

**DISSERTATION**

**INDEPENDENT VALIDATION OF THE CORE FOOD SECURITY MODULE  
WITH ASIANS AND PACIFIC ISLANDERS**

Submitted by

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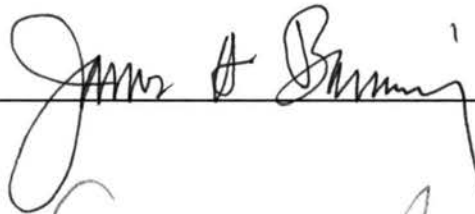
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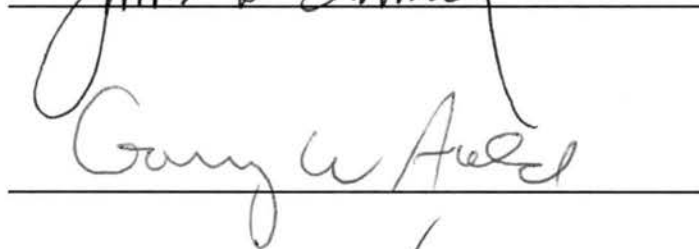
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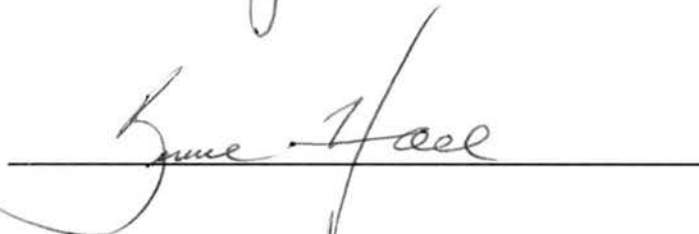
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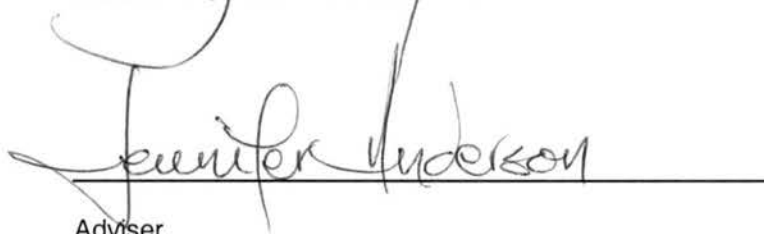
WE HEREBY RECOMMEND THAT THE DISSERTATION PREPARED UNDER OUR SUPERVISION BY JODA DERRICKSON ENTITLED INDEPENDENT VALIDATION OF THE CORE FOOD SECURITY MODULE WITH ASIANS AND PACIFIC ISLANDERS BE ACCEPTED AS FULFILLING, IN PART, REQUIREMENTS FOR A DOCTORATE OF PHILOSOPHY.

Committee on Graduate Work









Adviser



Department Head

## ABSTRACT OF DISSERTATION

### INDEPENDENT VALIDATION OF THE CORE FOOD SECURITY MODULE WITH ASIANS AND PACIFIC ISLANDERS

An independent validation of the national household food security measure—the Core Food Security Module (CFSM) and its categorical algorithm—was conducted with Asians and Pacific Islanders in Hawai`i. Research was conducted in three parts: 1) a qualitative study (n=61), 2) a pilot stability study (n=61), and 3) a study replicating methods used to develop the CFSM (n=1664). Caucasians, Hawaiians and part-Hawaiians, Filipinos and Samoans residing in Hawai`i comprised the ethnic groups of focus. Findings:

- ◆ Confirmed the face validity of the CFSM with Asians and Pacific Islanders in Hawaii.
- ◆ Indicated “balanced meals” was most often perceived as a meal with “meat, starch and a vegetable”;
- ◆ Indicated the CFSM yields valid and reliable scale measures among Asians and Pacific Islanders in Hawai`i, except possibly with American Samoans (n=23).
- ◆ Suggest weak credibility, validity and stability of the CFSM categorical algorithm: 27% of 111 households identified as food secure with one or more affirmative reply responded affirmatively to “unable to eat balanced meals”; 50% of 64 households classified as experiencing moderate hunger responded affirmatively to “respondent hungry”; and only 62% were consistently classified in the same category over time.

- ◆ A “face valid” algorithm—in which one affirmative response is classified as “at risk of hunger” and those who responded affirmatively to Q10 or to the child hunger question (Q14) were classified as such, regardless of other responses, was a preferred algorithm. Compared to the national algorithm, this algorithm resulted in:
  - a lower percentage classified as food secure (85% vs. 78%);
  - a greater percentage who were classified consistently as food insecure without hunger over time (57% vs. 80%);
  - improved face and concurrent validity.
  
- ◆ In general, progressively deteriorating food security status as experienced in Hawai`i resulted in concurrent decreased vegetable intake, and increased reliance on Saimin and resource augmentation behaviors.

Prudence must be utilized when extending findings to ethnic groups not studied. Findings warrant further investigation of a shorter household food security measure and reassessment of the CSFM categorical algorithm.

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*And to The Holy Spirit that guides and comforts me*

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Then Jesus called his disciples to him and said—

***“I have compassion for the crowd because they have been with me now for three days and have had nothing to eat, and I do not want to send them away hungry for they might faint along the way.”***

Matthew 15:32

New Revised Standard Version Bible

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## LIST OF ABBREVIATIONS

CFSM	Core Food Security Module
CPS	Current Population Survey
CSFII	Continuing Survey of Food Intake of Individuals
DBEDT	Department of Business, Economic Development and Tourism, State of Hawaii
DHHS-CDCP	(U.S.) Department of Health and Human Service's Center for Disease Control and Prevention,
DOH	Department of Health, State of Hawaii
FCS	Food and Consumer Service
FSP	Food Stamp Program
FRAC	Food, Research, and Action Center
HFB	Hawai'i Foodbank, Inc.
LSRO	Life Sciences Research Office (LSRO) of the Federation of the American Societies for Experimental Biology
MSR	Mean Square Residuals
NCHS	National Center for Health Statistics
NHANES	National Health and Examination Survey
NNMRRP	National Nutrition Monitoring and Related Research Program
PWORA	Personal Work Opportunity and Responsibility Act
Q	Question
RC	Radimer/Cornell
SES	Social-economic status
TANF	Temporary Assistance for Needy Families
WIC	Special Supplemental Nutrition Program for Women, Infants and Children

## CHAPTER 1

### Project Overview

*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" (LSRO, 1990). In the words of the needy, food insecurity means "running out of food." (For easy reference, additional terms related to food security are defined in Appendix 1). Recently enhancing food and nutrition security has become an established goal of the United States Department of Agriculture's food assistance programs (FCS, 1998).

Despite billions of dollars in federal assistance and a national network of food 12% of U.S. population have experienced some degree of food insecurity the last 12 months (Hamilton *et al.*, 1997a). Many are children or seniors without adequate resources to support themselves. Without reliable or inaccurate food security measure can negatively affect vulnerable segments of the population and waste valuable resources. The overarching purpose of this project was to develop a reliable and valid food security measure to use in Hawai'i for statewide surveillance efforts and for enhancing the accountability of charitable food distribution. Therefore, this research is focused not on enhancing food security status, but the more fundamental question of how to adequately, and cost effectively measure food security status in an ethnically diverse population.

As outlined in Figure 1.1, food insecurity is a unidimensional construct ranging from food secure to various stages of food insecurity culminating in severe hunger:

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Food Security	Food Insecurity without hunger	Food Insecurity with Moderate Hunger	Food Insecurity with Severe Hunger
---------------	--------------------------------	--------------------------------------	------------------------------------

**Figure 1.1. Food security status continuum**

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Currently, survey instruments to measure food security status are unidimensional scales that determine the severity of food security through multiple indicators. The 18-question Core Food Security Module (CFSM) is used by the federal government to measure the extent and severity of food security of households in the last 12 months (Carlson *et al.*, 1999: Appendix 2). Responses to the 18 items are used to create a respondent scale measure. Based on the number of affirmative responses and the composition of the household, a categorical algorithm can also be applied to classify respondents into one of four categories: food security, food insecurity without hunger, food insecurity with moderate hunger and food insecurity with severe hunger. As the CFSM is the “state of the art” food security measure it was chosen as the model worth validating among Asians and Pacific Islanders in Hawai`i .

Asians and Pacific Islanders are a diverse ethnic category encompassing Japanese, Chinese, Koreans, Vietnamese, Cambodians, Laotians, Filipinos, Hawai`i ans, Samoans, Tongans, Chamorros, Hmong and others. The percentage of Asians and Pacific Islanders, throughout the United States has gone from 3% of the U.S. population in 1990, to 3.7% in 1996, and is expected to increase to 5.1% by 2010 and to 8.7% by 2050 (U.S. Bureau of the Census, 1996). In Hawai`i, Whites and Blacks combined make up 23.6% of the population, Asians and Pacific Islanders make up at least 45.6% of the population, with 20.8% of mixed or miscellaneous groups (DBEDT, 1997). Furthermore, Asians and Pacific Islanders are known to have different approaches to food acquisition, food preparation, health care and in coping with stressful situations (Palafox & Warren, 1980).

However, only 2% of the sample used to develop the CFSM consisted of Asians and Pacific Islander respondents (Hamilton *et al.*, 1997a). Furthermore, neither the CFSM, nor the conceptual models it is based on, have been evaluated with Asians and Pacific Islander populations. Nor has the CFSM been reassessed with other ethnic or population groups

### **Objectives and Hypothesis**

The overall purpose of this research effort was to ascertain which food insecurity instrument or survey indicators should be used among Asians and Pacific Islanders. Hawai'i, a state where 50% of the population is of Asian or Pacific Islander origin, was the site of choice. The overall research question was:

*Does the 18 question CFSM and the conceptual framework it is based on, accurately and reliably describe food insecurity and hunger in Hawai'i, a state where 50% of the population is of Asian and/or Pacific Island ancestry?*

The following questions were also pursued:

1. Based on qualitative research are the unidimensional framework and the 18 indicator questions of the national food security measure consistent with target audience's perceptions of food insecurity? If not, what alternative question set provides a better measure of food security status in the target population?

*Null hypothesis: Yes, the core module appears appropriate to use without modification*

*Alternative hypothesis: No, an alternative set of questions (including the CFSM questions) should be used.*

2. Are there differences in the proportions of food security status estimates among ethnic groups in Hawai'i ?

*Null hypothesis: no*

*Alternative hypothesis: yes*

The objectives of this project were:

1. To conduct an independent validation of the 18 question CFSM (conceptual model, scale validity, and categorical algorithm) on a multi-ethnic sample of low-income households with children in Hawai'i:
  - a. To estimate reliability and validity of the CFSM;
  - b. If the CFSM was not found to be reliable and valid, to then develop an "alternate module" for use in Hawai'i.
2. To ascertain which survey questions may be useful as "predictors" for criterion-related validation of food security status in a predominately Asian and Pacific Islander limited resource population.

### **Experimental Design and Presentation**

A three-part methodology was applied. To simplify presentation and expedite publication, rather than conglomerate diverse methodologies, samples and findings, each individual research effort is described separately in its own chapter. Chapters, with the exception of Chapters 2 and 10 (which respectively contain a literature review, and overall conclusions and recommendations), are written in the style of a peer-reviewed manuscript. Thus, Chapters 3-9 each commence with a brief review of literature and a summary of relevant previous work. Consistent with publication guidelines tables for are presented at the end of Chapters 3-9. A list of all tables, figures and

acronyms can be found on pages x-xiii. References are formatted for publication in the Journal of Nutrition.

