults generally in the household, and some ask about the children generally (in households where children are present). Thus, items can be classified as "Household," "Adult," or "Child" items.

In a second important distinction, all questions relate to one of two separate time frames: the past 12 months or the past 30 days. Some 12-month items are followed by subsequent items asking how often, or in how many months, a condition occurred during the past 12 months. Similarly, several 30-day questions have follow-up items asking how often, or in how many days, a condition occurred during the previous 30 days. A few questions form four-item sequences following the pattern: (i) "did it ever occur within the past 12 months?," (ii) "if so, in how many months did it occur?," (iii) "did it occur within the past 30 days?," and (iv) "if so, on how many days did it occur?"

Both the adult-child and time dimensions of the items are conceptually related to aspects of the hypothesized managed process of household efforts to cope with food insufficiency, as

Exhibit 2-1

SUMMARY OF FOOD SECURITY SURVEY ITEMS BY SUBJECT AREA

Description of Survey Item Part	Items in Each Part
Part I: Weekly household food expenditures by place of purchase	(Eight items) Q1 - Q8
Part II: Food assistance program participation by type of program	(Eight items) Q9, Q9A - Q9G
Part III: USDA and NHANES-III food sufficiency items, and follow-up	(Four items) Q11A, Q11, Q12, Q13
Part IV: Existence of conditions requiring food-insufficiency coping behaviors	(Three items) Q15 - Q17
Part V: Household food-supply-augmentation coping behaviors	(Six items) Q18 - Q23
Part VI: Adult food intake reduction items	(15 items) Q24 - Q39
Part VII: Child food intake reduction items	(13 items) Q40 - Q52, Q57
Part VIII: Radimer-scale food sufficiency items (adult and child food quality and quantity concerns)	(Six items) Q53 - Q58

described in Chapter One. Research evidence had shown that when hunger emerges in food-insecure households it usually appears first among adult members, affecting children only at more severe levels.[3] Thus, items addressing aspects of food-intake sufficiency for adults and for children separately can provide a basis for measuring household food insecurity across differing levels of severity.

Several types of periodicity have been observed in studies of household food insufficiency and hunger.[4] Food insecurity at the less severe levels is expected to be more chronic in nature and less subject to this periodicity. For example, concerns about the adequacy of household food supplies may persist for some time after a household experiences inadequate

[3] Radimer, 1990; Radimer *et al.*, 1992; Wehler, Scott and Anderson, 1992; Olson, Frongillo and Kendall, 1995.

[4] See, for example, transcriptions of presentations by John Cook, Valerie Tarasuk, and Janet Fitchen included in "Food Security Measurement and Research Conference: Papers and Proceedings," USDA FCS, June 1995.

food supplies. Hunger is a more acute condition, however, and in the U.S. context is more likely to occur only periodically within households. For example, hunger may occur at the end of month, when household food resources are depleted, but then subside after paychecks, food stamps, or transfer payments are received. The two time periods addressed by survey items (12 months and 30 days) and follow-up items regarding frequency of occurrence are designed to capture some part of this periodic aspect of food insecurity.

The Current Population Survey Sample

The Food Security Supplement was first fielded as a part of the April 1995 CPS. The CPS is a nationally-representative monthly survey conducted by the Bureau of the Census in approximately 58,000 households throughout the U.S. The CPS is a probability sample based on a stratified sampling design. The overall sample is selected from lists of housing unit addresses obtained from the most recent decennial census, and updated for new construction.[5]

The CPS sample is a state-based design, with primary sampling units (PSUs), consisting of counties or groups of counties, selected in an initial sampling stage. The PSUs are grouped into strata, with all strata defined within state boundaries. The sample is allocated among the states to produce both state and national estimates with the required reliability, while keeping total sample size to a minimum.[6] Each stratum consists of one or more PSUs, with one PSU chosen for the sample from within each stratum with probability proportional to its population as of the most recent decennial census.

In a second step, a sample of addresses is obtained within each sample PSU. Most addresses are selected from census lists in a single stage within the selected PSU, although for a relatively small proportion a second stage of selection is necessary. This two-step process is roughly equivalent to a simple sampling plan of dividing each state into ultimate sampling units

[5] This brief summary of the CPS sample is based on documentation provided to users of the CPS public use data tapes. For more detail, see the U.S. Department of Labor, Bureau of Labor Statistics, "Redesign of the Sample for the Current Population Survey," *Employment and Earnings* 41(5): 7-10, May 1994.

[6] The magnitude of standard errors of state-level estimates produced from CPS data are related to the size of each state's population. Therefore, estimates for states with large populations will be more reliable and stable over time than those for states with smaller populations. In general, state-level estimates for the ten to twelve states with largest populations are fairly stable, whereas those for the other states may vary considerably from year to year due to greater sampling error and larger standard errors.

(USUs), each containing about four neighboring housing units, and selecting cluster samples of these USUs for the interview.

The variables used for stratification within each state derive from the principal uses of the CPS in providing reliable data for estimating labor force participation and characteristics. The same stratification variables are used in all states, and include employment and unemployment statistics by male, female, and total population; employment by occupation; change in population; racial and ethnic composition of population; and other variables.

Each CPS sample is divided into eight approximately equal rotation groups, with each group interviewed for four consecutive months, dropped out for eight months, then brought back in for four more consecutive months before being permanently retired. This "four months in—eight months out—four months in" rotation leads to improved reliability of estimates of month-to-month and year-to-year changes.

The weights for all interviewed households in the CPS sample are adjusted to account for occupied households for which no information could be obtained. Some reasons for non-interview include absence, impassable roads, refusals, or unavailability for other reasons. If a respondent is reluctant to participate in the CPS, the interviewer informs the regional office staff, and a follow-up letter is sent to the household with a fuller explanation of the CPS. If this procedure fails to achieve participation, a supervisory field representative recontacts the household and attempts to obtain participation through efforts to accommodate the respondent's concerns. The CPS non-interview rates range around 5-6 percent monthly.

The CPS Food Security Supplement Sample

Approximately 53,700 households completed the April 1995 basic CPS questionnaire, and were invited to answer the Food Security Supplement. Of these, 44,730 households completed the supplement, implying a non-interview rate of 16.7 percent below the basic CPS sample. The respondents completing the supplement included households at all income levels, both above and below the federal poverty thresholds. Special weights were computed to adjust the final supplement sample for the demographic characteristics of supplement non-interviews.

The Food Security Screener. The complete Food Security Supplement instrument was administered to all households with incomes at or below 185 percent of the federal poverty level for the 12 months prior to their entry into the CP sample. This is the income-poverty threshold

used in determining eligibility for some federal assistance programs (e.g., WIC and reduced-price school lunch and breakfast programs). All households with incomes below this level received all parts of the questionnaire.

Preliminary analyses of NHANES-III data had indicated that some households with annual incomes above 185 percent of poverty may have experienced food insufficiency sometime during the period covered by that survey (1988-94), based on their responses to food sufficiency items included in the NHANES questionnaire. To reduce the risk of screening out any currently food-insecure households with prior-year annual incomes above 185 percent of poverty, three additional routes for passing through the screener were included for higher-income households. These were: (1) reporting sometimes or often not having enough to eat on either of the two versions of the food sufficiency question (Q11A, or Q11 and Q12); (2) a combined answer pattern indicating the possibility of (low-severity) food insecurity (Q15 - "did you ever run short of money and try to make your food or food money go further?" plus reporting "enough but not the kinds of food wanted" in Q11A or Q12); and (3) an affirmative answer to Q16 - "did you ever run out of the foods that you needed to make a meal and didn't have money to get more?"

Of the 44,730 households that completed the Food Security Supplement, a total of 18,453 households passed this screener and were asked the full battery of food security and hunger questions. This group comprised the preliminary analysis sample for developing the food security scale. These included 15,662 households with incomes below 185 percent of poverty and 2,791 households with higher incomes. Initial analyses determined that an additional 83 households lacked responses on some important items, and these were dropped from the sample. This created a final analysis sample of 18,370 households used in the development of the measurement scales for food insecurity and hunger.

To allow assessment of reliability of the measurement scales and their invariance across different household types, the analysis sample was randomly subdivided into four subsamples. Initial scale development analyses and modeling were implemented using one of these subsamples, with the remaining three preserved for use in reliability and invariance testing. The Food Security Supplement sample is shown by household type in Exhibit 2-2.

Exhibit 2-2

DESCRIPTION OF THE FINAL FOOD SECURITY SUPPLEMENT SAMPLE BY TYPE OF HOUSEHOLD

	Household Type		
	Households with Children	**Households with Elderly and No Children**	**Households with No Elderly or Children**
Number of households in the population	38,232,774	27,851,187	34,354,945
Proportion of households in the population	38.1%	27.7%	34.2%
Number of households in the sample (total: 44,730)[a]	16,954	12,503	15,273
Proportion of households in the total sample	37.9%	28.0%	34.1%
Number of sample households passing the screener (total: 18,453)	7,998	5,731	4,724
Proportion of sample households passing the screener	43.3%	31.1%	25.6%

[a] Households completing the survey. Of those respondents completing the Supplement, 83 provided incomplete information on food security items and were dropped from the final analysis sample.

CHAPTER THREE

THE FOOD SECURITY MEASUREMENT SCALE

The questions included in the CPS Food Security Supplement were designed to represent the full range of severity of food insecurity and hunger as experienced in U.S. households, in order to allow the development of a comprehensive food security measurement scale. The purpose of such a scale is to combine a household's answers to many survey questions into a single measure of the severity of food insecurity and hunger, where the household's score on the measurement scale indicates the level of severity of food insecurity it has experienced. This chapter describes the two scales that have been developed. One measures the full range of food insecurity and hunger on a 12-month basis; the other focuses on only the more severe conditions of reduced food intake and hunger measured on a 30-day basis.

Scale Development

The process of developing, refining, and testing the scales occupied nearly a year, from the autumn of 1995 through the summer of 1996. The methods used and results obtained are summarized briefly below and described more fully in the study's technical report (Hamilton *et al.*, 1997).

Each of the questions considered as candidates for the food security scale refers explicitly to either the 12-month or the 30-day time frame. After early descriptive and exploratory analyses, these two groups of questions were separated, and distinct models were estimated for the 12-month and 30-day periods. The procedures described below apply generally to both the 12-month and the 30-day models, although the 12-month scale will be the main focus of the following discussion.[1]

Linear Analysis. Exploratory analyses were first conducted using linear factor analysis methods. This analysis phase was principally devoted to replicating analyses reported in the existing literature to determine whether the findings of prior research were applicable to the national population-level CPS data. These analyses focused on households with children, which were asked all questions in the Food Security Supplement. Results showed general conformity with previous

[1] The companion Technical Report volume provides a description of the 30-day scale and presents estimates of the prevalence of hunger within the 30-day period.

research. Analyses suggested that either a one- or two-factor model would best fit the data in linear models.

Exploratory Non-linear Analysis. Because most questions in the Food Security Supplement are asked in dichotomous or categorical form, a non-linear factor analysis model was considered best suited to the structure of the data. Exploratory analyses were conducted, fitting a series of alternative models to determine whether a single- or multi-factor model would best fit the data. Results indicated the unidimensional model to be most appropriate. Thus, the results support the hypothesis that the severity of food insecurity and hunger can be validly viewed as a single continuous dimension, along which various aspects of household food sufficiency and food management behaviors are arrayed.

Preliminary Model Estimation. The statistical approach chosen was the Rasch model, a concise one-factor non-linear Item Response Theory (IRT) model that was fit to the CPS data using a specialized software package.[2] Using a one-fourth random subset of the CPS data, a preliminary model was fit for the subpopulation of households with children within that one-quarter sample. The model was refined iteratively. Fit statistics were examined for each question in the candidate set, items that failed to meet threshold criteria were discarded, and the model was re-estimated with the new candidate list.

Tests for Invariance. The model estimated for households with children was then estimated separately for two other groups: households without children but with one or more elderly members, and households with neither children nor elderly members. A high level of correspondence was found among the models fit to the three separate household types, indicating that food security and hunger could be measured for all three populations using the same scale. A single model was therefore estimated for the full sample population, combining all three household types.

Tests for Robustness. The preliminary model estimated with the one-fourth subsample was then fit to the remaining three one-fourth partitions of the sample. Essentially identical results were found for all subsamples, which indicates that the model should be stable across repeated samples of households. The model was therefore re-estimated from the entire CPS sample.

[2] IRT describes a general type of measurement model developed by the educational testing industry for use in developing and scaling tests such as aptitude tests. IRT models provide a way to measure the overall ability level of an individual being tested, based on widely varying difficulty of particular questions, and on the individual's overall pattern of response to the entire set of questions.

Tests for Reliability. A variety of statistical tests for reliability were performed, including tests specific to the Rasch model and several tests commonly used for scales developed through linear analyses. Tests indicated quite good reliability for the 12-month scale and moderate reliability for the 30-day scale (Hamilton *et al.*, 1997).

12-Month and 30-Day Scales

Although food security measurement scales were developed for both the 12-month and 30-day time frames, this report gives primary emphasis to the 12-month scale, which is considered the more broadly useful measure.

The difference between questions asked in the 30-day time frame and the parallel 12-month questions is solely a matter of calendar timing. The 12-month questions ask whether the household experienced a particular condition at any time during the year ending in April 1995, whereas the 30-day questions ask whether those conditions that were experienced during the year also were experienced during the 30-day period prior to the survey.[3] The questions do not differ in the severity of the condition they measure, but because of this difference in time periods, one would expect to find more positive responses to the 12-month questions than to their parallel 30-day versions, and the data bear out this expectation.

The questions included in the 12-month scale differ substantively from those in the 30-day scale in one important respect. A number of questions about less severe food insecurity conditions (for example, whether the respondent worried that the household would run out of food before getting money to buy more) were asked in the 12-month time frame but not the 30-day frame. The 12-month scale is therefore able to describe a broader range of food insecurity conditions. This makes the 12-month scale better suited to a number of policy and research purposes, and also gives it stronger statistical properties.

[3] More precisely, the questions refer to the time period ending on the day of the interview, which occurred during the period April 16-22, 1995.

The remainder of this volume accordingly focuses mainly on the 12-month scale. As noted above, details on the 30-day scale are presented in this study's technical report.

Questions Used in the Scale

All 12-month questions in the Food Security Supplement were tested for possible inclusion in the scale.[4] Most candidate questions met the statistical criteria for inclusion in the final version of the model. Exhibit 3-1 lists the questions that are included, showing them in the order in which they appear in the questionnaire.

The questions included in the scale capture four kinds of situations or events. All are related to the general definition of food insecurity presented earlier, which includes a psychological dimension as well as qualitative and quantitative aspects of food supply and food intake. The four kinds of situation are:

- Anxiety or perception that the household food budget or food supply was inadequate (Q53, Q54)
- Perceptions that the food eaten by adults or children was inadequate in quality or quantity (Q32, Q55, Q56, Q57, Q58)
- Reported instances of reduced food intake, or consequences of reduced intake (such as feelings of hunger or reported weight loss) for adults in the household (Q24, Q28, Q35, Q38)
- Reported instances of reduced food intake, or its consequences, for children (Q40, Q43, Q47, Q50)

A number of the questions in the CPS Supplement did not fit the 12-month model, and are therefore not included in the measurement scale. Three of the excluded questions indicate relatively less severe conditions of food insecurity, such as concerns about the adequacy of the

[4] Specifically, those considered were the 12-month questions in the series from Q15 through Q58 (see Appendix A). The response frequencies for the 12-month and 30-day questions in this sequence are shown in Appendix B.

Exhibit 3-1

QUESTIONS INCLUDED IN THE FOOD SECURITY SCALE

Question Number	Question
24, 25	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? How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?
28, 29	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? How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?
32	In the last 12 months, did you ever ***eat less than you felt you should*** because there wasn't enough money to buy food?
35	In the last 12 months, were you ever ***hungry but didn't eat*** because you couldn't afford enough food?
38	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?
40[a]	In the last 12 months, did you ever ***cut the size of any of the children's meals*** because there wasn't enough money for food?
43[a], 44[a]	In the last 12 months, did any of the ***children ever skip a meal*** because there wasn't enough money for food? How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?
47[a]	In the last 12 months, were the ***children ever hungry*** but you just couldn't afford more food?
50[a]	In the last 12 months, did any of the ***children ever not eat for a whole day*** because there wasn't enough money for food?
53	"I ***worried whether our food would run out*** before we got money to buy more." Was that often, sometimes, or never true for you in the last 12 months?
54	"The ***food that we bought just didn't last***, and we didn't have money to get more." Was that often, sometimes, or never true for you in the last 12 months?
55	"We ***couldn't afford to eat balanced meals."*** Was that often, sometimes, or never true for you in the last 12 months?
56[a]	"We ***couldn't feed the children a balanced meal*** because we couldn't afford that." Was that often, sometimes, or never true for you in the last 12 months?
57[a]	"The ***children were not eating enough*** because we just couldn't afford enough food." Was that often, sometimes, or never true for you in the last 12 months?
58[a]	"***We relied on only a few kinds of low-cost food to feed the children*** because we were running out of money to buy food." Was that often, sometimes, or never true for you in the last 12 months?

[a] Question asked only of households with children.

food budget or food supply, or adjustments to the type of food served.[5] Although these particular questions were excluded, this range of comparatively less severe food insecurity experience is captured by other questions that did meet the statistical goodness-of-fit criteria for inclusion in the model.

The other five excluded questions ask about actions that a household might take to cope with food insecurity by seeking external food resources (examples are borrowing food or money for food from friends or relatives, or getting meals at soup kitchens).[6] These "resource augmentation" questions have a peculiar relationship to food insecurity. On the one hand, they represent household responses to a situation of food insecurity, and thus provide conceptually valid indicators of the existence of the condition: households that are food secure are not expected to take such actions. On the other hand, a household that successfully augments its food resources may thereby become less food insecure, so these indicators do not fit well in scales measuring the severity of the condition. Probably because of the complicated nature of their relationship to food insecurity, the resource augmentation or coping questions did not meet the statistical criteria for inclusion in the food security measurement model.

All questions are entered in the models in dichotomous "yes/no" form. Three follow-up questions in the 12-month series ask whether a situation occurred "almost every month, some months but not every month, or in only 1 or 2 months." These questions were recoded to combine the first two response categories into "three or more months."[7] Questions 53-58 ask the respondent whether the condition was "often, sometimes, or never" true in the past 12 months. The first two of these response categories are combined into "sometimes or often."

[5] These were Q15 ("Did you ever run short of money and try to make your food or your food money go further?"); Q16 ("Did you ever run out of the foods that you needed to make a meal and didn't have money to get more?"); and Q20 ("Did you ever serve only a few kinds of low-cost foods—like rice, beans, macaroni products, bread or potatoes—for several days in a row because you couldn't afford anything else?").

[6] The specific questions are Q18 (get or borrow food from friends or relatives); Q19 (children eat at home of friends or relatives); Q21 (put off paying bills); Q22 (get food from church or food pantry); and Q23 (get meals at soup kitchen).

[7] The other category, "less than three months," is coded to include respondents that answered negatively to the base question.

Relative Severity of Questions in the Scale

The analytic software that estimates the measurement scale computes an "item calibration" value for each question included in the scale. The item calibration score indicates the relative severity of the food insecurity or hunger condition represented by each question.[8] Exhibit 3-2 illustrates the pattern of relative question severity. Questions representing less severe levels of food insecurity and hunger are located at the bottom of the chart, and those measuring more severe levels are at the top. Questions that are grouped closely together can be considered to represent approximately the same level of severity of food insecurity and hunger.

The pattern of question severity reflects the three progressive stages of food insecurity that previous research has found for households with children. The first stage involves adjustments to the overall household food budget and to patterns of food acquisition and use. In the second stage, adults reduce food intake while generally protecting the children's intake levels. The third stage involves reductions in food intake for children as well as more pronounced reductions for adults.

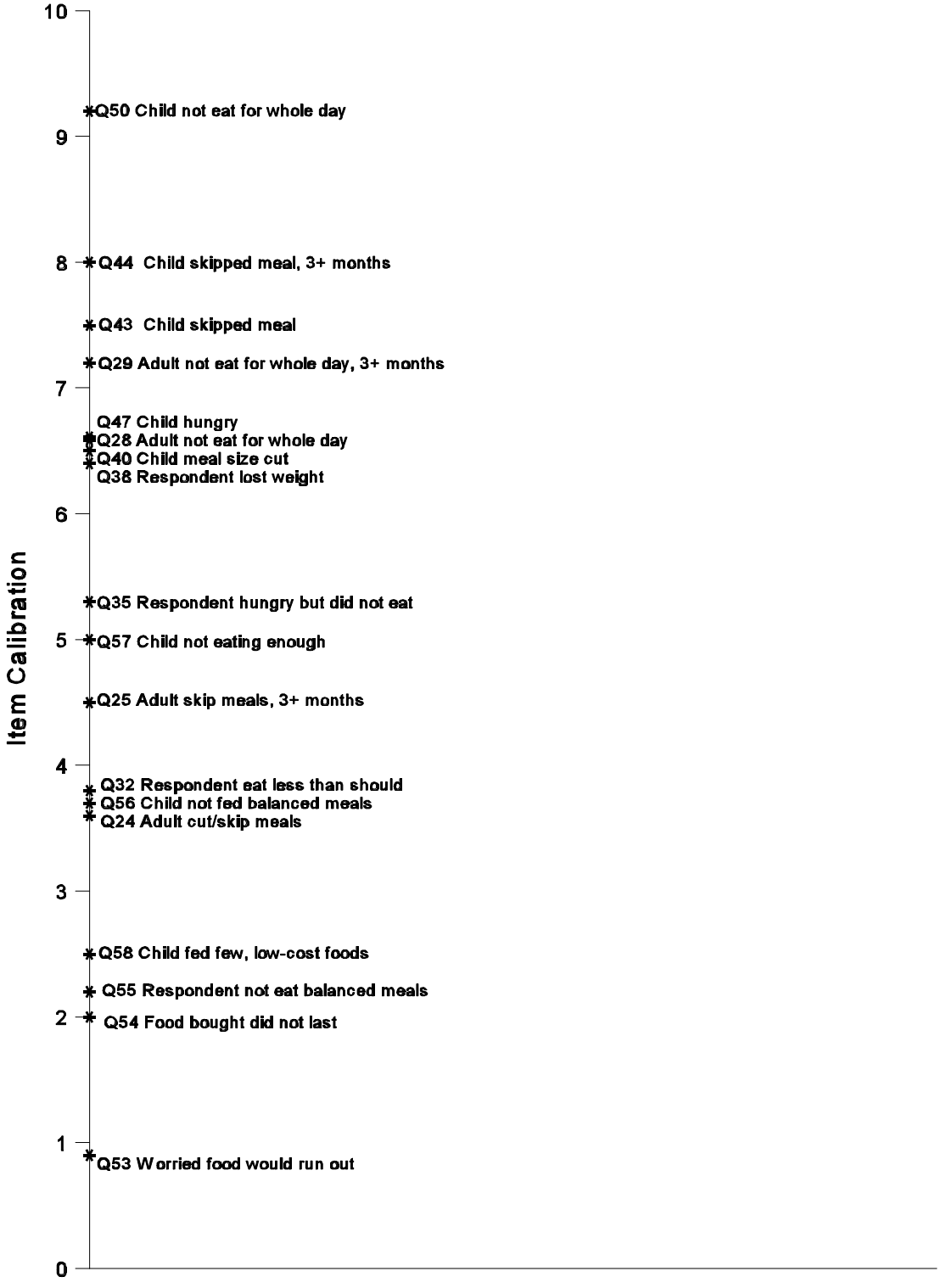
The item calibration scores generally correspond to this pattern. The least severe questions reflect concerns about the food supply and adjustments to the kind and quality (but not the amount) of food eaten. The most severe questions indicate reduction of children's food intake or drastic reductions in adult intake (not eating for a whole day). In between lie the questions indicating reductions in adult food intake.

Some overlap in item calibration scores, or severity, exists in the groups of questions. For example, the least severe child-oriented questions in the scale (Q58 and Q56) occur quite early in the severity sequence, whereas the most severe adult-oriented question (Q29) occurs at quite an advanced point in the sequence. This suggests that the movement between stages does not occur as abrupt or uniform behavior shifts, but as graduated adjustments that are likely to differ from household to household.

[8] In educational testing, the item calibration is considered to describe the relative difficulty of questions in a test. The item calibration score for a particular question depends on the overall response pattern by all the persons initially taking the test (i.e., when the "test is calibrated") and is based on the probability that households with a given value (overall test score) on the scale answer the question affirmatively. Households with scale value equal to the item calibration are predicted to have a 50 percent chance of answering the question affirmatively.

Exhibit 3-2

SEVERITY RANKING OF QUESTIONS IN FOOD SECURITY SCALE



Note: Item calibrations show relative severity of questions from 0.9 (least severe) to 9.2 (most severe).

Household Values on the Scale

The scaling model also assigns to each household a value on the scale. The household value is based on the number of questions the respondent answers affirmatively, adjusted for the number and relative severity of the questions the respondent answers.[9] Among households that answer the same set of questions, those that give more affirmatives have higher values on the scale.

The analysis indicates that household response patterns are largely ordered. That is, a household that answers a particular question affirmatively tends to affirm all less severe questions as well. It is appropriate to characterize households with *n* affirmative responses as having affirmed the *n* least severe questions, because that is the single most common, or modal, pattern.[10]

The vast majority of households have the lowest possible value on the scale (a scale score of zero), indicating that they did not respond affirmatively to any food insecurity or hunger questions. Many of these households were screened out because their incomes were above 185 percent of the poverty level and they gave no indication of food insecurity in the preliminary screener questions; such households amount to about 40 percent of all respondents. Another large group of households passed the screen and were asked all food insecurity questions, but responded negatively to all of them.

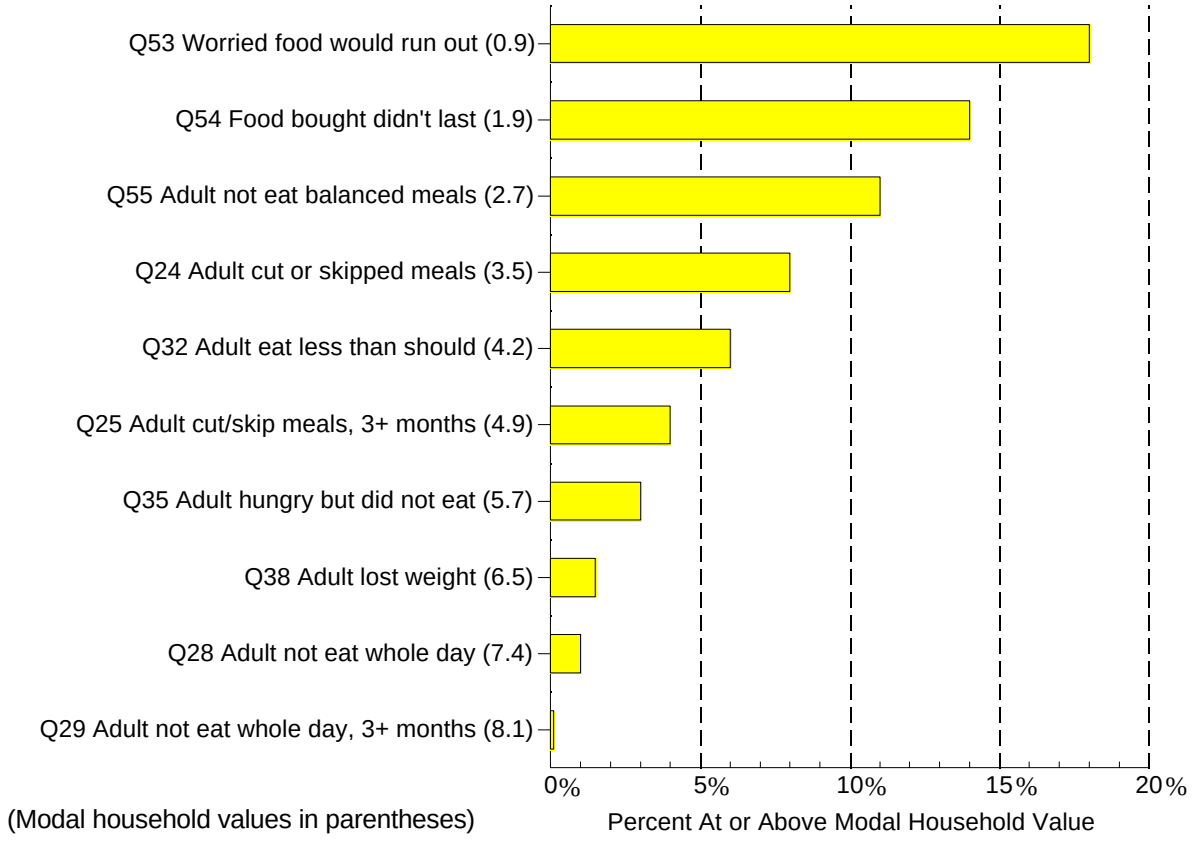
Thus, 82 percent of all households surveyed had the lowest possible value on the scale. The other 18 percent answered at least one question affirmatively and therefore have values above the minimum. The proportion of households at each successively greater level of severity declines rapidly, as indicated in Exhibit 3-3. The exhibit shows the percentage of the sample with household values at or above selected levels. The selected levels are the modal household values associated with each non-child question in the scale—that is, each question that is applicable to all

[9] The adjustment is necessary because all respondents do not answer all questions. Eight of the 18 questions in the 12-month scale are asked only to households with children. In addition, a few respondents simply fail to respond to some of the questions they are asked.

[10] Most households follow the modal pattern in their responses to the scaled questions, but not all households do. For example, a household with *n* affirmative responses may answer negatively to one of the less severe questions (i.e., less severe than the *n*th question), but answer affirmatively to one of the more severe questions. Such a household would have the same value on the scale as a household following the modal pattern. Households without children whose responses exactly follow the modal pattern amount to 82 percent of all households without children in the sample.

Exhibit 3-3

POPULATION DISTRIBUTION BY SELECTED HOUSEHOLD SCALE VALUES



households with or without children. For each question in sequence, the modal household value is the scale value assigned to all those households that said "yes" to that specified question and to all less severe questions, but that said "no" to all the more severe questions. The chart can thus be read as indicating the percent of households that answered affirmatively to the specified question and to all less severe questions.

About 18 percent of the sample households have scale values above the minimum, as indicated in the top bar on the chart. Only 8 percent have scale values at or above the level corresponding to the first direct indicator of reduced food intake (Q24). Just 0.1 percent have scale values in the highest range shown on the chart, associated with adults repeatedly not eating for a whole day (Q29).

Overview of Scale Development Results

In summary, the food security scale has three key properties. First, it captures multiple facets of food insecurity within the single dimension of relative severity, an important exception being resource augmentation actions that households take to address food insecurity.[11] Resource augmentation aside, the analysis indicates that food insecurity and hunger can be viewed as a unidimensional phenomenon that increases in severity from essentially no food insecurity up through the most severe level measured in the U.S. context.[12]

Second, the relative severity of the questions that make up the scale conforms well with past research. The severity ranking is quite consistent with the concept of food insecurity and hunger as a managed process, going through distinct behavioral stages that first involve the household budget and food use patterns, then the reduction of adult food intake, and finally reductions in the food intake of children in the household.