Part 1 involved a qualitative assessment of face validity of the CFSM. The target audience of this project are the "food gatekeepers" (the person who buys and prepares foods) in low-income families on the island of O`ahu, Hawai`i. Data collection was completed between September 1997 and January 1998. Chapter 3 contains findings of the face validity of the CFSM. Findings have been shared at the annual meeting of the Society for Nutrition Education (Derrickson & Anderson, 1998), and have been accepted for publication as a research article in the Journal of Nutrition Education (Derrickson & Anderson, 1999).

Part 2 consisted of a pilot test of the reliability and stability of the CFSM over time, a preliminary assessment of variables related to food security status, and an assessment of respondents perceived meaning of the term "balanced meals" as asked in Question (Q) 4. "unable to eat balanced meals". Survey respondents were 77 recipients of charitable food assistance on the island of O`ahu, Hawai`i, of whom 61 completed certain questions again a mean of 11 days later. Data collection took place in mid-June and again in early July of 1998. Findings related to the pilot test, reliability and stability of the CFSM are found in Chapter 4. Findings related to the assessment of Q4 "unable to eat balanced meals" are in Chapter 5. Findings related to the validity and reliability of a single question that was used to measure the amount of vegetables consumed are described in Chapter 6. All findings pertaining to concurrent validity (food security status with income, demographic, and dietary variables) are described in Chapter 9.

Part 3 involved the application of a survey containing the CFSM and selected predictor variables to both a statewide telephone sample and a telephone sample of charitable food recipients. To the extent possible, the methodology used to originally validate the core module (Hamilton *et al.*, 1997b) was replicated. Data included surveys completed by 1459 respondents from the statewide survey, 144 respondents from charitable food agencies including the 77 who were

collected in the pilot test, and at times, the 61 participants who completed the CFSM a second time. The study of scale validity of the CFSM is presented in Chapter 7. Findings related to the assessment of various food security categorical algorithms are described in Chapter 8. Findings pertaining to concurrent validity of the CFSM with the newly developed "face valid algorithm" are reported in Chapter 9.

### **Expected Outcomes**

This is the first study to independently validate the CFSM, both the respondent scale measure and the categorical algorithm. Furthermore, it is the first study to conduct specific food security research on Asians and Pacific Islanders residing in the United States. Preliminary findings were shared at the Second Food Security Measurement and Research Conference (Derrickson *et al.*, 1999). Many findings confirm previous research and have been identified by the Economic Research Service as warranting further investigation (ERS, 1999). However, various methods, findings, and recommendations are nouvelle and presented for the first time in this document.

At the onset of this project the accomplishment of four outcomes were desired:

1. An independent assessment of the robustness of the CFSM in a state population and among charitable food recipients consisting of a majority of Asians and Pacific Islanders;
2. Enhanced knowledge and measurement of predictor variables (causes, health, and experiential outcomes, and the various coping behaviors people utilize to ameliorate their situation) that can assist policy makers and educators in designing more effective programs and improving the measurement of program outcomes;
3. Construction and validation of a food security instrument, which would be used for food security surveillance efforts in Hawai'i; and

4. Development of a model that other researchers could use to validate the CFMS with diverse population groups.

While Chapter 10 contains a summary of the progress made in accomplishing these outcomes, it is clear that despite the merit of this study and previous work (Hamilton *et al.*, 1997b; Blumberg *et al.*, 1998), additional research is needed before a simple, reliable and valid food security monitoring tool is available for use among diverse population groups.

#### Disposition of the Author

An author's disposition and background affects their perspectives on and to any research project. The following brief biological sketch outlines the basis of my orientation to food security assessment in Hawaii. I was born in Honolulu, Hawaii and attended public school, prior to attending a private high school. Prior to this study I worked as a Nutrition Specialist with the University of Hawaii's Cooperative Extension Service, and was the State Coordinator of the Expanded Food and Nutrition Education Program in Hawai'i. I was and still am a volunteer with various non-profit and religious food agencies that serve an ethnically-diverse clientele in Hawai'i. I am the mother of two children whose father is part-Hawaiian.

My background as community nutritionist for limited resource audiences provided insights into why documentation of household and individual hunger at the local level was needed to

- a. justify to policy makers the extent of food insecurity at the local level;
- b. better target limited resources to those most in need; and
- c. evaluate program impact.

## CHAPTER 2

### Literature Review

This literature review consists of four sections:

1. measurement and validation methods applied to food security measurement;
2. food security measurement in the United States;
3. factors affecting food choices; and
4. background on Hawai'i.

The first section begins with a description of a general understanding of measurement and validation methods and concludes with a description of Rasch programming as it is applied to food security measurement. It provides the background to understand and judge the section on food security measurement.

#### **Measurement and Validation Methods Applied to Food Security Measurement**

Historically, one of the greatest obstacles to measurement of hunger and food insecurity has been lack of agreed upon definitions of terms (Margen & Neuhauser, 1989; Campbell, 1991). Key definitions used by the federal government are outlined in Appendix 1.

## **Traditional Measures of Validation and Reliability Assessment**

According to Hessler (1992) measurement involves classification of cases according to a predetermined rule; it is the means researchers have for bridging the abstract world of theories with concrete observations that allow us to generate meaning. The initial step in measurement is the “clarification of the concepts embedded in one’s hypothesis with words and examples, ultimately arriving at precisely stated definitions” (Singleton *et al.*, 1993; p. 100). Theoretical definitions provide a basis for judging the quality of measure and enable reviewers to evaluate the meaning of one’s work. Since the purpose of this project is to validate a measure of food security status, we begin with a dissection of the definition of food security (LSRO, 1990; p. 1589):

Access by all people at all times to enough food for an active, healthy life and includes at a minimum: a) the ready availability of nutritionally adequate and safe foods; and b) the assured ability to acquire acceptable foods in socially acceptable ways (without resorting to emergency food supplies, scavenging or other coping strategies).

Thus, the definition of food security captures various dimensions of food acquisition: caloric and nutritional adequacy, the safety of the food supplied, the confidence in one’s ability to procure food; and the social acceptability of how food is acquired.

The second step in measurement involves a “specification of variables and items to provide an empirical manifestation of one’s concepts” (Singleton *et al.*, 1993; p. 130). There are four levels of measurement: nominal, ordinal, interval and ratio. Ordinal measurement involves a rank order of measures. Rules are applied to create a ranking of the cases measured. The interval between ranks is of unknown size. Most food security status scales, including the CFMSM use multiple items to create an ordinal, unidimensional scale. Unidimensionality refers to measurement of a

concept that has only one dimension; not various dimensions such as nutritional adequacy. A set of items is used to measure the full extent of food insecurity and to create an ordinal scale.

The third step of measurement is operationalization or a description of the research procedures necessary to assign units of measure (Singleton *et al.*, 1993). Research completed by USDA staff (Cristofar & Basiotis, 1992), a group at Cornell University (Radimer *et al.*, 1992) and by the Community Childhood Hunger Identification Project (CCHIP: Wehler *et al.*, 1992) created the conceptual basis of the CFMS outlined in Appendix 2. Empirically, food insecurity is understood as a managed process of “rational economizing behavior” where hunger is the more severe form of food insecurity. Food insecurity includes four categories of effects both among the household and the individual:

- 1) deteriorating quality of food consumed;
- 2) deteriorating quantity of food consumed;
- 3) psychological affects involving anxiety and stress; and
- 4) socially unacceptable food choices and eating patterns.

As food security diminishes, initially household members worry about their food situation and make adjustments accordingly by utilizing various coping strategies such as eating less expensive foods and/or unbalanced meals, using alternative charitable food assistance, with little or no evidence of the physical manifestations of hunger. As the situation deteriorates further, additional behaviors, including cutting back on the size of meals, are also employed. If children are in the household, they are generally spared as long as possible.

The 18 question CFMS and its operationalized framework can be found in Appendices 2 and 3. In all cases responses are based on the respondents' perceptions of what has occurred in the last 12 months because of inadequate resources for food. Based on a sum of food security responses the national food security algorithm classifies respondents into one of four food security categories:

Food secure. This category includes households which are completely “worry free” and can for the most part, purchase what they want to eat when they want to eat it. According to USDA it also includes households who are minimally experiencing food resource economizing resulting in substitution of “cheaper” foods and a more monotonous diet (Bickel *et al.*, 1996).

Food insecure without hunger. This category includes households experiencing severe economizing, short of hunger, often affecting the quality of food consumed. Generally socially unacceptable food acquisition methods such as using a food pantry, borrowing from others, etc., are employed. Adverse affects to health and nutritional status may or may not occur depending on the extent of the depletion and food choices.

Food insecure with resource constrained hunger. This category includes households in which at least some adult members of the household experience inadequate food intake, i.e., cutting size or skipping meals, sometimes, because of insufficient resources. A reduction in the quality and amount of food eaten by children may also be seen.

Food insecurity with severe hunger and hunger among children. This category includes households experiencing progressively more severe hunger among adults and hunger among children.

The empirical understanding of food insecurity explicitly includes utilization of coping behaviors. “coping behaviors are strategies that household members use in response to food shortages to increase their food supply through culturally unconventional means” (Scott, 1994). Extra-household strategies include using emergency food resources, asking friends and family members for money or food, sending a child to someone else's house for dinner, buying food on credit or using discarded food from some other source. Intra-household strategies include stretching food or food money by buying less expensive or less nutritious foods, cutting the size of meals, skipping meals, and diluting infant formula.

Measurement error. There are three sources of variation in measurement: a) true differences; b) systematic errors; and c) random errors. The ideal measurement tool can discriminate true differences accurately and reliably with little or no systematic or random error. Systematic measurement is consistently biased in one direction, and can affect validity, but not usually reliability. Examples of systematic measurement include cultural bias and reading ability. On the other hand, random measurement is unrelated to the concepts measured and includes transient factors such as mood swings or fatigue of researchers or participants or ambiguous questions. Random errors can result in inaccurate measures, which affect reliability, but because unsystematic errors can cancel themselves out they do not usually affect validity.

Reliability and validity. "Reliability refers to the consistency or stability of an operational definition: *validity* to the goodness of fit between an operational definition and the concept it is purported to measure" (Singleton *et al.*, 1993, p. 131). In order to be valid a measure must be reliable. However, a reliable measure is not necessarily valid. Singleton neatly illustrates these differences using dartboards (Singleton *et al.*, 1993). A dartboard containing all the darts near the center represents a valid and reliable measure. A reliable but invalid measure, with high systematic error can be depicted as having all the darts in one quadrant of the dartboard. A measure with low reliability and low validity (high random error, low systematic error) would have darts all over the outer circle of the dartboard, but not in the middle.

Reliability assessment. Reliability, the repeatability or reproducibility of a measure (Singleton *et al.*, 1993) involves an assessment of the correlation between:

1. repeated applications of the measure (test-retest reliability);
2. responses to different but parallel forms of measure;
3. responses to subset of items from the same measure (split-half consistency);

an examination of the consistency of responses across all items (internal consistency); or an assessment of correspondence among different interviews, observers, or coders applying the same measure (intercoder reliability).

Test-retest reliability measures stability or consistency over time (1). Equivalence is measured by the other four tests outlined above (2-5). Reliability of a measure can be increased by having two or more questions on each specific topic, through objective scoring, by clarifying ambiguous wording of questions, and by having the correct person complete the survey under ideal test conditions (Carmines & Zeller, 1980). To the extent possible in test-retest assessment one must duplicate survey collection methods. To maintain validity in a test-retest situation researchers must minimize the effect that presence of a factor on a pretest may affect posttest results.

Test-retest reliability and internal consistency assessments are the primary forms of traditional reliability assessment utilized in this study. Zeller and Carmines (1980) argue that although these test-retest measures are intuitively appealing, they have serious limitations including expense, difficulty in reaching the same person in the same context in a short time frame, and reactivity of simply being measured. The split half procedure involves dividing the items into two halves and using correlation coefficients to assess their reliability. Chronbach's alpha is a similar procedure, which also encompasses variance between variables, where a coefficient above .70 is desirable:

$$a_{xx} = [k / (k-1)] * [1 - (\text{Sum of variance of item } l / \text{variance of the test score})]$$

Chronbach's alpha can be used to assess the appropriateness of including individual items in the scale. The usual rule is that if  $a_{xx}$  increases substantially when an item is removed from the scale than the item should be considered for removal. Likewise, for other measures of reliability, 0.70 is acceptable for general reliability but 0.90 is needed to support clinical measures (Nunnally, 1978).

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**Table 2.1**  
**Five Judgements of Internal and External Validity**

Internal validity	External validity
<b>Explanation credibility</b> -- is the relationship demonstrated plausible and is the rationale credible?	<b>Explanation generalizability</b> -- what is the generality stated or implied? Is it reasonable?
<b>Translation feasibility</b> -- is the operationalized translation of the proposition acceptable; has the relationship been demonstrated appropriately?	<b>Translation generality</b> --is generality accurately translated into the design of the study so that the subjects, situations, observations, etc. represent the subjects, observations, situations, etc. to which generality is to be extended?
<b>Demonstrated relationship</b> --was the demonstration successful in showing that the indicated relationship held in this instance? Is there evidence of authenticity, precedence of cause, presence of effect, and congruence of explanation and evidence?	<b>Demonstrated generality</b> -- does the level of generality being claimed extend at least to this instance?
<b>Rival explanations eliminated</b> --is there no way results can be explained by other reasonable explanations?	<b>Restriction explanations eliminated</b> --are there alternative explanations that would limit or restrict its generality from that claimed?
<b>Credible results</b> --are the findings credible in view of past research and the previous four judgements?	<b>Replicable results</b> --would this demonstration replicate with other subjects, situations, measures or observational techniques?

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**Note.** Adapted from Krathwohl, D.R. (1985) Social and Behavioral Science Research. A New Framework for Conceptualizing, Implementing and Evaluation Research Studies. Jossey-Bass, Publishers, San Francisco, p. 114.

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Validity assessment. Validity is defined as the accuracy of the measure and whether the measure measures as intended. Krathwohl (1985) summarizes internal validity as “linking power” and external validity as “generalizing power” (p. 59). He defines internal validity as “the judged validity with which a statement can be made such that the relationship thought to link the variables is the only appropriate interpretation of the evidence” (Krathwohl, 1985; p. 58). The stronger the internal validity the greater the confidence that the interpretation as measured is the only appropriate interpretation of the evidence. External validity is “ the power with which the relationship generalizes beyond the instance in which it was demonstrated” (Krathwohl, 1985; p.59). The wider the scope of external validity, the broader the applicability to new situations. Discernment of the internal and external validity can be judged by a variety of assessments outlined in Table 1.

Reliability involves straightforward mathematical calculations. On the other hand validity assessment is more difficult to complete. Traditionally validity of a measure has been assessed through: a) a subjective evaluation of whether or not an operational definition measures what it is intended to; or by b) a comparison of the results of the operational definition with results of other measures with which it should or should not be related. In general terms, these types of validity assessments are called internal and criterion-related validation.

Internal validity assessment. Internal validity assessment involves an assessment of face validity and content validity. Face validity assessment seeks to answer the question of whether or not the items in a measurement tool are appropriate and make sense to people who work in the field and policy makers, given their understanding of the problem. It is not a statistical evaluation, but an interactive process through which direct feedback from the intended target audience, key informants and policy makers is used to evaluate the degree to which the measure appears to measure the item(s) of interest. Technically, it involves a comparison of the conceptual definition (as known by experts or the target audience) and the operationalized measurement definition of a concept (Hessler, 1992). A variety of qualitative approaches may be used to ascertain face validity (Guba, 1991;Krefting, 1990; Patton, 1990; Strauss, 1987; Henderson et al., 1978).

Content validity concerns the extent to which a measure adequately represents all facets of a concept. To measure content validity one must clearly be able to identify and order all concepts in the domain, and then demonstrate that the items adequately represent all aspects of the domain. Singleton and colleagues argue (1993, p. 131) that content validity is important in educational testing, but otherwise, due to its subjective nature, is unacceptable as a single source of validation. Factor analysis can also be used to describe the empirical dimensional structure that underlies a set of measured indicants (Zellar & Carmines, 1980).

Criterion-related validation. Criterion-related assessment involves a comparison of the results of a measure to one or more criteria--predictors or gold standard, if available--that are theorized to be related to the construct being measured. When a measurement is utilized for decision making criterion-related validation measures of validation are particularly important. Criterion-related validation is also valuable to convince skeptics or "late believers". Criterion measures include concurrent validity and predictive validity. Singleton and colleagues define concurrent validity as "the ability of a measure to indicate an individual's present standing on the criterion variable" (Singleton, *et al.*, 1993; p. 124), i.e., distinguishing the healthy from the malnourished. Predictive validity assesses validity compared to a measure of future standing such as the link between inadequate intake over time and weight loss.

Construct-validation. When neither a well-defined content nor a definitive criterion are available construct validation can be utilized. Construct validity is the degree to which a measure measures the theoretical constructs it intends to measure (Zellar & Carmines, 1980). Compared to face validity, construct validity is based on an accumulation of evidence. It relies on:

1. correlations with other related variables;
2. consistency across items and different methods of measures resulting in a convergence of the same meaning (convergence validity),
3. correlations with unrelated variables (variables representing systematic errors with which a measure is not highly related (discriminant validity); and

4. difference among known groups, i.e., differences in food security status between those who reported using or not using charitable food assistance.

Factors enhancing validity. Various other factors can affect the validity of a study or measure. In general, in an experimental study, internal validation is enhanced by a strong experimental design--a design, which includes a control group and rules out the possible effects of extraneous variables through random assignment and consistent treatments. Random assignment can be crucial. If the same results are found in different settings, by different researchers who use the same method then "replication" occurs and external validity is enhanced. When there are multiple replications using the same methods and with the same findings, external validity is confirmed; and a measure may be called "robust." Response or interviewer bias may affect generalizability. Utilization of a probability sample can also enhance external validity.

### **Rasch Methodology: A New Method for Scale Creation and Validation**

As discussed in the previous section summed ordinal scales are often used in food security measurement to create a scale of items (used interchangeable with questions). However, there are two intrinsic problems with these traditional methods of scale validation (Fisher, 1993). First, summing ordinal scales does not result in a number that is a valid means of making quantitative comparisons; the same total score can result for different reasons. Second, internal scale validity must be confirmed through empirical methods. Reliance on content experts does not ensure the test items indeed test the single construct desired.

The Rasch model, developed by George Rasch, consists of an alternative approach to constructing and testing reliable and valid measures. It is based on the concept that only item difficulty can consistently and sufficiently estimate right/wrong response data for item analysis (Rasch, 1966; Wright & Stone, 1979). Rasch created a new approach to measurement in which the ability (or food security status) of an individual is mathematically assigned

independently of the others tested and independent of the items. The Rasch model asserts that the easier the item (indicating relatively greater food security), the more likely it is to be affirmatively answered by the respondents; and that the more able (in our case hungry) the respondent, the more likely he or she is to respond affirmatively to more difficult (hunger) questions than respondents who are less able (more food secure). The Rasch model also asserts that there are three measurement requirements (Wright & Stone, 1979):

1. Equal discrimination--the probability of a respondent receiving a given score depends only on the item characteristic curve (i.e. food security scale);
2. Unidimensionality--measurement of only one variable; and
3. Local independence--items elicit independent replications of the underlying construct.

Rasch computer programs such as "FACETS" or "BIGSTEPS" model these assertions mathematically. To develop the CFMS the BIGSTEPS program was utilized. BIGSTEPS is two-faceted program used to analyze items and respondents. It is used when there is dichotomous (0=no, 1=yes) rating scale scoring, and when partial credit is given. In either case, Rasch programs convert observed counts of ordinal data (raw item scores) into an approximately equal-internal scale or line representing the variable. Items are placed on a line according to the proportion of respondents that respond affirmatively. Respondents are placed on the same line according to the number (proportion) of items to which they responded affirmatively to. This conversion is accomplished through a logistic transformation of the proportion of respondents obtaining a given score (Wright & Masters, 1982).

The derived item calibrations of items and respondent ability (food security) measures are expressed in equal interval units of measurement based on the logarithm of the odds (log odds probability units or logits) of passing (affirmative response) a given item when a respondent of a given ability is scored on given items. Mathematically the basic Rasch models estimates the log-odds probability of a given scores as:

$$\text{Log} (P_{ni}/1 - P_{ni}) = B_n - D_i$$

$P_{ni}$  = the probability of an affirmative/correct response from a respondent on item  $i$

$B_n$  = the food security measure of respondent  $n$

$D_{ni}$  = the severity calibration of question  $i$

Because the logits are equal, they are additive linear measures. The length of the line determines the range of the test, from the least severe Question (Q)2 to the most severe item (Q16).

In the process of creating a scale, the spread of the line is assessed to ensure that there is enough distribution to assure that all respondents can be adequately tested. Next, one assesses whether or not there are significant gaps along the line where a respondent can not be adequately measured (Fisher, 1993). This is completed by an inspection of the item calibration values. One also seeks assurance that a household classified as “hungry” responds affirmatively to the majority of food insecurity items as well as the hungry items, and that a household classified as “food insecure” responds affirmatively to the food insecure items (Q2-6), but not the more severe hunger items (Q8-16). Construct or scale validation is confirmed through item calibration and goodness of fit statistics.

Item calibration. The item calibration of each item represents:

“ . . . the point on the scale at which there is a 50% probability that any given household will respond “yes” to that item That is, households with higher values on the scale than a particular item’s calibration score have a greater than 50% of answering that item positively; households with lower values have a less than 50% probability of a positive response to the item in question” (Hamilton *et al.*, p. 16).

The item calibration of the CFISM items from the 1995-CPS data set is listed in Appendix 4. Item calibration varies from a low calibration of  $-4.99$  (least hungry) for Q2 to a high of  $4.92$  to Q16 (most hungry).

Goodness of fit. The quality of the line is determined by how well the items fit the expectations of the Rasch model. To assure “goodness of fit”, each item is evaluated by mean square residuals (MSR). MSR measure the degree to which each parameter fits the Rasch model: the differences between observed and expected scores. There are out-fit ( $U_i$ ) and in-fit statistics ( $V_i$ ) based on a standardized residual:

$$\text{Standard residual } Z_{ni} = y_{ni} / W_{ni}^{.5}$$

$Y_{ni}$  is the score residual for household  $n$  on item  $i$  and  $W_{ni}$  is the variance.  $U_i$  the out-fit statistics is an unweighted fit statistic:

$$U_i = \text{Sum of } Z_{ni}^2 / N$$

The in-fit statistic  $V_i$  is a weighted fit statistic:

$$V_i = \text{Sum of } W_{ni} Z_{ni}^2 / W_{ni}$$

The expected values of both in- and out-fit statistics are 1.0. Generally, mean square fit statistics greater than 1.2 indicated a poor fitting item, and a MSR fit statistic of less than .8 indicates the item is redundant with another item. In the development of the CFMS items that had both an in-fit and out-fit statistics above 1.2 were targeted for removal. Items with fit statistics less than .8 were considered for removal (Hamilton *et al.*, 1997b; p. 15).