Finally, a relatively small proportion of survey respondents is seen to have any measurable level of food insecurity or hunger. This is the expected result in a survey representing the entire U.S. population. The proportion diminishes rapidly at higher, more severe levels of the scale.

[11] Other dimensions of food insecurity included in the LSRO conceptual definition, such as nutritional inadequacy of diets, problematic food safety, and food access problems apart from the household's own resource limitations, are not intended to be captured in the present measurement of food insecurity.

[12] A measurement scale developed for use in economically less-developed countries would be expected to include conditions more severe than those incorporated here, such as severe malnutrition and starvation.

CHAPTER FOUR
THE FOOD SECURITY STATUS MEASURE

The analysis reported in Chapter Three supports the hypothesis that food insecurity and hunger can be viewed as an ordered, sequential phenomenon. Households are distributed along a range that runs from no indication of food insecurity at all, through increasing levels of severity, up to the most severe measured level of food insecurity and hunger. Households in the United States are very largely food secure, falling outside the measured range of food insecurity and hunger. Among the minority of U.S. households that are measurably food insecure, most are concentrated at the less severe end of the continuum, with only a small fraction at the most severe end.

It is useful for policy purposes to divide the population into groups that can be identified as experiencing different designated levels of severity of food insecurity. This entails subdividing the food security scale into separate ranges, so that a household's value on the scale classifies the household as falling in a particular severity level or category of food insecurity. A number of research efforts have categorized their study populations into two or three groups, such as food secure *vs.* food insecure (Burt, 1993), or not hungry, at risk of hunger, and hungry (Wehler, Scott and Anderson, 1992).

Four categories are defined in the present analysis, based on the differing behavioral patterns that characterize different broad ranges of severity of food insecurity and hunger. Previous research as well as the analysis reported here suggests that food insecurity manifests at the household level as a managed process of efforts to cope with inadequate supplies of food and resources to obtain food (Radimer, Olson, and Campbell, 1990; Basiotis, 1992; Radimer *et al.*, 1992; Wehler, Scott and Anderson, 1992; Burt, 1993; Cohen, Burt, and Schulte, 1993). This managed process moves through an observable set of stages as food insecurity increases. In the first stage, household members experience food insufficiency and anxiety about their food situation, and adjust their budget and food management patterns. For example, they may worry that their food will not last until they have money to buy more, they may substitute increasingly cheaper foods in their diet, and they may eat the same few low-cost foods several days in a row. In the second stage, adults reduce their food intake, but in households with children they ration

food to avoid reducing the children's food intake. Adults may be hungry, but normally they try to protect their children from being hungry. In the third stage, the children also experience a reduction in food intake and hunger, and adults' food intake is more sharply reduced (e.g., going an entire day with no food). The transition from one stage or broad range of food insecurity to the next may be a gradual alteration of conditions and behaviors, or may be more sharply demarcated, but in either case, it is likely to occur differently in different households. Nonetheless, it appears that, overall, distinct behavior patterns exist at different levels of food insecurity and hunger.

These observed behavioral patterns provide the foundation for defining the four categories of food insecurity used in the present measurement project.[1] In order of increasing severity of food insecurity, they are as follows:

- ***Food secure*** — Households show no or minimal evidence of food insecurity.[2]
- ***Food insecure without hunger*** — Food insecurity is evident in households' concerns and in adjustments to household food management, including reductions in diet quality, but with no or limited reductions in quantity of food intake. In terms of the LSRO definitions, households cannot predictably obtain access to an adequate quantity and/or quality of acceptable food, but household members are not evidently experiencing hunger due to resource scarcity.
- ***Food insecure with moderate hunger*** — Food intake for adults in the household is reduced to an extent that implies that adults are experiencing hunger due to lack of resources.

[1] This four-way categorization is applied only to the 12-month food security scale. Because the 30-day scale does not measure the less severe condition of food insecurity short of actual hunger, a three-way categorization is used for that scale: (1) no hunger evident; (2) food insecure with moderate hunger; and (3) food insecure with severe hunger. The conceptual and operational definitions of the latter two categories are parallel to those for the two most severe categories on the 12-month scale.

[2] Most U.S. households show no signs of food insecurity, based on consistently negative responses to several broad screener questions in the CPS questionnaire. Households in this category, and with prior-year annual incomes over 185 percent of poverty, were screened out of the remainder of the Supplement at that point and directly classified as food-secure without further analysis. A much smaller proportion of higher-income households passed through the food security screener, by virtue of positive answers to at least one of the screener questions. Most of these households were also subsequently classified as food-secure, based on further analysis. Some of this latter group of food-secure households show one, or at most two, additional positive indications of food insecurity in the CPS data. To be classified as food-insecure, however, a household had to show at least three positive indicators of food insecurity from the set of food security items beyond the screener questions.

- ***Food insecure with severe hunger*** — Households with children reduce the children's food intake to an extent that implies that the children experience hunger as a result of inadequate household resources. Adults in households with or without children experience extensive reductions in food intake (e.g., going whole days without food).

It is important to emphasize that these behavioral classifications do not imply policy judgments. Policymakers, advocates, and the public at large must decide whether and at what level food insecurity and hunger may constitute a social problem that merits public concern and government action.

Readers should also note the necessary role of judgment involved in giving exact operational definition to these categories. The particular categories specified for classifying households according to level of severity of food insecurity are grounded in observable patterns of behavior, and the placement of boundary lines between categories attempts to reveal the nature of these patterns as clearly as possible, given the content of the available data. The exact placement of the classification boundaries, however, necessarily involves interpretive judgment. Judgment is involved in determining how well each indicator item in the data corresponds to one or another of the designated ranges of severity described above. In addition, judgment is required in identifying or selecting the particular indicator that best represents the dividing line or transition from one designated severity range to the next. Reasonable people can disagree about whether the dividing lines between the several designated severity ranges should be located somewhat differently.

The most important uses of the food insecurity and hunger measures, however, will be in examining changing severity and extent of needs over time, or differing needs across population groups. Comparing the prevalence of food insecurity from one year to the next and across population groups on a consistent basis can help identify changing levels and location of need, and help inform decisions as to whether re-targeting of assistance may be needed. In such analyses, the key requirement is that the dividing lines be robust, defined in an operationally clear and consistent way over time and across subgroups. The emphasis of the analysis has therefore been on establishing a clear and replicable logic for defining categories, rather than seeking universal agreement on the appropriateness of each dividing line between categories.

Defining Ranges on the Food Security Scale

To classify households into the categories described above, the food-security measurement scale is subdivided into corresponding ranges. The general procedure for defining these ranges is summarized below. Subsequent sections review the logic for each of the specific ranges.

The definition of ranges takes advantage of the scaling model's estimates of the relative severity of the questions that make up the food security scale. Because the model indicates that responses are sufficiently well ordered, it is acceptable to assume that a household answering a particular question affirmatively also answers all less severe questions affirmatively. This is the predominant actual pattern, or pattern of the "modal households." This allows behavioral ranges on the food security scale to be identified by considering the substantive content of sets of adjacent questions. Thus, if all the questions prior to question *n* in level of severity are judged to reflect conditions of food insecurity but not hunger, whereas question *n* is deemed to be an indicator of actual hunger, the boundary between food insecurity without hunger and food insecurity with hunger can be set between question *n-1* and question *n* in the severity ranking. Question *n* itself would then be considered a threshold or boundary indicator for the more severe category of food insecurity with hunger.[3]

Although the discussion below focuses on the individual questions that border the boundaries between ranges of the scale, it is important to bear in mind that households are classified on the basis of their overall pattern of responses to the entire sequence of questions making up the measurement scale. No single question, no single condition is used to classify households. Rather, classification depends on the accumulated evidence, from the entire set of questions, that the household has (or has not) experienced a series of successively more severe conditions and behaviors.

[3] Technically, the boundary is established at a particular value on the scale. Once a boundary question is chosen, the boundary is set at the scale score of those modal households that answer all less-severe questions and the selected boundary question affirmatively, while answering all more-severe questions negatively. In the simplest case, if question *n* in the severity ranking is the boundary question and all households respond to the same total number of questions, the boundary is established at the scale value of households that answer exactly *n* questions affirmatively.

Food Insecure

> *Food security — Access by all people at all times to enough food for an active, healthy life.... 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.* — Anderson/LSRO, 1990, pp. 1575-1576

The above definitions suggest that households are food insecure if they do not have, or cannot be reasonably sure of having enough food, of acceptable quality, to meet basic needs. Most questions in the Food Security Supplement, including all of the items retained in constructing the measurement scale, are pertinent to this concept of food insecurity.[4] A few questions measure either the respondent's level of uncertainty about the future adequacy of the household's food supply, or the retrospective assessment of the food supply.[5] A larger number of questions ask about events or conditions that can result from an inadequate food supply, such as not eating balanced meals, cutting or skipping meals, or losing weight because of not having enough food. All questions explicitly mention resource constraint as the immediate cause of food insufficiency through phrases such as "because you didn't have enough money."

Food insecure households are defined operationally as those which, at a minimum, express concerns about the adequacy of the household food supply and report some adjustments to dietary intake. Exhibit 4-1 illustrates this criterion. The two least severe questions in the 12-month scale concern the households' food supply, asking whether household members "worried that our food would run out" or whether the "food that we bought just didn't last" (Q53 and Q54). The third question in the severity ranking asks about the failure to eat balanced meals, an adjustment to nutritional (and conventional) quality of household members' diets (Q55). A respondent who answers all three of these questions affirmatively is deemed to show sufficient evidence of food insecurity to have met unambiguously the operational criterion for that

[4] The definition also refers to the household's need for access to food through "socially acceptable ways." This dimension of the definition may be captured in the CPS data with questions about coping activities such as getting emergency food from food pantries or eating meals at soup kitchens. As explained above (p. 26), however, these items are not included in the measurement scale for severity of food insecurity. (See the technical report for further discussion of the food-augmenting coping-behavior questions.)

[5] For example, Q53 asks whether respondents "worried our food would run out before we got more." Q54 asks whether "the food that we bought just didn't last, and we didn't have money to get more."

classification.[6] The boundary between "food secure" and "food insecure without hunger" is therefore drawn between Q54 and Q55 in the scale sequence.

Exhibit 4-1 illustrates the application of this definition. Households that answer no questions affirmatively, or that affirm only the one or two least severe questions, are classified as food secure. Households that give affirmative answers to three or more questions are placed into one of the three categories of food insecurity. The least severe condition classified as food insecure is that represented by affirmative answers to the three least severe questions in the scale sequence.

Food Insecure with Moderate Hunger

> *Hunger — The uneasy or painful sensation caused by lack of food. The recurrent and involuntary lack of access to food ... a potential, although not necessary, consequence of food insecurity.*[7] — Anderson/LSRO, 1990, p. 1598, 1576

As the severity of food insecurity increases, the household reaches a point at which further economizing on food costs requires reduction in food intakes such that household members experience hunger as a consequence of the household's financial resource limitation. Hunger, as the term is used here, is a physical sensation caused by a lack of food, where that lack of food results from scarce or limited household financial resources. The exact level at which the lack of food is certain to produce hunger varies substantially among individuals. The physiological literature indicates that virtually any noticeable reduction from an individual's

[6] This minimum requirement of three affirmative responses is more stringent than most previous literature, which typically has classified households as food insecure if they respond affirmatively to any one or more food insecurity indicator questions. Research has shown that households answering as few as one of the questions positively have significantly reduced household food supplies, and that women in these households have reduced intakes of fruits and vegetables and increased body mass indices (Kendall, Olson and Frongillo, 1995).

The approach to range definition used here sets each boundary at a level that requires two or three affirmative responses to questions measuring the condition of interest. This strategy reduces the likelihood that a household will be placed in a too-severe category of food insecurity because of an erroneous affirmative response (a "false positive" classification). The trade-off is an increased likelihood that a household will be placed into a less severe category than actually merited (a "false negative" identification).

[7] The present project makes explicit the condition that the measurement objective is limited to hunger resulting from inadequate resources.

Exhibit 4-1

SEVERITY RANGES ON THE FOOD SECURITY SCALE

Questions Associated with Each Food Security Status Level

Sequence of Questions Answered Affirmatively by Modal Households[a]		Food Security Status		
	None	Food Secure[b]		
Q53	Worried food would run out			
Q54	Food bought didn't last			
Q55	Adult not eat balanced meals	Food Insecure[c]		
Q58	Child fed few low-cost foods			
Q24	Adult cut size or skipped meals			
Q56	Couldn't feed child balanced meals			
Q32	Adult eat less than felt they should			
Q25	Adult cut size or skipped meals, 3+ months			
Q57	Child not eating enough			
Q35	Adult hungry but didn't eat			
Q38	Respondent lost weight			
Q40	Cut size of child's meals			
Q28	Adult not eat whole day	Food Insecure with Severe Hunger Evident[c]	Food Insecure with Hunger Evident[c]	
Q47	Child hungry			
Q29	Adult not eat whole day, 3+ months			
Q43	Child skipped meal			
Q44	Child skipped meal, 3+ months			
Q50	Child not eat for whole day			

[a] Modal households are those showing a perfectly ordered response pattern, i.e., whatever the most severe question the household answered affirmatively, it also answers all less severe questions affirmatively. This is the predominant response pattern among survey households.

[b] Households with no affirmative responses, or with one or two affirmatives, are classified as food secure. Some of these households may represent a "false negative" classification that under a methodologically less stringent classification rule would be identified as food insecure.

[c] To be classified in a given food security category, modal households must respond affirmatively to all questions associated with less severe categories, plus one or more of the questions associated with the category into which the household is classified. Other households (i.e., those not fitting the exact modal pattern) must give the same total number of affirmative responses as the modal households.

normal level of intake can produce the physical sensation of hunger, although the sensation apparently occurs differently for different people, and different people describe it differently.[8] The definition of the range of food insecurity with hunger therefore focuses mainly on behavioral questions that ask about reductions in food intake, initially for adults and subsequently for children.

Several questions used in the scale explicitly measure situations in which adults in the household experience reduced food intake as a result of inadequate resources. Two others ask about potential consequences of reduced food intake, one question referring to the sensation of hunger and another asking about weight loss. In order of increasing severity, the questions are:

- Q24 cut or skip meals because there wasn't enough money for food
- Q32 eat less than you felt you should because there wasn't enough money to buy food
- Q25 cut or skip meals because there wasn't enough money for food, in three or more months
- Q35 hungry but didn't eat because you couldn't afford enough food
- Q38 lost weight because there wasn't enough food
- Q28 not eat for a whole day because there wasn't enough money for food
- Q29 not eat for a whole day because there wasn't enough money for food, in three or more months

The questions that ask about cutting or skipping meals and not eating for a whole day are asked with reference to "you or other adults in your household." The other questions are asked only about "you," the adult respondent.

The questions pertinent to reduced food intake by adults are generally concentrated in the middle of the overall severity ranking for food insecurity, but overlap with both the less severe food insecurity questions and the more severe questions indicating reduced food intake by children. The threshold question used in drawing the boundary between food insecure without

[8] This literature is summarized in the companion Technical Report volume, Appendix A. See especially, among the references cited therein, Lappalainen *et al*., 1990, Mattes and Friedman, 1993; and Read, French and Cunningham, 1994.

hunger and food insecure with moderate hunger is Q25, which identifies a recurrent pattern of cutting or skipping of meals by adults in the household. Because this is the third question in the sequence asking about reductions in adults' food intake, and because it indicates multiple instances of reduced intake, it is deemed that households that reach this level on the scale have at least one, and potentially more, adult members who have experienced resource-constrained hunger. Thus, households that report repeated reductions in adults' food intake, in combination with affirmative responses to all less severe questions, are classified as food insecure with moderate hunger (see Exhibit 4-1).