Respondent food security scale measure. The second application of the Rasch model is to assign each respondent a scale measure. If all respondents answered the same number of questions, the respondent food security scale measure would be based on the sum of affirmative responses. Assignment of the respondent scale measure would not depend on which questions were answered affirmatively, but rather only on the food security sum. For instance, households with children who gave three affirmative responses (sum of three) would have the same scale value regardless of which items were answered affirmatively. However, if respondents answer different sets of questions as in the CFMS (households with families answer questions pertaining to children and households without children do not), then scale measures depend on the item calibration of the questions that the respondent answers affirmatively. The Rasch model takes into account these differences in item response and assigns scale measures for households with

or without children that are comparable even though households with or without children respond to different number of questions (Hamilton *et al.*, 1997b; p. 21-22). In a similar fashion, the Rasch model takes into account missing values. The reliability of the measure is, in part, assessed through the standard error of the person ability measures.

### **Food Security Measurement in the United States**

The next part of this literature review summarizes studies conducted in the U.S. which have created and tested direct measures of food security status. Studies from the Community Childhood Hunger Identification Project (CCHIP), Cornell University, and USDA are highlighted because they contributed to the development of the CFM. Prior to this review, to quell any skepticism of the importance of food security measurement, the question "Why measure food security status?" will be addressed.

#### **Why measure food security status?**

Food insecurity is an important aspect of health and well being. *Nutrition security*, "requires, in addition to food security, the provision of an environment that encourages and motivates society to make food choices consistent with short--and long--term good health" (CNNP, USDA, 1997: p3). This definition fundamentally establishes food security as a prerequisite for nutrition security. It is well known that adequate calories and nutrients are prerequisites to good health, particularly for children (CHPNP, 1985b). However, food insecurity short of hunger has been linked to:

- ◆ higher rates of obesity (IBMMR, 1995) through what is thought to be a feast or famine food situation (Wehler *et al.*, 1992);
- ◆ inadequate caloric and nutrient intake (Cristofar & Basiotis, 1992; Kendall *et al.*, 1996; Tarasuk *et al.*, 1998a, 1999); and
- ◆ poor psycho-social functioning (Murphy *et al.*, 1998; Kleinman *et al.*, 1998)

Over time food insecurity and hunger will most often lead to malnutrition. However, malnutrition in industrialized countries is different than the protein-energy malnutrition associated with severe calorie deprivation and famine in the third world. Due to higher standards of living and food assistance efforts designed to prevent hunger and malnutrition, overt clinical malnutrition from "resource-constrained" hunger is rare in the United States. Thus, physiological and anthropometric measures which work well in developing countries to measure hunger are not sensitive enough to differentiate the subtle nature of chronic, sub-clinical hunger experienced among the poor in the United States (Wehler *et al.*, 1992).

Food security monitoring is needed to appropriately guide U.S. domestic food and nutrition policy and to enhance the accountability of federal assistance programs. Nutrition research, nutrition monitoring and nutrition policy are all interdependent (USDA, Federal Register, 1993). Research lays the basis for effective monitoring; monitoring yields information for policy; and policy determines what research is needed. Since World War II and particularly since the late 1960's U.S. domestic public policy has largely been directed at making sure Americans have enough to eat:

"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."

(President's Task Force on Hunger, 1984; p. 2)

This policy has been continued through agricultural and nutritional policies supporting food and nutrition assistance for lower income households. In 1996, \$35.6 billion in federal funds supported food assistance programs to families and singles (Hamilton *et al.*, 1997b). The overall goals of programs such as the Food Stamp Program (FSP), the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) and the national school breakfast and lunch programs have recently been modified to "enhance food and nutrition security" (FCS, 1998).

Despite these programs, in the late 1980s and 1990s a growing number of people continues to seek food from untraditional food channels such as foodbanks, pantries and soup kitchen (Van Amburg, 1997). Second Harvest, the national clearinghouse of charitable food assistance, estimated that over half of its 183 food banks, reported increases in demands for food. Increases in demand were thought to be due to the onset of state and federal welfare reform and the decline of middle income jobs (Van Amburg, 1998). Thus, Americans appear hungry despite government programs and increasing private efforts to ameliorate the problem. This suggests a need to reassess policy priorities and effectiveness of current anti-hunger relief efforts.

In 1993, the Government Performance and Results Act (GPRA) was signed into law. The purpose of GPRA is to enhance government accountability. It requires increased attention to items used to evaluate program such as the FSP. However, until recently there was no agreement of what food insecurity was nor a robust measure to measure it. Policy makers did not have concrete information upon which to confidently make decisions regarding the effectiveness and appropriateness of programs to address these problems and have not had a strong basis upon which to take appropriate action.

To meet the need for measurements of food security Activity V-D-2.4 of the Ten-year Comprehensive Plan for National Nutrition Monitoring and Related Research Programs (NNMRRP: Federal Register, 1993) contained a specific initiative related to food security assessment:

“Recommend a standardized mechanism and measure(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”.

This initiative was the impetus for the formation of the Intra-agency Working Group of Food Security Measurement. Thus, a collaborative, systematic food security measurement initiative of the Food and Consumer Service (FCS) of USDA and the National Center for Health Statistics

(NCHS) was initiated to create the CFSM and to provide population prevalence estimates of resource-constrained which should be the basis for appropriate policy actions. The objective “to increase the prevalence of food security among households to at least 94% of all households” will be added to the Year 2010 objectives for health policy (Baseline 88%: Breifel, 1999).

It is this author's contention that now that the goals of various assistance programs are to enhance food and nutrition security that these programs, and even educational programs such as the Expanded Food and Nutrition Education Program (EFNEP) should now include food security measures in program impact assessments. In this vein, in 1996 the Committee on Scientific Evaluation of WIC Nutritional Risk Criteria (1996) recommended that food insecurity be included as a dietary risk criteria for WIC eligibility. A 6-question food security measure has also been suggested as an optional EFNEP measure of evaluation (CREES, 1998).

Food security assessments should be included as measures of the efficacy of welfare reform.

On August 22, 1996 the Personal Responsibilities and Work Opportunity Reconciliation Act of 1996 (PRWORA:P.L.94-193) was signed into law as a government policy designed to move the able-bodied into the work place and to discourage dependence on government assistance. PRWORA replaced the entitlement program called Aid to Families with Dependent children, with state block grants to the Temporary Assistance for Needy Families (TANF). TANF increased state flexibility over the FSP, added work and training requirements, restricted future benefits by 3%, encouraged electronic transfer of benefits, barred eligibility for legal and illegal immigrants, and placed a life-time cap on benefits which for many recipients may run out within five years (Johnson, 1996). Child welfare advocates have suggested that because of reduced funding PRWORA will increase the number of children living in poverty therefore the number of eligible children--and ultimately food insecurity among children and immigrants (CHPNP, 1995a; Willis *et al.*, 1997).

## **Food Security Measures Used in the United States**

Historically four basic measurement strategies for estimating the scope of hunger have been utilized (Eisenger, 1996):

- the use of medical and dietary data (anthropometric and food consumption items);
- the poverty proxy (i.e. <100 or 130% of the poverty income level guidelines);
- the utilization of food assistance (i.e. U.S. conference on Mayors, 1996); and
- the collection of survey data on perceived food sufficiency and coping behaviors".

As indicated in Table 2.2 considerable progress has been made in the last 10 years to define and measure hunger and food insecurity.

Because previous measurements and definitions of hunger and income as proxies of hunger vary, they lack congruence and are difficult to compare (Table 2.3).

**CCHIP measure** (Wehler, 1994; Wehler *et al.*, 1992).

CCHIP is a research project employing a point-prevalence survey to document the extent of hunger among low income families (incomes <185% of the poverty income level guidelines) with one or more children under age 12 (Wehler, 1992). CCHIP, working in collaboration with the Food Research and Action Center, defined hunger as "the mental and physical condition that comes from not eating enough food, due to insufficient economic, family or community resources (Wehler et al., 1992;; p.29S). Recall that this definition is similar to the USDA definition of

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**Table 2.2**

**Recent History of Food Security Measurement in the U.S.**

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- 1977 The household food sufficiency question or a close variant has been in use since 1977, in 12 national food population surveys.
- 1980-89 Community Childhood Hunger Identification Project surveys.
- 1984 President's Task force on Food Assistance recognized the existence of hunger in the U.S and distinguished between the "medical definition of hunger " related to malnutrition and anthropometric indices and "social definition of hunger, relative to problems in adequacy of food which may not cause health problems in the short run."
- 1985 NHANES III conducted by the DHHS-CDCP, NCHS (Ronette Briefel and Catherine Woteski) incorporated the core of the USDA food-sufficiency questions and 6 specific-hunger item items adapted from CCHIP.
- 1987 Berkeley Hunger Workshop identified a lack of agreement on the definition of hunger and tools for measuring it as major causes for failure to address the growing problem. (Margne & Neuhauser, 1987)
- 1988-97 Radimer/Cornell studies (Radimer,1990a and 1990b; Radimer *et al.*, 1992; Kendall *et al.*1995 and 1996; Frongillo *et al.*, 1997).
- 1990 The LSRO report "Core items of nutritional state for difficult to sample populations" provided the definitions of food security, food insecurity and hunger .
- 1990 NNMRRP Act of 1990 (PL 101-445).
- 1992 The Intra-agency Working Group on Food Security Measurement, formed by FCS/NCHS, jointly started a systematic food security measurement effort.
- 1993 Ten-year Comprehensive Plan for Nutrition monitoring and Related Research Programs (Federal Register,1993)
- 1994 FCS and NCHS convened the First Food Security Measurement and Research Conference seeking consensus on definitions, and begin development of the CFMS.
- 1996-9 Published studies elucidate linkages between food security status, health and poverty.
- 1996 PRWORA:P.L.94-193 was signed into law.
- The Committee on Scientific Evaluation of WIC Nutritional Risk Criteria recommends that food insecurity be included in dietary risk criteria for WIC.
- Enhancing nutrition security is announced as a key goal of U.S. nutrition policy.
- 1997 USDA releases their report on "Household food security in the United States" based on data collected in the April 1995 Current Population Survey and technical reports outlining development of the CFMS (Hamilton *et al.*, 1997a; 1997b)
- 1999 Second Food Security Measurement and Research Conference, Alexandria, VA.
-

**Table 2.3**  
**Selected national survey estimates of food insecurity and hunger in the U.S (1992-6)**

Study--year	N (millions)	Percent of population
CCHIP--1989-90	5.5 million children	
TUFTS--1992	28.1-31.6 million people (range of 20.4 to 42.8)	
CSFII--1990-91	2.4-6.2 million people	2.5% of the population were food insufficient
NHANES--1989-91	9.5 million were food insufficient	9-13% of respondents with low-income households are food insufficient
USDA--1995 (Hamilton <i>et al.</i> , 1997a)	11.9 million food insecure: 7.8 million, food insecure I, 3.34 million food insecure II, and 817, 000 as food insecure III.	12% of the household population are food insecure (7.8% food insecure I, 3.3% food insecure II, 0.8% food insecure III.)
CCHIP 1996 (Wehler <i>et al.</i> , 1996)	4 million children experience prolonged hunger: 10 million more are at risk of hunger	8% of children under age 12 experience hunger

hunger, and that the CCHIP measure is designed to measure the extent of hunger among children--not the extent of food insecurity in households.