Food Insecure with Severe Hunger

The most severe range of food insecurity measured by the scale is characterized by reduced food intake and consequent hunger for children. Most of the questions that pertain to reduced food intake and hunger among children are similar to questions asked about adults. They are listed below in order of increasing severity.

- Q57 children were not eating enough because couldn't afford enough food
- Q40 cut the size of children's meals because there wasn't enough money for food
- Q47 children were hungry but couldn't afford more food
- Q43 children skipped meals because there wasn't enough money for food
- Q44 children skipped meals, in three or more months
- Q50 children did not eat for a whole day because there wasn't enough money for food

The least severe of these questions (Q57) falls roughly in the middle of the range of questions shown earlier for adults. The remaining questions are all more severe than any adult-oriented item except the one measuring adults not eating for a whole day. Adults not eating for a whole day (Q28) has nearly the same severity as children being hungry (Q47).[9]

[9] Q28 and Q47 have item calibrations of 6.4 and 6.5, respectively. See Exhibit 3-2.

The intent in defining the most severe category of food insecurity is to focus on the condition of children. Specifically, the selected boundary item in the children's series is the question that asks whether the "children were ever hungry but you just couldn't afford more food" (Q47).

The classification procedure, however, must apply equally to households with and without children. A straightforward way to accomplish this objective is to select as the threshold item an adult-oriented question that is similar in severity to Q47. Accordingly, the question about adults not eating for a whole day (Q28), which has almost the same item calibration score as the question about children being hungry, is used as the boundary question. Households, both those with and without children, that report that one or more adults did not eat for a whole day, and that respond affirmatively to all less severe questions, are classified as food insecure with severe hunger.

Response Profile of Households in the Four Categories

If all survey responses were perfectly ordered, all households would fit the modal pattern that, although predominant in the actual data, is not universal. With perfectly-ordered data, we would expect to see very clear-cut differences between the response patterns of households classified into the different food security categories. For instance, 100 percent of the households categorized as food insecure without hunger would answer affirmatively either the three, four, five, six, or seven least-severe questions. No one in that category would give affirmative answers to any of the more severe questions in the scale (the eleven questions from Q25 onwards), because those questions lie beyond the boundary for the next more severe category, food insecurity with moderate hunger. For the five questions within the severity-range category of food insecure without hunger (Q55-Q32), the more severe questions would have systematically fewer positive responses than the less severe questions.

All of these patterns can be seen as general tendencies in Exhibit 4-2, although the divisions are not absolute because not all the survey responses are perfectly ordered. For example, among households classified as food insecure without hunger, more than 70 percent responded positively to all of the three least severe questions, whereas fewer than 20 percent responded positively to any one of the eleven most severe items, and less than 5 percent responded positively, on average, to these eleven severe items. The percent of positive responses

Exhibit 4-2

RESPONSE PROFILE BY CATEGORY

(Percentage of Households in Each Food Security Category Answering Each Question Affirmatively)

Questions (in order of increasing severity)		Food Security Status			
		Food Secure[a]	Food Insecure, without Hunger[b]	Food Insecure, with Moderate Hunger[c]	Food Insecure, with Severe Hunger[d]
Q53	Worried food would run out	5.0	89.5	97.2	99.1
Q54	Food bought didn't last	2.3	80.9	98.1	99.4
Q55	Adult not eat balanced meals	1.9	75.4	94.9	98.5
Q58	Child fed few low-cost foods	2.3	63.4	91.0	100.0
Q24	Adult cut size or skipped meals	0.4	36.8	93.1	99.1
Q56	Couldn't feed child balanced meals	0.3	41.2	77.4	95.5
Q32	Adult eat less than felt they should	0.3	34.4	90.3	98.8
Q25	Adult cut size or skipped meals, 3+ months	0.1	20.0	77.2	94.6
Q57	Child not eating enough	0.1	15.5	53.5	96.2
Q35	Adult hungry but didn't eat	0.1	8.3	57.5	94.3
Q38	Adult lost weight	0.0	2.8	30.5	71.7
Q40	Cut size of child's meals	0.0	2.1	24.2	70.7
Q28	Adult not eat whole day	0.0	2.4	20.7	87.6
Q47	Child hungry	0.0	1.7	20.0	72.9
Q29	Adult not eat whole day, 3+ months	0.0	0.8	11.6	80.6
Q43	Child skipped meal	0.0	0.6	8.1	56.4
Q44	Child skipped meal, 3+ months	0.0	0.2	4.7	43.6
Q50	Child not eat for whole day	0.0	0.1	1.4	18.1
Number of households in sample (unweighted)[e]		39,736	3,254	1,326	331

[a] No or minimal indicators of food insecurity evident.

[b] Multiple indicators of food insecurity, but no or minimal indicators of resource-constrained hunger evident for household members.

[c] Multiple indicators of resource-constrained hunger evident for adult household members.

[d] Multiple indicators of resource-constrained hunger evident for children in household and/or indicators of severe adult hunger.

[e] For questions applicable only to households with children, the unweighted sample in the four groups is: 14,192, 1,934, 655, and 133.

to each item consistently increases from left to right across the table, reflecting increasing levels of food insecurity; within each food insecurity category, the percent of positive responses declines from top to bottom, as the severity level of the questions increases.

Relationship of Food Security Status to Other Measures

Food insecurity is, by definition, a result of constrained financial resources. One would therefore expect income to be related to food security status. At the same time, one would not expect the correlation to be perfect for several reasons. In particular, in-kind food assistance programs, which are designed to ameliorate food insecurity, are specifically targeted to households with low income. Thus, food insecurity should depend on income in combination with other factors that ameliorate the effect of low income, especially program participation.

In fact, food security is clearly related to income, as shown in Exhibit 4-3.[10] Among households whose income is less than half of the federal poverty level, 41 percent are classified as having experienced some kind of food insecurity in the past 12 months,[11] and 5 percent fall into the most severe category of food insecurity. In contrast, 96 percent of the households with annual incomes above 185 percent of the poverty level are classified as food secure.[12]

Food security status is also related to the level of household expenditures for food. Households reporting that they usually spend less than $20 per household member per week are much more likely to be classified as food insecure than those spending $40 per week or more (21 percent *vs.* 6 percent).

Finally, the food insecurity categories defined here show close links to the food sufficiency measure that has been used in much previous research. Of the respondents who say in the food sufficiency measure that they have "enough of the kinds of food we want to eat," 96

[10] Income is measured in this analysis as cash income, exclusive of in-kind food assistance. Including the cash value of such assistance might lead to a stronger relationship between income and food security.

[11] This includes all households classified into any of the three food insecurity categories—i.e., those in the three right-hand columns of Exhibit 4-3.

[12] Because annual income and food security status are not measured for precisely the same period, it is possible for a household with apparently substantial income to be accurately identified as food insecure. In fact, it would be possible even if the two constructs were measured for exactly the same 12-month period. For example, a head of household could have substantial earnings for the first nine months of the year and then lose his or her job. Such a household might well be food insecure in the last months of the year.

Exhibit 4-3

RELATIONSHIP OF THE FOOD SECURITY STATUS MEASURE TO OTHER VARIABLES

	Households in Sample	Food Security Status[a]			
		Food Secure	Food Insecure without Hunger	Food Insecure with Moderate Hunger	Food Insecure with Severe Hunger
Income Relative to Poverty Line[b]					
<50%	2,219	59.5%	24.2%	11.4%	4.9%
50-100%	4,431	69.6	20.1	8.2	1.9
101-185%	8,944	82.6	11.9	4.6	0.9
>185%	29,053	96.2	2.6	1.0	0.2
Weekly Food Expenditures per Household					
<$20	7,681	79.2	13.9	5.6	1.4
$20-29	10,291	88.0	8.6	2.9	0.6
$30-39	8,406	92.4	5.3	2.0	0.3
$40 or more	14,826	93.7	4.0	1.9	0.5
Food Sufficiency[c]					
Enough of the kinds of food we want to eat	4,432	95.9	3.4	0.6	0.1
Enough but not always the kinds of food we want to eat	879	63.6	25.9	9.4	1.0
Sometimes not enough to eat	124	21.8	31.5	36.3	10.5
Often not enough to eat	38	15.8	29.0	18.4	36.8

[a] See notes, Exhibit 4-2.

[b] Income measured as cash income, excluding food stamps and other in-kind food assistance.

[c] Single-question version of food sufficiency question (see footnote 12).

percent are classified as food secure. Among those saying they have "often not enough to eat," 84 percent are classified as food insecure and 37 percent fall into the most severe category of food insecurity.[13]

In short, food security status is consistently related to income, to food expenditures, and to the single-item food sufficiency measure in the way that would be expected. There is no absolute measure of food security—no "gold standard" against which the status variable can be tested. Absent such a gold standard, the analysis in Exhibit 4-3 gives reasonable assurance that the measure is functioning as intended.

[13] The food insufficiency measure was applied in the CPS Supplement in two formats: a one-question version, which is reported here, and a two-question version. Each version was applied to a different portion of the CPS sample. A comparison of the food insecurity categories with the two-question version yields results very similar to those shown here (see the technical report for additional discussion).

CHAPTER FIVE
PREVALENCE OF FOOD INSECURITY AND HUNGER

The ultimate purpose of developing consistent national measures of food security is to provide information on how many American households are food secure, food insecure, and hungry. The measurement scale was used to produce estimates of the prevalence of household-level food insecurity and hunger for the 12-month time period ending on the date of the April 1995 CPS interview. The prevalence estimates for this 12-month period are shown in Exhibit 5-1.[1] Estimates are presented for each level of severity of the food security status variable by various household characteristics. Discussion of estimated prevalences for several population subgroups follows.

Prevalence Estimates

The four food security status categories shown in Exhibit 5-1 are mutually exclusive and exhaustive. Thus, to obtain the overall prevalence of food insecurity, aggregated over the three food insecurity status categories, the prevalences for the three categories must be summed. The overall prevalence of food insecurity among U.S. households, including all levels of severity, is 11.9 percent. This comprises 11.94 million of the approximately 100 million American households. The overall prevalence of food insecurity varies from a high of 19.5 percent among households with children under age 6 years, to a low of 5.9 percent among households with elderly members but no children. Households with children less than 18 years old comprise 56 percent of all households experiencing food insecurity, but only 38 percent of all households in the population.

Food Insecure without Hunger. The overall prevalence of food insecurity with no hunger, among all household types, is 7.8 percent, comprising 7.78 million households. Prevalence rates for this comparatively low severity range of food insecurity vary from 14.2 percent among households with children below age 6 years, to a low of 4.0 percent among

[1] Prevalence estimates for the 30-day time period ending on the date of the April 1995 CPS were also produced using a 30-day version of the scale. These estimates are presented and discussed in the companion volume of this report covering technical issues.

Exhibit 5-1

PREVALENCE OF HOUSEHOLD FOOD SECURITY STATUS BY SELECTED CHARACTERISTICS OF HOUSEHOLDS

Numbers in thousands. Characteristic	Total	Food Secure[a]		Food Insecure, Hunger not Evident[b]		Food Insecure, Moderate Hunger Evident[c]		Food Insecure, Severe Hunger Evident[d]	
		Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total
Household Composition:									
All races:									
All households									
With children under 18 yrs	38,113	31,434	82.5	4,676.2	12.3	1,670.6	4.4	331.9	0.9
With children under 6 yrs	18,282	14,722	80.5	2,593.3	14.2	814.8	4.5	151.5	0.8
With elderly[e] but no children	27,805	26,155	94.1	1,124.1	4.0	436.2	1.6	89.9	0.3
With no elderly or children	34,291	30,677	89.5	1,983.1	5.8	1,236.4	3.6	394.9	1.2
All household types	100,210	88,266	88.1	7,783.4	7.8	3,343.3	3.3	816.8	0.8
White:									
All households									
With children under 18 yrs	30,438	25,751	84.6	3,392.2	11.1	1,088.5	3.6	207.0	0.7
With children under 6 yrs	14,467	11,957	82.6	1,897.9	13.1	526.3	3.6	85.4	0.6
With elderly but no children	25,012	23,844	95.3	795.5	3.2	319.6	1.3	53.0	0.2
With no elderly or children	29,163	26,534	91.0	1,466.0	5.0	890.0	3.1	274.0	0.9
Black:									
All households									
With children under 18 yrs	5,841	4,195	71.8	1,054.0	18.1	496.2	8.5	95.5	1.6
With children under 6 yrs	2,826	1,980	70.1	556.3	19.7	249.0	8.8	40.8	1.4
With elderly but no children	2,321	1,896	81.7	292.0	12.6	99.7	4.3	32.5	1.4
With no elderly or children	3,852	3,013	78.2	433.4	11.2	299.5	7.8	105.8	2.8
Other:									
All households									
With children under 18 yrs	1,833	1,488	81.1	230.0	12.6	85.9	4.7	29.4	1.6
With children under 6 yrs	989	785	79.4	139.1	14.1	39.5	4.0	25.3	2.6
With elderly but no children	472	414	87.7	36.6	7.8	17.0	3.6	4.4	0.9
With no elderly or children	1,276	1,130	88.5	84.0	6.6	47.2	3.7	15.6	1.2
Hispanic:[f]									
All households									
With children under 18 yrs	4,475	3,116	69.6	966.5	21.6	334.6	7.5	58.4	1.3
With children under 6 yrs	2,539	1,697	66.8	599.2	23.6	200.2	7.9	42.4	1.7
With elderly but no children	1,151	910	79.1	174.9	15.2	46.0	4.0	20.0	1.7
With no elderly or children	2,075	1,699	81.9	218.8	10.5	120.4	5.8	37.2	1.8

Notes at end of exhibit

Exhibit 5-1 *(continued)*

PREVALENCE OF HOUSEHOLD FOOD SECURITY STATUS BY SELECTED CHARACTERISTICS OF HOUSEHOLDS

Numbers in thousands. Characteristic	Total	Food Secure[a]		Food Insecure, Hunger not Evident[b]		Food Insecure, Moderate Hunger Evident[c]		Food Insecure, Severe Hunger Evident[d]	
		Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total
Household Income Category:[g]									
(All races and household types)									
Below $10,000	14,977	10,137	67.7	2,931.4	19.6	1,443	9.6	465.8	3.1
$10,000 - $19,999	16,717	13,403	80.2	2,206.1	13.2	904.0	5.4	203.4	1.2
$20,000 - $29,999	15,625	13,912	89.0	1,200.2	7.7	452.1	2.9	60.4	0.4
$30,000 - $39,999	12,149	11,391	93.8	561.0	4.6	174.4	1.4	20.5	0.2
$40,000 - $49,999	8,539	8,181	95.8	257.1	3.0	85.2	1.0	15.3	0.2
Above $50,000	22,370	22,079	98.7	207.1	0.9	79.6	0.4	5.0	0.01
Household Income-to-Poverty Ratio:[g]									
(All races and household types)									
Under 0.50	5,545	3,240	58.4	1,365.0	24.6	668.4	12.1	270.9	4.9
Under 1.00	15,808	10,230	64.7	3,500.7	22.1	1,587.6	10.0	489.5	3.1
Under 1.30	21,810	14,841	68.1	4,367.9	20.0	2,032.7	9.3	567.7	2.6
Under 1.85	35,115	25,914	73.8	5,952.6	17.0	2,568.0	7.3	680.4	1.9
1.85 and over	65,094	62,352	95.8	1,830.8	2.8	775.3	1.2	136.3	0.2
Household Relationship:									
(All races)									
Households with children under 18 yrs	38,113	31,434	82.5	4,676.2	12.3	1,670.6	4.4	331.9	0.9
Married couple families	26,841	23,750	88.5	2,348.3	8.8	617.9	2.3	124.5	0.5
Female head, no spouse	8,941	5,786	64.7	2,048.3	22.9	922.9	10.3	182.8	2.0
Male head, no spouse	2,332	1,898	81.4	279.5	12.0	129.8	5.6	24.5	1.0
Households with no children or elderly	34,291	30,677	89.5	1,983.1	5.8	1,236.4	3.6	394.9	1.2
Living alone	13,724	11,671	85.0	1,053.0	7.7	742.6	5.4	257.5	1.9
Households with elderly but no children	27,805	26,155	94.1	1,124.1	4.0	436.2	1.6	89.9	0.3
Living alone	11,699	10,737	91.8	638.1	5.5	266.6	2.3	57.2	0.5