Focus groups with low-income families, service providers, and researchers were used to redefine the conceptual framework presented in Figure 1 (Wehler *et al.*, 1992). The CCHIP conceptual model was designed as a "graphic representation of the sequential nature of the determinants of hunger and some of their attendant outcomes" (Wehler *et al.*, 1992). This model included many factors which affect "food-related behaviors" including economic resources and other factors affecting access to food, household characteristics and education. The model then depicts the

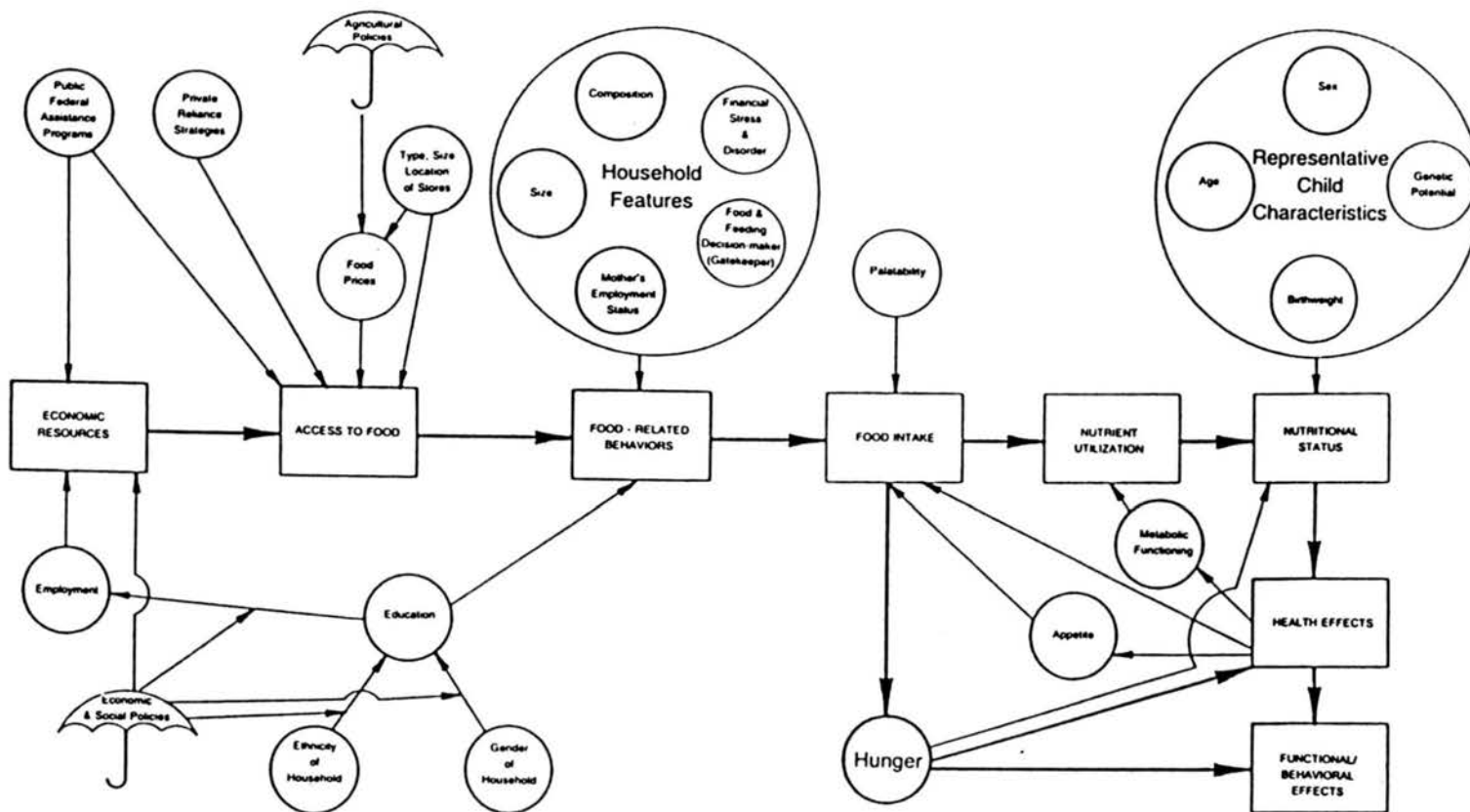


Figure 2.1 CCHIP Conceptual Model (Wehler et al., 1992, p.32S)

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**Table 2.4.**  
**Community Childhood Hunger Identification Project Survey**

Thinking about the past 12 months:

1. Did your household every run out of money to buy food to make a meal?
  2. Did you or adult members of your household ever eat less than you felt you should?
  3. Did your child(ren) ever eat less than you felt they should because there was not enough money to buy food?
  4. Did your child(ren) ever say they were hungry because there was not enough food in the house?
  5. Did your child(ren) ever go to bed hungry because there was not enough money to buy food?
  6. Did you ever cut the size of your child(ren)'s meals or skip meals because there was not enough money to buy food?
  7. Did you or adult members of your household ever cut the size of your meals because there was not enough money to buy food?
  8. Did you every rely on a limited number of foods to feed members of your household because you were running out of money to buy food for a meal?
- 

individual factors affecting nutritional status and ends with effects on health and functional behavioral effects.

The CCHIP hunger scale consists of eight questions, which assess whether adults and/or children in the household are affected by food insecurity, food shortages, perceived food insufficiency or altered food intake. Table 2.4 contains these eight questions. The CCHIP measure is of additive scale containing two household items, two adult hunger items and four children's hunger item. In the CCHIP categorical hunger algorithm five or more affirmative responses (out of eight) is used as the cut-off for identifying "hungry" families (0 = no hunger, 1-4="at risk of hunger).

The original CCHIP measure was used to assess of hunger in Massachusetts. It was subsequently used in Connecticut and Washington State. FRAC sponsored further replication of this method. From 1989-1991 the CCHIP study was replicated in Alabama, California, Connecticut, Florida, Michigan, Minnesota, and New York. During 1992-3 the CCHIP

methodology was also utilized in Indiana, Maine, New York, South Carolina, Utah (Wehler, 1994), and Hawai'i (SMS, 1992). Based on the seven studies conducted between 1989-91, FRAC estimated the prevalence of hunger to be 5.5 million low-income children under age 12. Tufts University's, Center on Hunger, Poverty and Nutrition Policy extrapolating the same data, estimated that about 31.6 million people were hungry in 1991 (FRAC, 1991). A series of surveys from 9 states and the District of Columbia, estimated that 4 million children experience prolonged periodic food insufficiency and hunger each year: 8% of the children in this country (Wehler *et al.*, 1996).

Validity and reliability of CCHIP. Initial validity assessment of the five CCHIP studies was conducted in 1992-3 (n=2204, Wehler, 1994). Content validity was assessed using factor analysis of the eight questions. The alpha values for each of the eight variables were all above 0.80. Factor loading varied from .5 to .8. The eigenvalue, an indication of the strength of the factors, was approximately 4.0 (values over 1 are considered significant). Criterion-validity was assessed by comparing risk factors such as income and outcomes, i.e., total number of coping strategies used by three categories (no hunger, at risk of hunger, and hungry). Almost all variables were statistically significant by hunger classification. There was also a clear trend with increasing score and number of days of hunger, suggesting an index of what the authors call "temporal severity".

A team of CCHIP and medical researchers (Murphy *et al.*, 1998; Kleinman *et al.*, 1998) recently assessed the relationship between CCHIP measures of psychosocial functioning and behavioral and emotional correlates in low-income American children. These researchers sought to answer the question of whether or not food deprivation and marginal nutrition intake yielded measurable affects on a child's psychosocial functioning. They also sought to establish the stability or test-retest reliability of the CCHIP measure. Data were collected from parent, teacher, and clinician-reported measures of psychosocial functioning from a sample of 243 low-income school children. Ninety-six students were reassessed four months later to assess the stability of CCHIP hunger

measures. Results suggested that children classified as hungry or at risk of hunger were twice as likely to be classified as having impaired functioning by parent and child report (Murphy *et al.* 1998). Teachers reported higher rates of hyperactivity, absenteeism and tardiness among the children classified as hungry or at risk of hunger.

In a similar study these researchers assessed children aged 6-12 comparing CCHIP hunger measures with parent reports of a child's emotional and behavioral symptoms (Kleinman *et al.*, 1998). They found that those defined as hungry were more likely to have clinical levels of psychosocial dysfunction, and that aggression and anxiety had the strongest degree of association with experiences of hunger. Importantly, findings strongly suggested that food insecurity is a poverty-related burden. The authors explained that the negative behaviors were understandable responses to the stress of periodic hunger. They suggest that researchers and practitioners should be "mindful" of food insecurity, but that based on these research studies this merely confirms association--not causation--of psychosocial problems.

Stability analysis indicated that 73% (70/96) were classified consistently over time by CCHIP measure (Murphy *et. al.*, 1998). The overall correlation between CCHIP summed values between time 1 and 2 was  $r=0.56$ . Hunger classification by the parents and their children were significantly related as assessed by a chi-square test. Likewise, exact agreement was found in 142/193 cases (74%). According to the authors these findings indicate an acceptable level of variability in the CCHIP classification system.

### **Radimer-Cornell (RC) Food Security Measure**

Kathy Radimer's dissertation research (Radimer, 1990a) and the measure she created is the foundation of recent work completed by the Cornell University, Department of Nutrition Sciences on hunger in households with children (Kendall *et al.*, 1985; Kendall *et al.*, 1986; Frongillo *et al.*, 1997). In these studies hunger was defined as "the inability to acquire or consume an adequate

quality or sufficient quantity of food in socially acceptable ways, or the uncertainty that one will be able to do so" (Radimer *et al.*, 1992). Note that this definition is most similar to the LSRO definition of food insecurity--not hunger—(Appendix 1), thus, the RC measure really measures food insecurity and mild to moderate hunger (LSRO, 1990).

Radimer's work (Radimer, 1990a; Radimer *et al.*, 1990b; Radimer *et al.*, 1992) established a model for studying food insecurity and hunger in a community. Her work was the forerunner of much of our current understanding of how to measure hunger and food insecurity in a valid manner, but the data set was rather small and not culturally-diverse. Radimer started with 32 open-ended interviews with rural and urban, black and white women in upstate New York. Interviews, analyzed using the constant comparative method (Glaser & Strauss, 1967), were the basis of her underlying conceptual framework of food insecurity.

Radimer found that women in her study had both a broad dimension of hunger in the entire household and a narrower individual dimension of hunger. Each dimension has four components: quantitative, qualitative, psychosocial and social. The household dimension is focused on food insufficiency or insecurity. The individual dimension is focused on what we call hunger, the "going without food for a period of time" and the physical sensations. Hunger was viewed as a managed process, whereby women used a variety of coping tactics to prevent running out of food, particularly to prevent hunger among children. She also noticed a generalized order or sequence in which hunger-related events occurred a) anxiety about food insufficiency or poor food quality; b) restricting of mother's food intake as the household food supply became insecure; and if the situation did not improve, c) hunger among children.