Notes at end of exhibit

Exhibit 5-1 *(continued)*

PREVALENCE OF HOUSEHOLD FOOD SECURITY STATUS BY SELECTED CHARACTERISTICS OF HOUSEHOLDS

Numbers in thousands. Characteristic	Total	Food Secure[a]		Food Insecure, Hunger not Evident[b]		Food Insecure, Moderate Hunger Evident[c]		Food Insecure, Severe Hunger Evident[d]	
		Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total
Area of Residence:[h]									
(All races and household types)									
Inside Metropolitan areas	60,657	53,287	87.8	4,738.8	7.8	2,079.0	3.4	552.3	0.9
In central city	24,055	20,172	83.9	2,494.4	10.4	1,102.5	4.6	286.5	1.2
Not in central city	36,602	33,115	90.5	2,244.3	6.1	976.4	2.7	265.8	0.7
Outside Metropolitan areas	23,877	20,007	88.0	1,906.2	8.0	802.8	3.4	161.2	0.7
Census Geographic Region:									
(All races and household types)									
Northeast	19,446	17,443	89.7	1,335.6	6.9	524.6	2.7	142.6	0.7
New England	4,946	4,486	90.7	308.8	6.2	110.6	2.2	41.3	0.8
Middle Atlantic	14,499	12,957	89.4	1,026.8	7.1	547.0	3.4	116.5	0.7
Midwest	23,623	21,113	89.4	1,614.6	6.8	743.9	3.2	150.9	0.6
East North Central	16,156	14,383	89.0	1,109.1	6.9	547.0	3.4	116.5	0.7
West North Central	7,466	6,730	90.1	505.5	6.8	196.9	2.6	34.4	0.5
South	35,800	31,311	87.5	2,959.2	8.3	1,244.6	3.5	285.5	0.8
South Atlantic	18,841	16,862	89.5	1,275.7	6.8	557.3	3.0	145.3	0.8
East South Central	6,586	5,659	85.9	592.5	9.0	267.3	4.1	67.3	1.0
West South Central	10,373	8,789	84.7	1,091.0	10.5	420.0	4.0	73.0	0.7
West	21,341	18,399	86.2	1,874.0	8.8	830.3	3.9	237.7	1.1
Pacific	15,348	13,119	85.5	1,444.1	9.4	613.6	4.0	171.3	1.1
Mountain	5,993	5,280	88.0	429.9	7.2	216.7	3.6	66.4	1.1

[a] No or minimal indicators of food insecurity evident.

[b] Multiple indicators of food insecurity, but no or minimal indicators of resource-constrained hunger evident for household members.

[c] Multiple indicators of resource-constrained hunger evident for adult household members.

[d] Multiple indicators of resource-constrained hunger evident for children in household and/or indicators of severe adult hunger.

[e] Elderly persons are defined as persons aged 60 years and older in this report.

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

[g] Income and poverty status refer to household income in a recent 12-month period, varying among rotation groups in the CPS sample. Income is missing for 9.8 percent of households but their income-to-poverty ratio category was imputed by the Census Bureau.

[h] For confidentiality reasons the CPS did not report the area of residence for 15.6 percent of households. The estimates shown are for households with area of residence identified.

households with elderly persons (age 60 years or over) but no children.[2] Generally, prevalence rates for food insecurity with no hunger are higher among households with young children (under age 6 years) than for all households with children.

Food Insecure with Moderate Hunger. The overall prevalence of food insecurity with moderate hunger evident, among all household types combined, is 3.3 percent, or 3.34 million households. The prevalence rates for this level of severity of food insecurity range from 4.5 percent among households with children under age 6 years, to 1.6 percent among households with elderly members but no children. Households with children of any age experienced higher levels of food insecurity with moderate hunger than did households without children, whereas households with young children experienced the highest rate.

Food Insecure with Severe Hunger. The overall prevalence of food insecurity with severe hunger (i.e., with child hunger in households with children, and severe levels of adult hunger in households with or without children) is 0.8 percent when measured among all household types. This measured level of food insecurity is estimated to have occurred in 820,000 households during the 12 months prior to the survey. The pattern of distribution of households experiencing severe hunger is similar to that for the other food insecurity status levels, except that households with non-elderly adults and no children experienced the highest prevalence among household types. Overall, 1.2 percent (400,000) of all households of this type experienced food insecurity with severe hunger.

Overall Prevalence of Hunger. Combining the two most severe levels of food insecurity yields an overall estimate of food insecurity with either adult or child hunger. This procedure indicates that an estimated 4.1 percent of all households experienced some level of resource-constrained hunger during the year prior to the April 1995 CPS. Counting all household types, some 4.16 million households had either adults or children, or both, who experienced hunger due to inadequate resources sometime during the 12-month period preceding the survey. Examination of the hunger prevalence rate for each household type separately shows that hunger was experienced by a larger proportion of households with children (5.3 percent) than households without children, whereas a larger proportion of households with neither

[2] Note that households with elderly persons (age 60 and over) may also include younger adult members but do not include children.

children nor elderly members experienced hunger than did households with elderly members and no children.

Food Insecurity Prevalence by Race and Ethnic Origin. The household food insecurity prevalence estimates in Exhibit 5-1 show differences across race and ethnic origin similar to those commonly seen in household income and poverty statistics.[3] Prevalences for each level of food insecurity are slightly lower among White households than for all races combined, whereas those for Black and Hispanic households are greater than for all races combined. Although the relative patterns of prevalences across household type within each race or ethnic group are similar, overall prevalences among Black and Hispanic households are about twice those for White households.[4]

The "other" category is comprised of Asian, Pacific Islanders, Alaska natives, Inuits, and other Native Americans. Overall, food insecurity prevalences among households in this subgroup are higher than those for White households, but lower than prevalences for either Black or Hispanic households. The one exception to this pattern is that the prevalence of severe hunger among households with children below age 6 years is higher in this subgroup (at 2.6 percent) than in any other racial or ethnic group.

Food Insecurity and Household Income. Examination of food insecurity prevalences across household income categories, and by ratio of household income to poverty, shows the influence of household financial resources on food security. Food insecurity prevalence rates, at all levels of severity, decline consistently as household income levels increase. As expected, food insecurity and hunger prevalence rates at all severity levels are highest among households with money income under 50 percent of the poverty threshold.

Overall, 41.6 percent of households with income below 50 percent of poverty experienced some level of food insecurity within the 12 months preceding the survey, and 17 percent of these households experienced food insecurity with either adult or child hunger. Examining the changes in prevalence of each level of severity of food insecurity across increasing ratios of income to poverty reveals large differences between households with incomes under 185 percent

[3] See, for example, U.S. Bureau of the Census, Current Population Reports, Series P60-189, *Income, Poverty and Valuation of Noncash Benefits: 1994*, U.S. Government Printing Office, Washington, DC, 1996.

[4] Note that Hispanic households may be either White or Black.

of poverty and households with income at or above 185 percent of poverty. The variation is less dramatic in comparing households across various levels of income below 185 percent of poverty, but food insecurity and hunger prevalences consistently increase as income declines.

That food insecurity increases as income falls is no surprise: because food insecurity is defined to include only conditions that result from financial resource constraints, it is expected that greater constraints mean more food insecurity. Nonetheless, it is important to note that food insecurity is not simply an alternative measure of poverty. Many households with below-poverty cash incomes apparently manage to avoid hunger, or even the less severe indications of food insecurity. Thus, food insecurity is a potential result of constrained financial resources, but not an inevitable result. How so many poor households avoid food insecurity is an important topic for future research.[5]

Food Insecurity and Household Relationship. Food insecurity prevalence rates reflect the greater degree of economic insecurity among single-parent families headed by women. The overall food insecurity prevalence rate (including all severity levels) for households with children headed by females with no spouse present is 35.3 percent, coincidentally the same rate as that for all households with incomes below 100 percent of poverty. Overall food insecurity prevalence rates among households with children headed by males with no spouse present are closer to those for all households in the population with children. The proportions of these households experiencing food insecurity with hunger, however, are somewhat higher than the rates for all households with children.

Concerns have been expressed regarding food insecurity among elderly persons living alone because the elderly experience more limitations in activities of daily living, are sometimes less mobile, and have more health problems than non-elderly people (Burt, 1993). These concerns are moderately supported by the prevalence estimates from the CPS data. The prevalence rates of all levels of food insecurity among households with elderly persons living alone are higher than for all households with elderly, but lower than those for all household types combined, or for households with no elderly or children (whether living alone or not).

[5] One line for such research, already underway at USDA, is to test alternative measures of income that include food stamp benefits and other forms of food assistance.

Living alone does appear to involve a slightly greater likelihood of the elderly experiencing each level of food insecurity.

Food Insecurity by Area of Residence. The distribution of overall household food insecurity across areas of residence (in central cities, in metropolitan areas but not central cities, outside metropolitan areas) follows a similar pattern as poverty. Overall food insecurity is highest in central cities, next highest in rural areas (outside metro areas), and lowest within suburbs (in metro areas, but not in central cities). Overall, 16.1 percent of central city households experienced some level of food insecurity during the year prior to the survey, whereas 5.8 percent experienced either adult or severe hunger.

Households in rural areas (outside metro areas) have nearly the same estimated prevalence of overall food insecurity and overall hunger as all households combined, whereas the estimated prevalences of overall food insecurity and hunger for suburban households are lowest, at 9.5 percent and 3.4 percent, respectively.

Food Insecurity by Geographic Region. In terms of broad geographic regions, the estimated prevalence of overall food insecurity is lowest in the northeast (10.3 percent), and highest in the west (13.8 percent). Estimated overall prevalence of hunger was also highest in the west, at 5.0 percent of households.

Within the larger regions there is variation in estimated food insecurity and hunger prevalence among smaller sub-regions. For example, estimated overall food insecurity prevalence varies from a low of 10.5 percent in the South Atlantic sub-region to a high of 15.3 percent in the West South Central sub-region. The estimated prevalence of overall hunger in these two sub-regions are 3.8 and 4.7 percent, respectively.

Participation in Food Assistance Programs

Food insecurity should be expected to have a complex relationship to households' participation in food assistance programs. Members of a household that is food insecure or hungry might logically seek food assistance—provided that someone in the household is aware of a program, is able and willing to apply, and meets the program's eligibility criteria. If the household then receives food assistance, the household's degree of food insecurity or hunger would presumably be reduced. Whether the assistance would eliminate the household's food insecurity and hunger entirely, or move the household into a more favorable food security status

category, would depend on the household's particular circumstances and the nature and amount of assistance it receives.

Given this complex relationship, simple tabulations can shed little light on the effectiveness of food programs in ameliorating food insecurity and hunger. Nonetheless, descriptive statistics on the proportion of households in the four food security status categories that participate in food programs provide a useful perspective on the behaviors of these populations. Exhibit 5-2 presents such statistics, indicating the percentage of households in each food security status category that received food assistance in the month before the interview.

Exhibit 5-2

PERCENT OF HOUSEHOLDS RECEIVING FOOD ASSISTANCE IN THE PAST 30 DAYS, BY FOOD SECURITY STATUS

Nature of Food Assistance Received in Past 30 Days	Food Secure	Food Insecure without Hunger	Food Insecure with Moderate Hunger	Food Insecure with Severe Hunger	All Households
Food stamps	4.4%	29.2%	32.1%	38.8%	7.5%
Free/reduced-price school lunch	4.3	25.2	26.4	22.1	6.8
Free/reduced-price school breakfast	2.6	15.9	17.1	13.2	4.2
Free/reduced-price meals at day care or Head Start	0.9	5.8	5.9	6.2	1.5
WIC	2.0	10.6	9.4	5.8	2.9
Free/reduced-price meals for elderly	0.6	1.1	1.2	1.8	0.6
Food or vouchers from other program	0.3	1.4	2.1	3.9	0.5
Food assistance from any of the above programs	8.4	44.0	46.7	51.2	12.8
No food assistance from any of the programs	91.6	56.0	53.3	48.8	87.2

The figures show that a small fraction of food secure households received some form of assistance (8 percent). Among households reporting food insecurity or hunger at some level in the past 12 months, roughly half said they received some kind of food assistance in the most recent month. The data do not indicate whether or to what extent the assistance improved the

food security status of participating households. For non-participants, the data do not indicate whether they were ineligible, were unaware of the programs, or did not participate for other reasons.[6]

State-Level Food Security Prevalence Estimates

Overall state-level food insecurity prevalence estimates were produced from the CPS sample data. Because the primary sampling units for the CPS sample are defined within states, it is possible to derive state-level estimates. Users of these prevalence estimates, however, are strongly cautioned to make comparisons across states only with appropriate qualification, because sampling error can be large, especially for states with small populations. Generally, the estimates for the largest 10-12 states embody smaller sampling error than for the remaining states. The state-level estimates, along with standard errors, are listed in Appendix C to this report.

Thirty-Day Prevalence Estimates

Food insecurity prevalence estimates were derived for the two most severe levels of food insecurity from a scale referring to conditions experienced during the 30 days prior to the survey. The 30-day prevalence estimates are presented in the companion report covering technical issues.[7] Many of the same patterns in prevalence rates observed in the 12-month scale also emerge in the 30-day scale, although there are some differences.

Generally, larger proportions of households with children experienced food insecurity with either adult or child hunger within the 30 days preceding the survey than did households of other types. Households with elderly members but no children generally have the lowest prevalence rates on the 30-day scale, as in the 12-month case, whereas households with no elderly or children tend to have rates intermediate to other household groups. The 30-day food

[6] Program participation has typically been found to be under-reported in national household surveys. It is therefore likely that some households categorized as non-participants actually received assistance from one or more of the programs.

[7] The 30-day scale only measures food insecurity at the two most severe levels: food insecurity with moderate hunger, and food insecurity with severe hunger. Thus, the residual category for the 30-day scale is not "food secure," but more accurately interpreted as "no indication of hunger." There are no status categories comparable to "food secure" or "food insecure without hunger" in the 30-day scale.

insecurity prevalence rates appear generally to be approximately half to two-thirds the magnitude of the 12-month rates.

Estimating the Number of Persons in Food-Insecure Households

The Food Security Supplement is a household-level survey, with adult respondents providing information about the household. For most households, the questions in the Food Security Supplement do not allow accurate determination of the food security status of each individual in the household.[8] Within the conceptual framework guiding this research, it is possible that the experience of food insecurity and hunger is not uniformly experienced by all members of the household. Therefore, the prevalence estimates for different levels of severity of food insecurity shown above are household-level estimates only. It is not possible to produce exact estimates of true individual-level prevalences for food insecurity or hunger from the Food Security Supplement data.