The items Radimer included in her measure were phrased as statements, in the words of the interviewed respondents. The RC categorical algorithm consisted of four categories no hunger, household hunger, women's hunger, and child's hunger. The final RC measure and the categorical description can be found in Table 2.5 (Kendall, *et al.*, 1996)

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**Table 2.5.**  
**Radimer/Cornell Hunger and Food Insecurity Items**

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**Household level.**

Food Anxiety

1. I worry whether my food will run out before I get money to buy more.

Quantitative Component:

2. The food I bought just didn't last and I didn't have money to get more.

3. I ran out of foods that I needed to put together a meal and I didn't have money to get more.

Qualitative component.

4. We eat the same thing for several days in a row because we only have a few different kinds of food on hand and don't have money to buy more

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**Adult "individual" level**

Qualitative component:

5. I can't afford to eat properly.

Quantitative component

6. I am often hungry, but I don't eat because I can't afford enough food.

7. I eat less than I think I should because I don't have enough food.

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**Child level**

Qualitative component

8. I cannot give my child(ren) a balanced meal because I can't afford that.

Quantitative:

9. My child(ren) is/are not eating enough because I just can't afford enough food.

10. I know my child(ren) is/are hungry sometimes but I just can't afford enough food.

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**Notes.**

1. Response categories are "not true, sometimes true, or often true".

2. CCHIP Categorical Algorithm: Food Secure = 0 affirmative responses. Household insecure = 1+ response to household items, not any other items. Individual insecure = 1+ responses to individual or child qualitative hunger. Child hunger = positive to question 9 or 10.

**Source.** Kendall *et al.*, 1996.

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Validation of the RC food security measure. Kendall and colleagues (1995) conducted a two-part study, which validated the RC measure. They chose a random sample of 193 households with women and children in a rural county in New York State. To assess criterion-related validity they compared demographic and dietary characteristics by four levels of food security status: 1) food secure (46%), 2) household insecure (26%), and 3) individual insecure (17%), and 4) child hunger (10%). Factor analysis, used to assess construct validity, revealed four clear factors that correlated well with the intent of the questions. Chronbach's alpha, used to assess internal consistency of items measured, was 0.84 or higher for each of the items. A cumulative logit model and a linear test for trends were used to assess the relationship of categorical and demographic variables with the food security grouping.

Predictors of food insecurity with CCHIP. A 1996 article by Kendall and colleagues describes the first part of this team's work on criterion-related validity (Kendall *et al.*, 1996). Researchers assessed fruit and vegetable consumption (Serdula *et al.*, 1993), household food inventory score (Sanjur *et al.*, 1979; Crocket *et al.*, 1992), a 24-hour food recall, and eating disorders (Stanford eating disorder questionnaire: Agras, 1987). Statistical analysis included regression analysis to assess linear trends across food security groups for the household food inventory scores and the frequency of consumption of fruits and vegetables. Student t-tests were used to evaluate the differences in food security status for food and nutrient food group means. Trends in fruits and vegetable consumption were analyzed using Chi-square analysis. Worsening food security status was significantly associated with a decrease in the frequency of fruit and vegetable consumption, the amount of food in the household, and an increase in disordered eating. The high variability in nutrient intake made analysis of 24-hour recall data problematic and the results questionable.

This work confirmed that 1) expected functional problems associated with hunger (decreased fruit and vegetable intake, increased eating disorders) were associated with worsening food security status, and of equal importance, 2) established the difficulty of linking aspects of food and nutrition intake with food security status. However, the generalizability of these findings must be

questioned: the study was small, not randomly selected, and not culturally-diverse. The authors hypothesized that the relationship between worsening food security status and increased eating disorders may be causally related to the high rates of obesity among the low-income population in the U.S.

Cornell researchers next used both the RC and CCHIP measures to assess what they called a definitive measure of food security status (Frongillo *et al.*, 1997). Definitive measures (compared to reference or routine) should be highly accurate, precise and reliable. From their rich data set these researchers outlined positive and negative quantitative variables as their definitive criterion. Positive factors most notably included: borrowing money for food quite often, using a food pantry, family income less than \$10,000, no medical insurance and the loss of job in the last year. Negative factors most notably included adequate savings and household income greater than \$10,000.

Based on definitive criterion, two researchers in this team independently classified each household as either food secure, definitely food insecure or probably food insecure. Food security classification based on the definitive criteria was then compared to the RC food security categorical algorithm both with, and without, the first uncertainty item, Q2."I worry whether my food will run out before I get money to buy more" the CCHIP measure, and with the food insufficiency question asked in USDA (described in the next section). Sensitivity was defined as the percentage of households definitely food insecure by the criterion measure that were also determined to be food insecure by a questionnaire measure.

Specificity was defined as the percentage of those households defined as definitely food secure by the criterion measure that were also defined as food secure by a questionnaire measure. The first question of the RC measure regarding anxiety (Q2) was removed for comparison purposes since the CCHIP measure does not include a similar item. Results indicated that 45% of the sample was defined as food insecure by the definitive criterion, 46% by the RC measure

without the uncertainty question, 53% by the RC method, 48% by the CHHIP method, and 26% with the food insufficiency measure. Overall, the RC and CCHIP measures agreed in 85% (160/189) of households. Specificities were respectively 63% (RC), 73% (CCHIP), 90% (Food insufficiency), and 71% for the RC measure without the uncertainty component. Sensitivities were respectively 89% and 86%, 26% and 84% without the Q2. Thus, overall agreement with the criterion and with between the RC and CCHIP measures was good.

Interestingly, there were 25 households categorized by the criterion as food secure, but as food insecure by both the RC and CCHIP measures: 19 had incomes greater than \$20,000, nine reported savings, 13 indicated they did not use the food stamp program or a food pantry, 11 indicated they borrow money for food. The authors state that their higher incomes, non-usage of assistance programs and savings led the researchers to classify these households as food secure, although they responded affirmatively to both food insecurity measures. This suggests that households can have perceptions of food insecurity without extreme financial stress or use of assistance programs.

### **National Studies**

Three national studies have been used to estimate food security status or food insufficiency in households. To this author's knowledge the only food security measure used in the 1995 –1999 Current Population Surveys (CPS) included the state of Hawai'i in its sampling.

### **USDA's 1989-91 Continuing Survey of Food Intakes by Individuals (CSFII).**

Rose and colleagues (1995) reported that the following single food insufficiency question: "Which statement best describes the food eaten in your household?" has been used in the Nationwide Food Consumption Surveys (1977-78, 1987-88) as well as the CSFII 1985-6 and 1989-91 studies Respondents can answer in one of four ways:

- (1) enough of the kinds of foods we want to eat;
- (2) enough but not always what we want to eat;
- (3) sometimes not enough to eat; or
- (4) often not enough to eat.

Respondents with either the third or fourth response are classified as *food insufficient*—defined as inadequate amount of food intake due to lack of money or resources (Briefel & Woteki, 1992). Using this question, estimates of food insufficiency have varied from 3.1% (1977-8) to 3.6% (1987-8) to 2.5% (1989-91) in the total U.S. population. Other researchers have questioned these relatively low estimates of food insufficiency and the reliability of a single measure (Parker, 1994; Nestle, 1994; Carlson, 1994; Frongillo *et al.*, 1997). In the 1989-91 continuing survey of food intake of individuals (CSFII) 8.9% of respondents with income < 131% of the poverty income level guidelines indicated they either "sometimes did not have enough food or often did not have enough" (IBNMRR, 1995). Another 36.7% indicated that they had enough but not always what they wanted to eat. Reported rates of food insufficiency were higher among food stamp participants (13.7%) and lower among non-participants (7.1%) at the same income level. Extrapolations of this estimate to the entire population suggested that 2.4 to 6.2 million people sometimes or often did not get enough food to eat in 1988-91.

Predictors of food insufficiency. Cristofar & Basiotis (1992) explored the relationship of reported food sufficiency status with both dietary intake and selected characteristics of women and children. They used the 1985-86 CSFII data set of over 3000 U.S. households with at least one female aged 19-50 years from the 48 contiguous states. Data analysis included ANOVA to test the relationship between food sufficiency status and food consumption, followed with Tukey's test to evaluate group differences. They also used SAS Proc Logist Procedure to develop profiles of the types of individuals who were most likely to report not having enough to eat. Due to the small numbers of respondents in food sufficiency status groups three and four (sometimes or often not enough to eat), were combined into one "not-enough to eat" group. The mean nutrient intake and money spent on food was significantly lower for both women and children in hungry households.

There was no difference in number of eating occasions. Food sufficiency status was negatively correlated with poverty status. Household size and available economic resources were the best estimates of reported food sufficiency status. Black and Asian women from large households with children, who perceived themselves as being in poor health and were smokers were most likely to report food insufficiency. This research suggests that there is a relationship between food sufficiency status and nutrient intake for women, but not for children, and that several economic characteristics are associated with food sufficiency status.

### **The National Health and Nutrition Examination Survey III (NHANES III) 1989-91**

NHANES is a general population survey containing a variety of health and nutrition questions. Their primary food insufficiency question was "Which one of the following statements best describes the food eaten by you/your family: Do you have enough food to eat, sometimes not enough, or often not enough?" In the third report on National Nutrition Monitoring the authors stated that "about 9-13% of the people living in low-income households experience some degree of food insufficiency . . . and . . . 4% of the total population either "sometimes" or "often" did not have enough foods (IBNMRR, 1995). Rates of food insufficiency were higher among Mexican Americans (15.5%) and for those with income <100% of the poverty income level guidelines (15.7%).

Alaimo *et al.* (1998) recently assessed the sociodemographic characteristics related to food insufficiency using NHANES III data. The most notable finding was a strong relationship between food insecurity with: a) Mexican American ancestry; b) age of less than 60; c) head of household without a high school diploma; and d) lack of health insurance. Curiously, in this study, food insecurity was not strongly associated with very low income or presence of children in the household.

## **The Core Food Security Module**

Conceptual framework. In USDA's operationalized framework (Appendix 2) "resource-constrained hunger is not only a consequence of food insecurity but also is a salient and identifiable characteristic of a severe level of food insecurity" (Bickel *et al.*, 1996). Like the food security supplement and core module the "operationalized framework of the measurement of food insecurity and hunger" builds on the two models of hunger and food insecurity developed by Wehler *et al.*, (1992) and Radimer *et al.*, (1992). As depicted in Appendix 2 for the CFSM, food insecurity as measured by the CFSM is understood as a managed process of "rationale economizing behavior" where hunger is depicted as the more severe form of food insecurity (Radimer *et al.*, 1992; Wehler *et al.*, 1992; Bickel *et al.*, 1996).

Food Security Supplement. The first measure developed by the food security measurement project was the food security supplement utilized in the Current Population Survey (CPS) in 1995 (Hamilton *et al.*, 1997; Carlson *et al.*, 1999). The supplement was developed from a consensus derived at the first Food Security Measurement and Research conference (FCS/NCHS, 1994). One hundred professionals who work in the field of hunger, nutrition and food policy attended this conference. Decisions were then made to limit food security measures to resource-constrained hunger which focused on the behavioral and experiential dimensions of food insecurity in households (which was seen as the gap in the existing information and essential for policy makers) and to create a single scale which captured all levels of severity of food insecurity.

One of the first steps in the measurement process was to review the physiological and clinical nutrition research addressing the nature of hunger. A summary of the most comprehensive review of its kind can be found in the first appendix of Hamilton *et al.*, 1997b (p. A-1). The researchers pursued the questions of whether or not:

- a. Subjective reports of hunger were reliable items of measurable levels of food deprivation; and

- b. If reduction in food intake was a reasonable item or precursor of “the uneasy or painful sensation caused by lack of food or hunger.