It is possible, however, to estimate the number of persons living in the households whose food security status has been determined. These estimates are shown in Appendix E of this report. Readers are cautioned against treating these as estimates of true individual-level prevalences, however. Rather, they represent valid upper-bound estimates, or the maximum individual-level prevalences that would be estimated if all adults in each household shared the same food security status, and all children likewise had a common status. To the extent that food insecurity is not uniformly distributed among household members, these upper-bound figures will overestimate the true individual-level prevalences.

Comparing Food Security Prevalence Estimates from Various Sources

The prevalence estimates presented above result, first, from the LSRO/AIN conceptual definitions of food security, food insecurity, and hunger; second, from the operationalization of these concepts via the particular set of questions included in the April 1995 CPS Food Security Supplement; and third, from the scale development procedures used in this study. Because this particular combination of food security measurement concepts, data, and methods is implemented

[8] This applies to households with more than one adult and/or one child. For single-person households, however, and households with one adult and one child, the household-level data also provide valid individual-level information.

here for the first time, these prevalence estimates are not directly comparable with any of the diverse food security, food insecurity, or hunger prevalence estimates previously reported in the U.S. The present study is the first direct measurement undertaken from a national survey sample representative of the entire population and based on a large number of carefully-defined conditions of food insecurity and hunger across all levels of severity.

There are, therefore, no comparative benchmarks that enable one to say whether the estimates presented here indicate worsening or improvement of the U.S. food security situation relative to earlier estimates. The CPS Food Security Supplement, however, has been implemented again in September 1996 and April 1997, which will enable comparisons to be made on a consistent basis over time and assessment of year-to-year changes in the severity and extent of food insecurity and hunger in the U.S. Current plans are to seek implementation of the CPS Food Security Supplement on a continuing annual basis.

Although one cannot make valid direct comparisons of prevalence estimates from this study with those from other research, it may be instructive to note some of the previous estimates that have been reported. Burt and colleagues at the Urban Institute surveyed elderly persons (age 65 years or over) in 1992 using two slightly different surveys and samples, and estimated that between 8 and 16 percent of elderly Americans experienced food insecurity in a six-month period. These proportions comprised between 2.5 million and 4.9 million food-insecure elderly persons (Burt, 1993, pp. xii and 39). Exhibit 5-1 shows the estimated prevalence of household-level food insecurity (all levels combined) for households in which there are elderly persons (age 60 years or over) but no children, to be 5.9 percent. This proportion comprises 1.6 million food-insecure households with elderly members but no children. Of these, 526,000 are estimated to have experienced hunger among one or more household members sometime during the year.

Based on several implementations of the CCHIP survey, CCHIP researchers estimated in 1991 that 12 percent of all families with at least one child below age 12 years experienced hunger during the preceding year. An additional 16 percent of such families were estimated to be "at risk" of child hunger, a category approximating the "food insecure with moderate hunger" and "food insecure without hunger" categories in this study (Wehler, Scott and Anderson, 1991). In 1995, CCHIP researchers reported updated national estimates of child hunger prevalences using data from implementations of the CCHIP surveys in the period 1992-1994. Based on

results from these surveys, 19 percent of low-income families with at least one child under age 12 were estimated to be hungry (Wehler, Scott and Anderson, 1995a). The overall prevalence of food insecurity with moderate or severe hunger among households with children under age 18 (but including all income levels), based on the April 1995 Food Security Supplement scale, is 5.3 percent.

An additional comparison can be made with the estimated prevalence of ***food insufficiency***, as indicated by responses to the USDA food sufficiency item in earlier national surveys.[9] Tabulations from the 1988-91 National Health and Nutrition Examination Survey (NHANES III) indicate that 3.9 percent of families in the overall U.S. population characterized the food eaten in their households as either "sometimes not enough" or "often not enough" to eat (DHHS, Third National Health and Nutrition Examination Survey, 1988-91). Among households with incomes below 131 percent of the federal poverty threshold, the combined proportion for these two categories was 12.9 percent. Similar tabulations from the 1989-91 Continuing Survey of Food Intakes by Individuals (CSFII) indicated that 9.1 percent of households with income below 131 percent of the poverty threshold characterized the food eaten in their households as "sometimes not enough" or "often not enough" to eat, on the basis of the USDA food sufficiency question (USDA, Continuing Survey of Food Intakes by Individuals, 1989-91).

The overall prevalence of households answering either "sometimes not enough" or "often not enough" to eat on the two versions of the food sufficiency question asked in the April 1995 Food Security Supplement to the CPS combined is 6.3 percent of all households in the population, comprising 6.3 million households. Among households reporting incomes less than or equal to 185 percent of the poverty threshold, 13.3 percent of respondents reported that the food eaten in their households was either "sometimes not enough" or "often not enough." Moreover, 92.9 percent of households at or below this income level that characterized their food as sometimes or often not enough also reported occasions within the previous 12 months when they did not have enough money for food.

[9] The USDA food sufficiency question, first implemented in the 1977-78 USDA Nationwide Food Consumption Survey, ask respondents, "Which of the following statements best describes the food eaten in your household: (1) enough and the kind wanted to eat; (2) enough, but not always the kind wanted to eat; (3) sometimes not enough to eat; (4) often not enough to eat." The question addresses both a quality and a quantity dimension of the household food supply. For the NHANES III, the item was modified to ask about the quantitative dimension only.

Conclusion

Although the various prevalence estimates summarized above are not directly comparable with those derived from the April 1995 CPS Food Security Supplement data, they do indicate that the prevalences reported in Exhibit 5-1 are broadly consistent with earlier estimates. When the varying degree of precision of conceptual and operational definitions, differing sample sizes and levels of sophistication of sampling strategies, and different scaling methods used in these studies are considered, the range of food insecurity, food insufficiency, and hunger prevalence estimates that results is perhaps more similar than might be expected. Given the differences in measures, samples, and measurement approaches used in the studies described, variation in prevalence estimates derived from them is to be expected. To the extent that the goals of building on these earlier measures, and improving and extending them through application of state-of-the-art survey design, sampling, and scaling methods, have been achieved in the current study, the food security and hunger prevalence estimates reported in Exhibit 5-1 can be viewed as more complete and accurate in their representation of these phenomena in the U.S. population.

CHAPTER SIX

STRENGTHS AND LIMITATIONS OF THE FOOD SECURITY MEASURE

The Food Security Supplement and the scale development effort described in previous chapters are intended to provide policymakers and the research community with new tools for understanding the phenomenon of food insecurity and hunger in the United States. The results of this first round of survey and analysis are promising, suggesting that the tools will contribute to understanding an important dimension of American households' well-being.

Results of the Scaling Analysis

The analysis resulted in the creation of a unified food security scale, measuring the central dimension of food insecurity and hunger in the 12 months before the April 1995 interview. A secondary scale, focusing on the comparatively severe range of food insecurity with hunger, covers a 30-day period. The primary 12-month scale is expected to be broadly useful for policymakers and researchers monitoring community well-being.

The scaling analysis indicates that food insecurity and hunger can appropriately be viewed as a unidimensional phenomenon, with qualitatively distinct behaviors and conditions characterizing different levels of severity. The severity ranking of the questions in the scale supports the concept of food insecurity and hunger as a managed process of efforts to cope with food insufficiency. Questions concerning household anxiety about the food supply and adjustments to food management patterns are ranked at the less severe end of the scale. The middle range of the scale largely captures reductions in food intake for adults, whereas the most severe range contains indicators of reductions in children's food intake. Although this managed process can be best observed in households with children, tests indicate that a single version of the scale fits households with and without children equally well.

The food security scale meets standard requirements of reliability and validity. Statistical tests of reliability yielded good results. The scale has the expected relationship to other constructs: food security and hunger increase as income declines, as food expenditures decline, and as food sufficiency (measured through independent questions) increases. Thus, the available evidence indicates that the scale performs as intended.

Summary of Prevalence Estimates

During the 12 months ending in April 1995, 88.1 percent of the approximately 100 million households in the United States are estimated to have been food secure. The remaining 11.9 percent experienced some degree of food insecurity at some time during that year. This includes 7.8 percent who were food insecure without hunger, 3.3 percent who were food insecure with moderate hunger, and 0.8 percent who were food insecure with severe hunger, i.e., children's hunger, and/or severe adult hunger.

Some food insecurity and hunger is found in all parts of the nation and in all major population subgroups. As expected, however, food insecurity and hunger is particularly concentrated in subgroups that tend to have high rates of poverty, such as female-headed households and minority households.

Notes on Validity and Accuracy

Measures based on sample surveys always have two types of error: sampling error and non-sampling error. Sampling error refers to the fact that a randomly-drawn sample of a population will not always be perfectly representative of the population from which it is taken. The potential magnitude of this type of problem is estimated in the table of standard errors presented in Appendix D. Because the CPS sample is quite large, standard errors are small for prevalences estimated for the full population sample (less than half a percentage point for each of the food security status categories). Standard errors are larger for some of the smaller population and geographic subgroups, and particularly for smaller states.

Most types of non-sampling error cannot be directly estimated. One can only describe the types of error that might exist, given the study design, and speculate on their possible importance. The following comments therefore identify potential areas of error stemming from conceptual issues, non-response bias, and reporting errors.

Conceptual Limitations. The food security scale does not capture all dimensions of food security as spelled out in the LSRO definition, focusing instead on the central dimension of food sufficiency. This focus reflects the fact that the experience of hunger results strictly from inadequate ***quantity*** of food relative to need, largely independent of the source or nutritional quality of the food.

The food security scale does not capture the facet of food insecurity that is related to the lack of access to food through "socially acceptable" means, a facet explicitly incorporated in the LSRO definition. Although the Food Security Supplement included some questions pertinent to this dimension, they did not meet the statistical criteria for inclusion in the measurement scale. Additional households might be judged food insecure if the availability of food through socially acceptable means were fully considered. The number of such additional households would be quite small, however, based on analysis of the food resource augmentation questions included in the CPS data (see the companion Technical Report volume for estimates and discussion).

The food security scale also omits the dimensions of food safety and nutritional quality of household diets. Although a few questions refer to food quality, these represent households' subjective valuations of food, not the actual nutritional quality of diets as measured by nutritionists.[1] Some relationship presumably exists between food sufficiency and nutritional quality: for example, the LSRO definition indicates that, like hunger, "malnutrition is also a potential, although not necessary, consequence of food insecurity." The exact relationship between food insecurity, hunger, and the nutritional quality of household diets is an important area for future research.[2]

A final conceptual issue concerns the partitioning of the food security scale into ranges of relative severity to create the food security status measure. The ranges are grounded in different behavioral patterns that characterize different regions of the scale. The variation in behavioral patterns, however, occurs in somewhat different ways for different households, so any dividing line on the scale will probably classify some households at too severe a level of food insecurity, whereas others may be wrongly classified at an insufficiently severe level. The threshold questions, which are used to establish boundaries between the ranges, do not represent the least severe indicators of the behavior of interest, but the second or third such indicator in

[1] Recent research findings, however, show that individuals' perceptions of the nutritional quality of their own diets are apparently fairly accurate, as compared with the quality of their diets as assessed by nutritionists. (See, e.g., "Healthy Eating Index Score Compared to Individual's Self-Rating of Diet," Table 9 in *The Healthy Eating Index,* USDA, Center for Nutrition Policy and Promotion, October 1995.)

[2] See Chapter One, note 5 (page 8). See also the recent USDA Economic Research Service Staff Report, "Validation of a Self-Reported Measure of Household Food Insufficiency with Nutrient Intake Data" (Rose and Oliveira, 1997a).

the severity sequence. This procedure may weight the balance of erroneous classifications in the direction of placing households in a less severe status than their actual condition would warrant, if the underlying conceptual definitions are accepted as meaningful and appropriate.

Non-response Bias. Non-response bias may occur for two reasons. First, the CPS sample is defined on the basis of housing units. It therefore omits many homeless persons and families, who might be expected to have a particularly high prevalence of food insecurity and hunger. Second, some kinds of households are more difficult to find and interview than others, and these non-respondents might have either higher or lower than average prevalence of food insecurity and hunger.

The CPS has well-established, strong procedures for maximizing the representativeness of the sample, including procedures for weighting responses to compensate for potential non-response bias. Nonetheless, these procedures may not fully adjust for the likelihood that some types of non-respondents (especially homeless individuals and families) may have especially high rates of food insecurity. To the extent that this occurs, the study may underestimate the prevalence of food insecurity and hunger in the entire population.[3]

Reporting Error. Finally, three types of reporting error may exist. First, the Food Security Supplement included a screening logic that skipped the main battery of food insecurity and hunger questions for households not likely to be food insecure (for example, those with prior year incomes above 185 percent of the poverty level who reported no indications of food insufficiency). Screened-out households are classified as food secure, but it is possible that some would have been classified as food insecure if they had been asked the full battery of questions. Second, some households who respond to the full survey may systematically paint too positive or too negative a picture of their circumstances. Either type of bias is theoretically possible, but researchers familiar with past surveys believe that households more often under-report than over-report the severity of their condition. Third, households may simply respond erroneously to some questions, or interviewers may record the response incorrectly. This last sort of purely random error would be weighted in the direction of classifying households at a too-severe level

[3] The Census Bureau has recently completed data collection under the National Survey of Homeless Service Providers and Clients (NSHSPC), sponsored by the Interagency Council on the Homeless. When these data are available for analysis, future household-based national prevalence estimates can be adjusted to make some allowance for food insecurity and hunger among homeless persons.

of food insecurity.[4] Thus, two of the three possible types of reporting error would lead to underestimation of the prevalence of food insecurity, whereas the third would work in the opposite direction.[5]

Future Directions

The completed food security scale and the estimates of the prevalence of food insecurity and hunger mark the completion of one phase of the Food Security Measurement Project. FCS plans to continue sponsorship of the CPS Food Security Supplement on an annual basis. This will provide the basis for continuous monitoring of the level of food security, food insecurity, and hunger in the U.S population. Because the data collection and analysis methods will be consistent over time, policymakers will know whether, and by how much, conditions are improving or deteriorating, and be able to judge what new or different actions may be needed.

In the shorter term, several lines of activity are oriented toward enhancing the measurement tools. The battery of questions in the Food Security Supplement will be re-examined in the light of the analysis results to identify refinements that may make the survey more reliable or efficient. Subsets of questions will be identified, and scaling procedures specified, to allow more localized or specialized research efforts to measure food security in a way that will also be consistent and comparable to the CPS-based national benchmark measures. A variety of other analytic efforts will be undertaken to assess the quality of the data in the Food Security Supplement, to understand the relationship between the food security measure and related measures such as food expenditures or dietary intake, to explore the factors associated with food security, and to assess the impact of food assistance programs in ameliorating food insecurity and hunger.

[4] This occurs because the vast majority of households are food secure and the numbers decline at each successively severe level of food insecurity. Misclassifying a food secure household means that it will be considered food insecure, and the reverse is true for food insecure households. Thus, there are many more households with an opportunity to be misclassified as food insecure than with an opportunity to be misclassified food secure.

[5] A more thorough treatment of possible sources of error in the present estimates is presented in the companion Technical Report volume, Chapter Eight.

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APPENDIX A

SUPPLEMENT TO THE APRIL 1995 CURRENT POPULATION SURVEY

APPENDIX B

QUESTIONS TESTED FOR THE FOOD SECURITY SCALES: UNWEIGHTED RESPONSE FREQUENCIES

Exhibit B-1

RESPONSES TO QUESTIONS TESTED FOR THE FOOD SECURITY SCALES
(Percent of Households in Category Responding Affirmatively)

Questions (in order of decreasing severity or response rate)		Household Type			Household Income Relative to the Poverty Line				All Households
		Households without Children or Elderly Members	Households with Children	Households with Elderly Member(s), No Children	Below 50 Percent	Between 50 and 100 Percent	Between 100 and 185 Percent	Above 185 Percent	
Number of Households (Unweighted)		15,273	16,954	12,503	2,240	4,451	8,971	29,068	44,730
Questions Included in the 12-Month Scale									
Q50	Child not eat for whole day	0.0%	0.2%	0.0%	0.6%	0.2%	0.1%	0.0%	0.1%
Q44	Child skipped meal, 3+ mos.	0.0	0.6	0.0	1.1	0.5	0.3	0.1	0.2
Q43	Child skipped meal	0.0	0.9	0.0	1.6	0.8	0.5	0.1	0.3
Q29	Adult not eat whole day, 3+ mos.	1.5	1.3	0.4	5.7	3.2	1.5	0.3	1.1
Q47	Child hungry	0.0	1.8	0.0	4.0	1.9	0.9	0.1	0.7
Q28	Adult not eat whole day	2.1	2.0	0.5	7.9	4.2	2.2	0.5	1.6
Q40	Cut size of child's meals	0.0	2.1	0.0	4.7	2.3	0.9	0.2	0.8
Q38	Adult lost weight	2.3	2.1	0.9	7.5	5.0	2.7	0.6	1.8
Q35	Adult hungry but didn't eat	3.9	4.3	1.4	12.9	8.6	5.1	1.2	3.4
Q57	Child not eating enough	0.0	5.3	0.0	9.9	6.2	2.9	0.4	2.0
Q25	Adult cut/skipped meals, 3+ mos.	5.5	6.4	2.5	19.1	13.5	7.3	1.8	5.0
Q32	Adult eat less than felt they	6.8	9.4	3.2	23.3	17.7	10.5	2.5	6.8
Q56	Couldn't feed child balanced	0.0	9.5	0.0	15.9	10.6	5.4	0.9	3.6
Q24	Adult cut size or skipped meals	7.7	9.5	3.2	24.7	17.6	11.0	2.8	7.1

Exhibit B-1 ***(continued)***

RESPONSES TO QUESTIONS TESTED FOR THE FOOD SECURITY SCALES

Questions (in order of decreasing severity or response rate)		Household Type			Household Income Relative to the Poverty Line				All Households
		Households without Children or Elderly Members	Households with Children	Households with Elderly Member(s), No Children	Below 50 Percent	Between 50 and 100 Percent	Between 100 and 185 Percent	Above 185 Percent	
Q58	Adult fed child few low-cost	0.0	14.8	0.0	23.9	15.1	8.9	1.6	5.6
Q55	Adult not eat balanced meals	11.1	15.1	7.0	39.3	31.2	18.5	4.0	11.5
Q54	Food bought didn't last	11.1	17.5	6.7	43.6	33.4	19.6	4.3	12.4
Q53	Worried food would run out	12.8	23.0	8.2	51.9	41.2	26.0	5.1	15.4
Resource Augmentation Questions									
Q23	Eat meals at soup kitchen	0.7	0.4	0.2	2.8	1.6	0.5	0.1	0.5
Q19	Children to other's home for meal	0.0	3.3	0.0	5.3	4.2	1.6	0.3	1.3
Q22	Get food from food pantry	2.1	4.7	1.6	15.5	10.7	3.4	0.5	3.0
Q21	Put off paying bill	9.9	20.8	4.5	33.7	29.9	22.5	5.0	12.5
Q18	Get food or borrow from others	8.1	12.6	3.1	30.3	21.9	13.8	2.8	8.4
Other Questions Excluded from 12-Month Scale									
Q20	Serve few kinds of low-cost food	9.4	10.8	6.0	32.0	25.2	13.8	3.1	9.0
Q16	Run out of food, no money for	88.8	82.1	94.6	62.2	71.6	82.8	94.1	87.8
Q15	Short of money, make food go	72.5	59.3	83.5	41.1	49.7	61.1	79.1	70.5
Questions Included in the 30-day scale									
Q52	Child not eat for whole day, 5+	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0
Q51	Child not eat for whole day	0.0	0.1	0.0	0.3	0.1	0.0	0.0	0.0
Q46	Child skipped a meal, 5+ days	0.0	0.2	0.0	0.5	0.1	0.1	0.0	0.1

Exhibit B-1 *(continued)*

RESPONSES TO QUESTIONS TESTED FOR THE FOOD SECURITY SCALES

Questions (in order of decreasing severity or response rate)		Household Type			Household Income Relative to the Poverty Line				All Households
		Households without Children or Elderly Members	Households with Children	Households with Elderly Member(s), No Children	Below 50 Percent	Between 50 and 100 Percent	Between 100 and 185 Percent	Above 185 Percent	
Q31	Adult not eat whole day, 5+ days	0.4	0.3	0.1	1.7	0.7	0.3	0.1	0.3
Q49	Child hungry, 5+ days	0.0	0.3	0.0	0.7	0.5	0.1	0.0	0.1
Q42	Cut child meal size, 5+ days	0.0	0.5	0.0	1.1	0.7	0.1	0.1	0.2
Q45	Child skipped meal	0.0	0.5	0.0	1.0	0.3	0.3	0.1	0.2
Q37	Adult hungry but didn't eat, 5+	0.9	0.9	0.2	3.1	2.2	1.0	0.2	0.7
Q48	Child hungry	0.0	0.9	0.0	1.9	1.0	0.4	0.1	0.3
Q30	Adult not eat whole day	1.1	0.9	0.2	4.4	2.1	1.0	0.2	0.8
Q41	Cut child meal size	0.0	1.1	0.0	2.3	1.3	0.5	0.1	0.4
Q39	Adult lost weight	1.1	1.1	0.4	4.0	2.9	1.3	0.3	0.9
Q34	Adult eat less than should,	2.0	1.9	0.7	6.3	4.3	2.3	0.6	1.6
Q36	Adult hungry	2.0	2.1	0.7	6.7	4.4	2.6	0.5	1.7
Q27	Adult cut/skip meals, 5+ days	2.2	2.2	0.6	7.2	4.6	2.6	0.6	1.8
Q33	Adult eat less than felt they	3.6	4.4	1.5	12.6	8.6	5.1	1.2	3.3
Q26	Adults cut meal size or skip	4.4	4.8	1.8	13.9	10.1	5.8	1.4	3.8
Questions Excluded from 30-Day Scale									
Q17	Run out of food, no money for	4.8	7.2	2.2	18.3	12.3	6.7	2.2	5.0

APPENDIX C

PREVALENCE ESTIMATES AND STANDARD ERRORS BY STATE

Exhibit C-1

ESTIMATED FOOD SECURITY PREVALENCES BY STATE:
Twelve Months Preceding the Survey

State	Total Households [in thousands]	Food Secure[a] (Percent)	Food Insecure, Hunger not Evident[b] (Percent)	Food Insecure, Moderate Hunger Evident[c] (Percent)	Food Insecure, Severe Hunger Evident[d] (Percent)
US	100,210	88.1	7.8	3.3	0.8
AK	214	89.4	6.1	4.1	0.4
AL	1,773	87.1	8.2	3.4	1.2
AR	949	86.4	8.3	4.1	1.2
AZ	1,628	86.2	8.7	4.1	1.0
CA	11,400	85.6	9.6	3.8	1.0
CO	1,561	90.7	4.3	3.7	1.3
CT	1,280	90.2	6.2	2.2	1.4
DC	273	87.6	7.3	3.8	1.3
DE	261	90.7	5.1	3.4	0.7
FL	5,746	87.5	7.3	3.8	1.5
GA	2,744	90.2	7.1	2.3	0.3
HI	375	90.8	7.0	1.5	0.7
IA	1,093	91.4	6.5	1.9	0.2
ID	422	88.8	8.4	2.1	0.6
IL	4,426	88.2	7.3	3.8	0.8
IN	2,448	86.9	7.5	5.1	0.5
KS	998	88.8	7.2	3.1	0.9
KY	1,583	86.4	8.7	3.8	1.0
LA	1,475	84.4	10.6	4.2	0.8
MA	2,103	91.4	5.8	2.2	0.7
MD	1,936	94.9	2.0	2.9	0.2
ME	476	89.9	6.8	2.3	1.1
MI	3,284	88.8	6.9	3.4	1.0

Notes at end of exhibit

Exhibit C-1 *(continued)*

ESTIMATED FOOD SECURITY PREVALENCES BY STATE:
Twelve Months Preceding the Survey

State	Total Households [in thousands]	Food Secure[a] (Percent)	Food Insecure, Hunger not Evident[b] (Percent)	Food Insecure, Moderate Hunger Evident[c] (Percent)	Food Insecure, Severe Hunger Evident[d] (Percent)
MN	1,920	91.2	5.9	2.4	0.6
MO	2,235	88.1	7.8	3.8	0.3
MS	993	82.8	10.3	6.0	0.9
MT	364	89.9	6.8	2.1	1.2
NC	2,792	89.1	8.1	2.4	0.4
ND	268	93.5	4.8	1.2	0.5
NE	658	91.6	6.9	1.1	0.4
NH	495	92.6	5.4	1.8	0.3
NJ	2,946	91.3	5.6	2.7	0.4
NM	615	83.3	10.6	4.1	1.9
NV	589	88.2	6.5	3.5	1.8
NY	6,714	87.8	8.1	3.3	0.8
OH	3,920	89.1	7.1	2.9	0.9
OK	1,243	84.4	11.1	3.9	0.7
OR	1,283	84.6	9.3	4.6	1.6
PA	4,840	90.4	6.6	2.3	0.6
RI	360	87.2	9.5	2.7	0.6
SC	1,513	91.0	6.4	2.0	0.6
SD	295	91.3	6.4	1.8	0.5
TN	2,238	86.0	9.2	3.8	0.9
TX	6,706	84.6	10.7	4.0	0.6
UT	618	89.3	7.3	3.2	0.2
VA	2,814	89.7	6.8	3.0	0.5
VT	232	90.0	6.1	3.4	0.5

Notes at end of exhibit

Exhibit C-1 *(continued)*

ESTIMATED FOOD SECURITY PREVALENCES BY STATE:
Twelve Months Preceding the Survey

State	Total Households [in thousands]	Food Secure[a] (Percent)	Food Insecure, Hunger not Evident[b] (Percent)	Food Insecure, Moderate Hunger Evident[c] (Percent)	Food Insecure, Severe Hunger Evident[d] (Percent)
WA	2,080	83.8	9.3	5.2	1.8
WI	2,078	93.6	4.8	1.4	0.2
WV	764	86.8	9.9	2.6	0.7
WY	197	89.2	6.3	4.4	0.2

[a] No or minimal indicators of food insecurity evident.

[b] Multiple indicators of food insecurity, but no or minimal indicators of resource-constrained hunger evident for household members.

[c] Multiple indicators of resource-constrained hunger evident for adult household members.

[d] Multiple indicators of resource-constrained hunger evident for children in household and/or indicators of severe adult hunger.

Exhibit C-2

STANDARD ERRORS FOR STATE PREVALENCE ESTIMATES:
Twelve Months Preceding the Survey

State	Total Households in Sample	Food Secure[a] (Percent)	Food Insecure, Hunger not Evident[b] (Percent)	Food Insecure, Moderate Hunger Evident[c] (Percent)	Food Insecure, Severe Hunger Evident[d] (Percent)
US	44,647	0.36	0.30	0.09	0.07
AK	494	1.63	0.59	1.34	0.30
AL	644	1.16	1.23	0.62	0.31
AR	558	1.92	1.87	0.49	0.67
AZ	548	2.19	1.48	1.05	0.33
CA	3,099	0.91	0.90	0.46	0.19
CO	581	1.05	0.79	0.78	0.64
CT	394	1.59	0.79	0.93	1.39
DC	474	1.76	1.44	0.89	0.64
DE	343	3.29	2.18	1.37	0.53
FL	2,032	1.34	1.07	0.60	0.26
GA	1,110	1.55	1.75	0.53	0.12
HI	322	1.54	1.50	0.69	0.54
IA	555	1.62	1.67	0.39	0.17
ID	574	2.22	2.14	0.68	0.37
IL	1,832	0.58	0.87	0.44	0.21
IN	506	2.30	1.69	0.98	0.34
KS	572	1.97	1.83	0.67	0.49
KY	574	0.96	0.63	0.69	0.53
LA	479	2.21	1.90	0.72	0.37
MA	1,680	0.76	0.56	0.32	0.22
MD	461	0.54	0.46	0.52	0.23
ME	435	1.23	1.19	0.87	0.57
MI	1,798	0.52	0.66	0.55	0.25

Notes at end of exhibit

Exhibit C-2 *(continued)*

STANDARD ERRORS FOR STATE PREVALENCE ESTIMATES:
Twelve Months Preceding the Survey

State	Total Households in Sample	Food Secure[a] (Percent)	Food Insecure, Hunger not Evident[b] (Percent)	Food Insecure, Moderate Hunger Evident[c] (Percent)	Food Insecure, Severe Hunger Evident[d] (Percent)
MN	620	1.48	1.30	0.63	0.27
MO	487	2.13	1.67	0.71	0.21
MS	527	2.23	1.46	1.67	0.49
MT	643	2.10	1.13	0.97	0.45
NC	1,764	0.66	0.67	0.44	0.17
ND	630	1.10	0.91	0.41	0.36
NE	620	0.81	0.81	0.53	0.32
NH	398	1.33	1.67	0.56	0.27
NJ	1,767	0.88	0.51	0.43	0.14
NM	529	1.52	1.19	0.73	0.60
NV	474	1.82	1.36	0.68	0.74
NY	2,751	0.85	0.75	0.41	0.22
OH	1,804	0.82	0.70	0.64	0.23
OK	634	1.54	1.01	0.85	0.37
OR	516	1.70	1.10	0.64	0.54
PA	2,097	0.34	0.47	0.33	0.23
RI	387	1.66	1.32	0.96	0.38
SC	502	1.91	1.86	0.79	0.33
SD	655	1.32	0.87	0.52	0.29
TN	552	2.49	1.66	1.33	0.64
TX	1,809	0.87	0.76	0.41	0.19
UT	499	1.56	0.86	0.57	0.19
VA	1,173	0.95	0.75	0.72	0.29
VT	399	1.08	1.49	1.13	0.34

Notes at end of exhibit

Exhibit C-2 *(continued)*

STANDARD ERRORS FOR STATE PREVALENCE ESTIMATES:
Twelve Months Preceding the Survey

State	Total Households in Sample	Food Secure[a] (Percent)	Food Insecure, Hunger not Evident[b] (Percent)	Food Insecure, Moderate Hunger Evident[c] (Percent)	Food Insecure, Severe Hunger Evident[d] (Percent)
WA	544	1.99	1.46	0.89	0.78
WI	626	0.85	0.77	0.44	0.20
WV	629	1.82	1.11	0.60	0.38
WY	546	2.99	1.49	1.94	0.16

[a] No or minimal indicators of food insecurity evident.

[b] Multiple indicators of food insecurity, but no or minimal indicators of resource-constrained hunger evident for household members.

[c] Multiple indicators of resource-constrained hunger evident for adult household members.

[d] Multiple indicators of resource-constrained hunger evident for children in household and/or indicators of severe adult hunger.