These reviewers concluded that it appeared likely that subjective reports are reliable measures of food deprivation, and that a reduction of intake is a precursor of “the uneasy sensation of hunger. Based on these findings and CCHIP, RC, and USDA’s food sufficiency questions, a new measure called the “food security supplement” was developed, refined, and field-tested in 1994. The supplement consisted of a total of 58 questions. The Census Bureau first administered the food security supplement in the Current Population Survey (CPS) in April 1995. USDA has sponsored comparable food security data collections every April or September since 1995.

The CPS is a monthly survey tool primarily used to obtain labor force participation data (Rose *et al.*, 1995). The sample data set used to create and test the core food security module came from the 44,730 households out of an estimated total U.S. household population of just over 100 million households. Approximately 2% were households from non-White, non-Black, non-Hispanic households (Hamilton *et al.*, 1997a); thus, no more than 2% of the population who responded to the CPS survey were Asians or Pacific Islanders. Out of this sample of 44,730, responses from 18,453 respondents--who were identified by a screening procedure to have an income <185% the poverty level--were included in the sample used to create the CFSM. Both a 30-day and a 12-month scale were created. The discussion and research presented herein is limited to the 12-month scale.

Construction of the CFSM. The FCS subcontracted Abt. Associates Inc., to develop and validate of the CFSM. Abt Associates is a known leader in state-of the art scaling methods and educational testing. Abt’s reports describing the CFSM include both a summary report and a technical report of Household food security in the United States in 1997 (Hamilton *et al.*, 1997a, 1997b). A Guide to Implementing the CFSM was created by Price and colleagues (1997). Additional, peer-reviewed reports describing the CFSM include manuscripts by Carlson and colleagues (1999) and Bickel and colleagues (1999).

The construction of the CFMS commenced with linear and non-linear factor analysis. Results indicated that food security was unidimensional (Hamilton *et al.*, 1997b). Based on this finding, the Rasch BIGSTEPS software program was utilized to construct the CFMS from the 58 food security supplement items. Various food security scales (models) were iteratively tested. Selection of the final scale was based on mean square residual fit statistics and item calibration values. The final “core module” used to assess food security status due to inadequate resources for food is the food security scale presented in appendices 2 and 3. Relevant fit statistics and item calibrations are depicted in Appendix 4. For a technical discussion on Rasch methodology applied to the development of the CFMS refer to pages 2-10 to 2-14. These findings suggest a unidimensional food security scale with an adequate dispersion of items to assess the spectrum of food security status experienced in the United States, and that items have a good fit according to the Rasch model. Independent fitting with subset of responses from households with children under 18, with elderly households with no children and with households with neither elderly nor children (single or multiple adults) documented the CFMS to be robust across diverse household types.

The CFMS is designed to be completed by food gatekeepers (who buys and/or prepares food for the household most of the time). All questions are related to the respondents' perceptions of what has occurred during the last 12 months because of inadequate resources to secure food. Thus, by design skipping meals due to inadequate time or dieting practices would be excluded. The CFMS consists of four levels of severity:

- Least severe food insecurity items (Q2 and Q3) indicating that the respondent was worried about food not lasting, and the household experienced food shortfalls;
- Low to intermediate food insecurity items (Q4-Q7 and Q9) indicated perceptions of inadequate quality (Q4, Q5, Q6) and not eating enough (Q7, Q9);
- Moderate hunger (Q8, Q8a, Q10, Q11) and reduced intake among adults; and

- Severe hunger among adults (Q12, Q12a) and reduced intake and hunger among children (Q13, Q14, Q15, Q15a, Q16).

To minimize the response burden, skip patterns can be utilized after the food insecurity items (Q2-6) and adult hunger items (Q7-11) (Price *et al.*, 1997). For example, if a respondent does not respond positively to any of the food insecurity questions he or she will not continue with the more severe hunger questions; all other responses are assumed to be negative. The single question of food insufficiency (Q1):“ Which of these statements best describes the food eaten in your household in the last 12 months, that is, since July 1997?

- 1) We always have enough and the kinds of foods we wanted;
- 2) We have enough to eat but NOT always the KINDS of foods wanted;
- 3) Sometimes we don't have ENOUGH to eat, or
- 4) Often we don't have enough?”

is used prior to the CFMS to assist in screening out food secure households. When the skip patterns are employed, the authors estimated that it takes between 2-8 minutes to complete the CFMS.

National food security algorithm. The practical application of using the CFMS is to consistently monitor the extent and severity of food insecurity overtime across various populations (Carlson *et al.*, 1999). A scaled measure is useful in precisely determining the extent of food insecurity but is not useful for prevalence estimates; thus a food security categorical algorithm, based on sub-ranges of severity and conceptual framework described previous, was created to make prevalence estimates of food security status. The sequence of items based on the modal pattern of responses from the original 1995 data, the italicized threshold items, and the boundaries for classification are outlined in Appendix 2.

The modal pattern is the frequency of item response (from most to least frequently affirmatively answered questions). A modal pattern response occurs when a household's

affirmative response pattern follows the sequential item severity: a household with an affirmative response to a particular item, will respond affirmatively to all less severe questions, but no other items. Using the 1995 CPS data, eighty-two percent of households without children followed the modal pattern, however 65% of these households responded negatively to all questions. Of the households responding to at least one question affirmatively, 49% followed the modal pattern (Hamilton *et al.*, 1997b, p. 45). Modal pattern response rates for more food insecure respondents were not reported.

Categorization of food security status was based on the number of affirmative responses, regardless of the severity of responses. Three cut-offs for the boundaries between categories were subjectively set and designed to reflect conceptual distinctions and LSRO definitions of food security and food insecurity based on the Rasch item calibration of the 18 items.

For households with children the following pattern was used:

- ◆ food security (two or less affirmative responses);
- ◆ food insecurity without evidence of hunger (Food insecurity level 1: three to seven affirmative responses);
- ◆ food security with evidence of adult hunger (Food insecurity level 2, eight to twelve affirmative responses); and
- ◆ food insecurity with evidence of child and/or severe adult hunger (Food insecurity level 3, thirteen or more affirmative responses).

As outlined in Appendix 4 for households without children, which only respond to ten questions (not Q4-7 or, Q13-16), the scoring pattern was slightly different.

The reasoning behind these judgements is summarized in the technical report describing the CFMS (Hamilton *et al.*, 1997b, p. 50-59). The research team was looking for items that would hold for households with and without children. Face validity was not a priority (Bickel, 1999) . This research team viewed a pattern of sequential affirmative responses as stronger evidence than an affirmative response to one or two items.

“Determining the initial threshold of each designated severity range was done by identifying the second or third items in sequence that conceptually indicates the continuous characterizing the category” (Carlson *et al.*, 1999: Appendices 2 and 4).

This principle was also utilized to minimize response error. The rationale written for each food security category and cut-off are summarized on the next two pages.

- Evidence of food insecurity: The evidence of food insecurity is consistent with an uncertainty of the food supply (Q2). However, this question by itself was thought to lack face validity of food insecurity and was thought to be an insufficient measure of food insecurity. Affirmative responses to two more responses--i.e. Q2, and either Q3 or Q4 -- were also judged insufficient to “unequivocally establish that severity had reached the threshold required for a categorical measure of food insecurity” (Hamilton *et al.*, 1997; p. 51). Based on the item calibrations (Appendix 4), questions Q3, Q4 and Q5 scale together and fit the conceptual understanding of food insecurity. The research team felt that affirmative responses to three or more questions would unequivocally establish a household as food insecure. Q4. “unable to eat balanced meals” is the third in the series of food insecure items; it was deemed the threshold food insecurity item.
- Evidence of hunger. Conceptually hunger is understood as a “potential but unnecessary cause of food insecurity” and an “uneasy or painful sensation caused by lack of food” and inadequate resources (LSRO, 1990; Wehler *et al.*, 1992). The primary judgement question of this level was to determine, based on the scaling of the items, how many affirmative responses were needed to demonstrate a repeated pattern of inadequate food intake. Studies describing the experience of hunger discovered considerable variation in intake but a general pattern of cutting back on meals or skipping meals resulting in “a painful sensation caused by lack of food” (Hamilton *et al.*, 1997a). Q8a, “adults repeatedly cutting the size of meals or skipping meals,” was deemed adequate evidence of adult hunger, and thus the threshold item distinguishing the threshold between food insecurity

without hunger and food insecurity with hunger. This item is the eighth in the severity order, thus eight affirmative responses were deemed necessary for assurance of “food insecurity with hunger.” This question is substantially more severe than all other food insecurity items.

- Evidence of severe hunger among adults and hunger among children. The presence of hunger among children is understood as the most salient, measurable characteristic of severe hunger. Instead of using Q13 or Q14 in which affirmative responses indicate either cutting the size or frequency of children’s meals question, Q15, “child hungry,” for consistency with the rationale described above was initially used as the threshold item. However, this item was not useful for households without children, thus, Q12 “adults do not eat for a whole day” was chosen as the threshold item of severe hunger. For households with children the categorical classification of severe hunger was thus based on thirteen or more affirmative responses.

Resource augmentation behaviors. One of the surprises of the food security measurement project was that none of the coping behavior questions factored into the CFSM. From the 58 initial food insecurity items, 40 items were dropped because they did not meet MSR fit statistics requirements for retention. Importantly, a whole group of “coping strategy items” did not fit the model. This finding confirmed Scott’s (CCHIP) earlier work that discovered coping behaviors did not align with specific stages of hunger and must be measured separately from hunger status (1994):

“Extra-household coping strategies are clearly not solving the problems or helping families adjust to food insufficiency, despite a higher use of these strategies as the severity of hunger increases. Nevertheless, reliance on friends and family and emergency resources, at about one time a month, is quite low”.

“Extra-household strategies are not equivalent to intra-household measures of food insufficiency. Clearly, food insufficiency and intra-household strategies are narrower than the broader concept of food security, and thus should be measured differently”.

(Scott, 1994: p. 67-78)

To capture the second part of food insecurity “the limited or uncertain ability to acquire foods in socially-acceptable ways” (LSRO, 1990), a resource augmentation index consisting of the following five questions (in order of increasing severity) was created:

- 1) do adults put off paying a bill so that they will have money to buy food;
- 2) do adults ever get food or borrow money from family or friends;
- 3) do adults ever get emergency food from a church, a food pantry, or food bank;
- 4) do adults ever send or take children to homes of friends or relatives for meals, and
- 5) do adult ever eat meals at a soup kitchen?

There are at least three arguments for not including coping behaviors in a food insecurity scale (Hamilton *et al.*, 1997, p. 61-68). First, some respondents may not consider participation in any assistance programs socially-acceptable. Second, programs are not consistently available to all respondents. Thus, response is biased by the availability of assistance programs and their perceived social-acceptability. Third, if participation in programs was included in the food security measure, it would be difficult to determine the effect of the assistance programs. The research team concluded by suggesting that use of a resource augmentation index is only useful to classify households as food insecure without hunger present, and that future research is needed to better understand the linkages between food security and coping behaviors.

Reliability. Reliability of the food security scale was assessed using the Rasch reliability index and other traditional items of internal consistency i.e. Chronbach's alpha. Chronbach's alpha

for the entire scale for households with children was 0.882, and .0856 for all households. Dichotomized split half procedures were also used to distinguish food secure households from food insecure households with and without children. Split-half analysis revealed that the core module is equally reliable in households without children (where there are 10 rather than 18 possible responses). Rasch reliability estimates were .63 when households with extreme scores were included and were 0.74 when households with extreme scores were excluded from analysis.