APPENDIX D

ESTIMATED STANDARD ERRORS FOR PREVALENCE TABLES IN CHAPTER FIVE

Exhibit D-1

STANDARD ERRORS: PREVALENCE OF HOUSEHOLD FOOD SECURITY STATUS BY SELECTED CHARACTERISTICS OF HOUSEHOLDS: 12-MONTH SCALE

Characteristic	Sample Size (in ones)	Food Secure[a]		Food Insecure, Hunger not Evident[b]		Food Insecure, Moderate Hunger Evident[c]		Food Insecure, Severe Hunger Evident[d]	
		Number (1000s)	Percent-age Points	Number (1000s)	Percent-age Points	Number (1000s)	Percent-age Points	Number (1000s)	Percent-age Points
Household Composition:									
All races:									
With children under 18 yrs	16,914	223	0.59	195	0.51	63	0.17	34	0.09
With children under 6 yrs	7,934	173	0.95	144	0.79	44	0.24	37	0.20
With elderly; no children	12,485	115	0.41	95	0.34	35	0.13	20	0.07
With no elderly or child	15,248	132	0.38	80	0.23	52	0.15	56	0.16
All household types	44,647	356	0.36	295	0.30	86	0.09	74	0.07
White:									
With children under 18 yrs	13,808	129	0.43	123	0.40	77	0.25	25	0.08
With children under 6 yrs	6,391	116	0.81	116	0.80	45	0.31	24	0.16
With elderly; no children	11,283	88	0.35	71	0.28	29	0.12	11	0.05
With no elderly or child	13,137	75	0.26	86	0.30	50	0.17	39	0.13
Black:									
With children under 18 yrs	2,023	76	1.31	74	1.27	19	0.33	13	0.22
With children under 6 yrs	959	49	1.74	33	1.15	21	0.73	15	0.52
With elderly; no children	926	40	1.71	35	1.50	9	0.39	10	0.41
With no elderly or child	1,370	50	1.29	34	0.88	33	0.87	22	0.58
Other:									
With children under 18 yrs	1,083	32	1.74	26	1.41	16	0.88	5	0.29
With children under 6 yrs	584	22	2.26	17	1.71	9	0.96	6	0.65
With elderly; no children	276	13	2.71	10	2.10	7	1.50	3	0.55
With no elderly or child	741	28	2.18	16	1.22	14	1.08	7	0.56
Hispanic:									
With children under 18 yrs	1,529	84	1.87	97	2.16	46	1.02	16	0.36
With children under 6 yrs	857	65	2.55	73	2.88	35	1.39	15	0.58
With elderly; no children	406	36	3.16	29	2.49	13	1.16	11	0.94
With no elderly or child	695	53	2.56	59	2.86	17	0.80	12	0.56

Notes at end of exhibit

Exhibit D-1 *(continued)*

STANDARD ERRORS: PREVALENCE OF HOUSEHOLD FOOD SECURITY STATUS BY SELECTED CHARACTERISTICS OF HOUSEHOLDS: 12-MONTH SCALE

Characteristic	Sample Size (in ones)	Food Secure[a]		Food Insecure, Hunger not Evident[b]		Food Insecure, Moderate Hunger Evident[c]		Food Insecure, Severe Hunger Evident[d]	
		Number (1000s)	Percentage Points	Number (1000s)	Percentage Points	Number (1000s)	Percentage Points	Number (1000s)	Percentage Points
Household Income Category:[e]									
(All races and household types)									
Below $10,000	6,368	105	0.70	10	0.67	41	0.27	57	0.38
$10,000 - $19,999	7,651	158	0.95	12	0.70	74	0.44	24	0.14
$20,000 - $29,999	7,202	92	0.59	60	0.38	61	0.39	15	0.09
$30,000 to $39,999	5,808	49	0.40	37	0.30	17	0.14	6	0.05
$40,000 - $49,999	4,037	20	0.24	22	0.25	18	0.22	6	0.07
Above $50,000	10,690	43	0.19	29	0.13	19	0.08	21	0.01
Household Income-to-Poverty Ratio:[c]									
(All races and household types)									
Under 0.50	2,219	86	1.55	82	1.48	40	0.71	33	0.59
Under 1.00	6,650	130	0.82	127	0.80	35	0.22	64	0.41
Under 1.30	9,384	176	0.81	159	0.73	42	0.19	68	0.31
Under 1.85	15,594	263	0.75	218	0.62	68	0.19	68	0.19
1.85 and over	29,053	92	0.14	78	0.12	40	0.06	21	0.03
Household Relationship:									
(All races)									
Households with children under 18 yrs	16,914	223	0.59	195	0.51	63	0.17	34	0.09
Married couple families	12,295	103	0.38	97	0.36	62	0.23	12	0.05
Female head, no spouse	3,677	93	1.04	77	0.87	59	0.66	28	0.32
Male head, no spouse	942	30	1.30	23	1.00	20	0.88	6	0.28
Households with no children or elderly	15,248	132	0.38	80	0.23	52	0.15	56	0.16
Living alone	5,941	93	0.67	47	0.34	56	0.41	39	0.29
Households with elderly but no children	12,485	115	0.41	95	0.34	35	0.13	20	0.07
Living alone	5,222	90	0.77	76	0.65	31	0.27	21	0.18

Notes at end of exhibit

Exhibit D-1 *(continued)*

STANDARD ERRORS: PREVALENCE OF HOUSEHOLD FOOD SECURITY STATUS BY SELECTED CHARACTERISTICS OF HOUSEHOLDS: 12-MONTH SCALE

Characteristic	Sample Size (in ones)	Food Secure[a]		Food Insecure, Hunger not Evident[b]		Food Insecure, Moderate Hunger Evident[c]		Food Insecure, Severe Hunger Evident[d]	
		Number (1000s)	Percentage Points	Number (1000s)	Percentage Points	Number (1000s)	Percentage Points	Number (1000s)	Percentage Points
Area of Residence:									
(All races and household types)									
Inside Metropolitan areas	24,214	286	0.47	230	0.38	73	0.12	58	0.10
In central city	9,606	169	0.70	129	0.53	49	0.20	48	0.20
Not in central city	14,608	165	0.45	132	0.36	41	0.11	28	0.08
Outside Metropolitan areas	12,532	97	0.41	72	0.30	41	0.17	23	0.10
Census Geographic Region:									
(All races and household types)									
Northeast	10,308	76	0.39	62	0.32	35	0.18	23	0.12
New England	3,693	16	0.33	14	0.28	11	0.22	15	0.31
Middle Atlantic	6,615	68	0.47	63	0.43	27	0.18	21	0.14
Midwest	10,705	158	0.67	124	0.52	57	0.24	26	0.11
East North Central	6,566	95	0.59	77	0.48	54	0.34	23	0.14
West North Central	4,139	68	0.91	57	0.76	22	0.29	12	0.15
South	14,265	142	0.40	109	0.30	41	0.11	26	0.07
South Atlantic	8,488	81	0.43	63	0.34	34	0.18	15	0.08
East South Central	2,297	76	1.16	60	0.92	28	0.42	16	0.25
West South Central	3,480	80	0.77	65	0.63	22	0.21	20	0.20
West	9,369	111	0.52	109	0.51	68	0.32	34	0.16
Pacific	4,975	123	0.80	124	0.81	63	0.41	33	0.22
Mountain	4,394	33	0.54	25	0.41	23	0.38	11	0.19

[a] No or minimal indicators of food insecurity evident.

[b] Multiple indicators of food insecurity, but no or minimal indicators of resource-constrained hunger evident for household members.

[c] Multiple indicators of resource-constrained hunger evident for adult household members.

[d] Multiple indicators of resource-constrained hunger evident for children in household and/or indicators of severe adult hunger.

[e] Income and poverty status refers to household income in preceding 12 months.

APPENDIX E

DISTRIBUTION OF PERSONS IN HOUSEHOLDS BY FOOD SECURITY STATUS CLASSIFICATION

Exhibit E-1

ESTIMATED NUMBERS AND PROPORTIONS OF PERSONS WITH SELECTED CHARACTERISTICS LIVING IN HOUSEHOLDS WITH EACH FOOD SECURITY STATUS: 12-MONTH SCALE

Characteristic[a]	Total (1000s)	Food Secure		Food Insecure, Hunger not Evident[b]		Food Insecure, Moderate Hunger Evident		Food Insecure, Severe Hunger Evident[c]	
		Number (1000s)	Percent	Number (1000s)	Percent	Number (1000s)	Percent	Number (1000s)	Percent
Age:									
All races:									
Children under age 6	24,410	19,460	79.7	3,599	14.7	1,137	4.7	215	0.9
Children under age 18	70,160	56,480	80.5	9,427	13.4	3,570	5.1	692	1.0
Adults age 18 to 59	148,900	130,400	87.6	12,380	8.3	4,997	3.4	1,168	0.8
Adults age 60 or older	41,650	39,190	94.1	1,686	4.1	638	1.5	128	0.3
All people	260,170	226,000	86.7	23,490	9.0	9,205	3.5	1,987	0.8
White:									
Children under age 6	19,170	15,720	82.0	2,621	13.7	697	3.6	130	0.7
Children under age 18	55,480	46,070	83.1	6,703	12.1	2,263	4.1	439	0.8
Adults age 18 to 59	123,900	110,500	89.1	9,192	7.4	3,432	2.8	835	0.7
Adults age 60 or older	37,050	35,360	95.4	1,171	3.2	451	1.2	69	0.2
Black:									
Children under age 6	3,969	2,749	69.3	790	19.9	387	9.8	44	1.1
Children under age 18	11,200	7,714	68.9	2,217	19.8	1,083	9.7	188	1.7
Adults age 18 to 59	18,250	14,150	77.5	2,557	14.0	1,278	7.0	266	1.5
Adults age 60 or older	3,670	3,010	82.0	448	12.2	157	4.3	54	1.5
Other:									
Children under age 6	134	80	59.4	32	24.0	14	10.3	8	6.3
Children under age 18	457	279	61.2	90	19.7	74	16.1	14	3.0
Adults age 18 to 59	770	559	72.6	103	13.4	86	11.2	22	2.8
Adults age 60 or older	122	104	84.9	13	11.0	3	2.3	2	1.9
Hispanic:									
Children under age 6	3,714	2,388	64.3	928	25.0	323	8.7	75	2.0
Children under age 18	9,715	6,327	65.1	2,354	24.2	879	9.1	154	1.6
Adults age 18 to 59	15,420	11,560	75.0	2,655	17.2	1,037	6.7	170	1.1
Adults age 60 or older	2,099	1,653	78.7	320	15.2	100	4.8	27	1.3

Notes at end of exhibit

Exhibit E-1 *(continued)*

ESTIMATED NUMBERS AND PROPORTIONS OF PERSONS WITH SELECTED CHARACTERISTICS LIVING IN HOUSEHOLDS WITH EACH FOOD SECURITY STATUS: 12-MONTH SCALE

Characteristic[a]	Total (1000s)	Food Secure		Food Insecure, Hunger not Evident[b]		Food Insecure, Moderate Hunger Evident		Food Insecure, Severe Hunger Evident[c]	
		Number (1000s)	Percent	Number (1000s)	Percent	Number (1000s)	Percent	Number (1000s)	Percent
Household Income Category:[d]									
(All races and household types)									
Below $10,000	31,450	19,670	62.6	7,237	23.0	3,527	11.2	1,010	3.2
$10,000 - $19,999	38,750	28,830	74.4	6,745	17.4	2,615	6.8	563	1.5
$20,000 - $29,999	39,180	33,430	85.3	4,197	10.7	1,402	3.6	157	0.4
$30,000 to $39,999	33,140	30,320	91.5	2,132	6.4	609	1.8	71	0.2
$40,000 - $49,999	25,120	23,740	94.5	1,028	4.1	322	1.3	35	0.1
Above $50,000	70,430	69,320	98.4	813	1.2	274	0.4	27	0.0[e]
Household Income-to-Poverty Ratio:[d]									
(All races and household types)									
Under 0.50	17,220	9,733	56.5	4,524	26.3	2,196	12.8	770	4.5
Under 1.00	43,860	27,030	61.6	10,820	24.7	4,753	10.8	1,249	2.8
Under 1.30	58,820	37,990	64.6	13,410	22.8	5,984	10.2	1,431	2.4
Under 1.85	94,440	67,040	71.0	18,330	19.4	7,400	7.8	1,672	1.8
1.85 and over	166,300	159,000	95.6	5,168	3.1	1,805	1.1	314	0.2
Household Relationship:									
(All races)									
Households with children under 18 yrs	150,200	123,800	82.4	18,470	12.3	6,619	4.4	1,266	0.8
Married couple families	112,700	98,600	87.5	10,540	9.4	2,967	2.6	619	0.6
Children < age 18	50,740	43,950	86.6	4,990	9.8	1,482	2.9	318	0.6
Female head, no spouse	29,690	19,030	64.1	6,908	23.3	3,177	10.7	578	2.0
Children < age 18	15,940	9,774	61.3	3,938	24.7	1,876	11.8	347	2.2
Male head, no spouse	7,752	6,184	79.8	1,023	13.2	475	6.1	69	0.9
Children < age 18	3,491	2,754	78.9	499	14.3	212	6.1	27	0.8
Households with no children or elderly	62,290	56,560	90.8	3,233	5.2	1,905	3.1	584	0.9
Living alone	13,720	11,670	85.0	1,053	7.7	743	5.4	258	1.9
Households with elderly but no children	48,260	45,650	94.6	1,792	3.7	681	1.4	136	0.3
Living alone	11,700	10,740	91.8	638	5.5	267	2.3	57	0.5

Notes at end of exhibit

Exhibit E-1 *(continued)*

ESTIMATED NUMBERS AND PROPORTIONS OF PERSONS WITH SELECTED CHARACTERISTICS LIVING IN HOUSEHOLDS WITH EACH FOOD SECURITY STATUS: 12-MONTH SCALE

Characteristic[a]	Total (1000s)	Food Secure		Food Insecure, Hunger not Evident[b]		Food Insecure, Moderate Hunger Evident		Food Insecure, Severe Hunger Evident[c]	
		Number (1000s)	Percent	Number (1000s)	Percent	Number (1000s)	Percent	Number (1000s)	Percent
Area of Residence:[f]									
(All races and household types)									
Inside metropolitan areas	158,300	136,830	86.4	14,492	9.2	5,581	3.5	1,392	0.9
In central city	59,760	48,830	81.7	7,457	12.5	2,791	4.7	680	1.1
Not in central city	98,540	88,000	89.3	7,035	7.1	2,790	2.8	712	0.7
Outside metropolitan areas	62,140	53,720	86.4	5,742	9.2	2,319	3.7	357	0.6
Census Geographic Region:									
(All races and household types)									
Northeast	50,150	44,660	89.1	3,852	7.7	1,307	2.6	323	0.6
New England	12,520	11,340	90.6	820	6.6	278	2.2	76	0.6
Middle Atlantic	37,630	33,320	88.6	3,032	8.1	1,029	2.7	248	0.7
Midwest	61,180	54,220	88.6	4,774	7.8	1,827	3.0	357	0.6
East North Central	42,130	37,220	88.4	3,295	7.8	1,326	3.2	289	0.7
West North Central	19,050	17,000	89.2	1,479	7.8	501	2.6	68	0.4
South	92,750	79,590	85.8	8,848	9.5	3,622	3.9	684	0.7
South Atlantic	48,040	42,390	88.2	3,819	8.0	1,470	3.1	358	0.7
East South Central	16,760	14,200	84.7	1,682	10.0	735	4.4	142	0.9
West South Central	27,950	23,000	82.3	3,347	12.0	1,418	5.1	184	0.7
West	56,640	47,550	84.0	6,020	10.6	2,449	4.3	623	1.1
Pacific	40,980	34,050	83.1	4,655	11.4	1,809	4.4	469	1.1
Mountain	15,650	13,500	86.2	1,365	8.7	640	4.1	154	1.0

[a] Some numbers may not sum to totals due to rounding.

[b] Hunger evident at moderate levels for adults in household.

[c] Hunger evident for children and at more severe levels for adults in ousehold.

[d] Income and poverty status refer to household income and status in the preceding year.

[e] Too few cases to provide a meaningful estimate

[f] Area of residence is not identified for between 12-16 percent of persons in each food security category.

APPENDIX F

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