Item response stability was assessed using data from 1,100 households in the week following the regular April 1995 survey (McGuinness, 1996). McGuinness assessed the stability of the CFMS using the 1995 national sample data for 1159 households. An index of consistency was created from a ratio of the response variance to the total variance. As a general rule of thumb an index value of less than 20 suggested low response variance, and between 20-40 as moderate variance, and a value greater than 40 high or problematic variance. In general, findings suggested no difference in response variance between adult only and child households and moderate variance--Index of 22.7--in all food insecurity items except the severe hunger responses where there were too few responses to adequately assess reliability. The categorization of households was less reliable with an index of 44.6. McGuinness also found that responses to the food insufficiency questions were not consistent and recommended that it not be used. His rationale was that it is a complex confusing question and recommended that it not be used.

External construct validation. External construct validation of the CFMS was limited because as of yet, there is no gold standard against which food security measures can be tested (Hamilton *et al*, 1997b, p. 69). In the absence of a gold standard, factors thought to have predictive value were correlated. As expected, household food expenditure ( $r=-.21$ ) and income relative to the poverty line ( $r=-.32$ ) were both negatively correlated to food security status; although for many reasons the relationship is inconsistent among individuals. Food

insufficiency had a strong, but far from perfect positive relationship with the food security scale. Thus, despite the weakness intrinsic to each "predictor" variable, findings suggested that the CFSM constitutes a valid measure of the underlying construct of food insecurity. The authors ended their discussion on external validation by suggesting that:

"Further validation would be desirable, including a comparison of the food security variables to potentially related measures. In particular, the relationship of the present measure of the central dimension of food insecurity and hunger as experienced in the U.S. households and established measures of the nutritional quality of diets and their health consequences will be an important area of future research. (Hamilton *et al.*, 1997b, p. 77).

The findings and discussion above suggest that additional validation work is needed to externally validate the CFSM and to confirm the categorical cut-offs. The work of Tarasuk and colleagues (1998) was the first to confirm nutritional deterioration as food insecurity, measured by the CFSM, worsens. In a study of 153 food insecure Canadian charitable food recipients this research team found that households classified as having severe food problems were at particular risk for nutrient inadequacies. They also found that caloric and nutrient intake of a variety of nutrients decreased as the severity of food insecurity increased. However, the differences were largely attributed to decreased caloric intake. Another important finding was that food deprivation occurred in spite of a host of coping strategies including food bank utilization. Many women interviewed shared their reluctance to go to a food bank because of the shame and humiliation. Thus, despite assistance, needs were not being met. This finding raised serious concerns over the current trend toward decreased governmental assistance; and suggests that, as much as they try, charitable providers can not meet the needs that are likely to result in long-term physical and psychological health consequences (Tarasuk *et al.*, 1998a, p. 23).

Critique of the CFMSM. Prevalence statistics for the extent and severity of food insecurity and hunger in the U.S. in 1995 are presented in Table 2.2. Household food insecurity was more prevalent among African American and Hispanic households, households with children, households under the poverty level and in households within central city metropolitan areas (Carlson *et al.*, 1999). Ohls and colleagues (1999) in a preliminary report indicated that it was unlikely that there were differences in item hierarchy or prevalence estimates across CFMSM data collected in the 1996-8 CPS. He did however, assess differences among ethnic groups. While items from African Americans were similar to those of Caucasians, data from Hispanics were notably different.

At the Second Food Security Measurement and Research Conference (February 23-24, 1999) several experts consistently raised the following important issues regarding CFMSM:

1. If the CFMSM measures "resource-constrained" food insecurity, then why do so many very low income households report food security (Hamilton *et al.*, 1997a; Jencks, 1999; Deaton, 1999) which raises the question of whether poverty is the chief cause of what is measured and creates the need for more clear-cut empirical models.
2. Why are the elderly less likely to be classified as food insecure (Alaimo *et al.*, 1998; Deaton, 1999)? Olson reported personal experience with elderly respondents who do not have any food in their homes but denied worrying that food would run out (Olson, 1999). These findings suggest potential respondent bias among older Americans.
3. Why do those classified as experiencing "moderate hunger" not always respond affirmatively to Q10 "respondent feels hungry because of not enough money for food" (Bavier, 1999)? Also, some that do respond affirmatively are not classified as hungry. This observation raises questions about the validity of the national food security categorical algorithm.

4. Does awareness of the problem create a normalcy of perceptions, which, because we may change over time affect prevalence estimates (Deaton, 1999)?

As a follow-up to the Second Food Security Measurement and Research conference, the Federal Interagency Working Group on Food security Measurement outlined priorities research listed in Tables 2.6 and 2.7 (ERS, 1999).

Individual – level core food security measure (ICFSM). Based on the CFMS, the number of people in households where one or more persons deemed hungry was 4.16 million. However, the CFMS can not determine the number of individuals actually affected by hunger, only the upper bounds of the number of people in households experiencing hunger (Carlson *et al.*, 1999). However, policy makers and advocates, at least in Hawai'i, are very interested in the actual number of hungry adults and hungry children, which the CFMS does not provide (Personal Communications: Baldwin, 1998; Kuntz, 1998; Tanoue, 1998).

To attempt to meet the demand for individual level items of hunger among adults and children, USDA experts in food security measurement created the Individual-level CFMS (ICFSM) (USDA, 1998). The ICFSM consists of:

1. The 18 question CFMS (2, 3, 4, 5, 6, 7, 8, 8a, 9, 10, 11, 12, 12a, 13, 14, 15, 15a, 16);
2. Six individual-level" questions asked to estimate the extent and severity of hunger of the respondent, and if there were children in the household, the child who most recently had a birthday. (8I, 12I, 13I, 14I, 15I and 16I.)

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**Table 2.6**

**Food Security Measurement and Research Priorities Identified: Major Themes**

**Measurement**

- Development and testing of individual (as opposed to household) scales for measurement of prevalence and severity of food insecurity among adults and children;
- Improvements in the measurement and understanding of the dynamics of food insecurity, e.g. frequency and duration of episodes;
- Developing better questions and strategies for asking about nutritional quality (alternative to "balanced meal" questions);
- Assessment of the effects of the questionnaire structure, item sequencing, and survey context on response patterns measured food security levels.
- Determination of research situations appropriate for implementation of abbreviated household food security scales and/or scales with different time frames such as monthly vs. annual;

**Applications and Policy**

- Focused sampling and research on food insecurity and its consequences among high risk groups with chronic health conditions, mental illness and other biological vulnerability (especially among the homeless, elderly and young children);
- Development of a research basis for linking community food insecurity and household food insecurity.
- Better understanding of the context and determinants of food insecurity and hunger and their relationship to poverty, household resources and time management;
- Applications which assess and investigate the linkages between food insecurity measures, welfare reform, and measures of program performance.

Source: Economic Research Service. United States Department of Agriculture (1999). Food Security: Measurement and Research Priorities Identified: Second Food Security Research and Measurement Conference. Downloaded May 21, 1999 from <http://www.econ.ag.gov/briefing/foodasst/fsresearch.htm>.

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**Table 2.6**  
**Food Security Measurement and Research Priorities Identified: Other Suggestions**

**Measurement**

- Exploration of the usefulness of multidimensional food insecurity scales in examining links with health outcomes;
- Assessment of the comparability of different types of food security scales (e.g. household vs. individual, 6-item vs. 18 item);
- Investigation of the implications of skip patterns, coding conventions, and response imputations on the validity of the food security scale.
- Development of alternatives to the current data collection strategy that asks parents to report on the extent of hunger among their children.

**Applications and Policy**

- Further testing the scale characteristics of the household food security measure among ethnically and culturally distinct subpopulations;
- Improved understanding of the association of food insecurity with income; food, housing and medical expenditures; and other measures of well-being;
- Examination of the feasibility of international comparisons of food insecurity levels.
- Investigation of the relationship between food insecurity and food safety concerns;
- Development of materials and protocols for providing technical assistance to communities that want to assess community food security.

Source: Economic Research Service. United States Department of Agriculture (1999). Food Security: Measurement and Research Priorities Identified: Second Food Security Research and Measurement Conference. Downloaded May 21, 1999 from <http://www.econ.ag.gov/briefing/foodasst/fsresearch.htm>.

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3. Individual-level follow-up questions were asked (How often did this happen?) to assess the temporal duration that hunger among adults was experienced (Q81a, Q121a, Q141a, Q151a: Response included almost every month, some months but not other months, or only 1 or 2 months. Affirmative responses included yes, almost every month, and some months but not every month); and
4. Three additional temporal duration follow up questions (9a, 10a and 14a) were also added in an attempt to fill gaps in 18-item scale.

The entire ICFSM consists of a maximum 31 questions which are answered by households with two or more adults with children. Households without children answer a maximum of 16 questions. The adult items are asked of the respondent only. Questions pertaining to individual-level child hunger are asked about the child who most recently had a birthday. When there was a single adult or only one child in the household, the respondent was not asked questions which did not pertain to their situation i.e. responses to 8HI were taken from 8H if only one adult resided in the household. To date there are no peer-reviewed studies or other reports using the ICFSM.

Along this same vein of thought, Nord & Bickel (1999) recently conducted research which suggested that the CFSM underreported hunger among children and supports a separate food security index for children. Using the 1995 CPS data set these authors reported not only that there were--depending on what index was used--differences in the percentages of households classified as experiencing hunger among children (0.87% with the CFSM versus 1.12% with the child hunger index versus 1.76% who responded affirmatively to the Q14, "children are hungry;" but also that each measure picked up different households.

Six-question food security question measure. Many researchers, state surveillance efforts and programs such as WIC and EFNEP may be unable to use the CFSM or ICFSM because of time or cost constraints. A group of experts at NCHS and Abt. Associates collaboratively created a six-question scale which categorized households into three categories: food secure, food insecure with no evidence of hunger, and food insecure with evidence of hunger (Blumberg *et al.*,

1998). They sought to create a reasonably precise smaller scale that could be used in households with or without children for monitoring purposes. To minimize the sample size needed for reliable estimates the two most severe categories were combined into one category called “food insecurity with hunger”.

One or more affirmative responses were classified as food insecure; households with five or more affirmative responses were classified as “food insecure with hunger”. This research team found that the six-question measure containing questions Q8, Q8a, Q9, Q10, Q3 and Q4 could reliably classify 97% of all households classified in the 1995-CPS sample. Eighty-seven percent of households with at least one affirmative answer were classified correctly. No estimates of accuracy were available for households that were more food insecure.

### **Cultural Heritage and Income Affect Food Choices**

Managing hunger or food insecurity fundamentally involves making food and financial choices under constraints. Caliendo (1979) has reported that socio-economic status (SES) and cultural heritage affect the food choices of lower-income populations much more than nutrition requirements. The following section provides a brief orientation to how SES and cultural heritage affect food habits and concludes with implications for nutrition educators.

### **Socio-Economic Status**

It is fairly well established that food intake varies with SES in the United States (Kinsley, 1994). As income increases, a smaller percentage of income is spent on food and more food money is spent on food eaten away from home. A recent national report (IBNMRR, 1995) documented that “the risk of nutrition-related health problems is high among people with low incomes. Certain sub-populations, such as elderly people, some minorities, pregnant women,

infants and children, are also at nutritional risk, particularly those with low incomes." Likewise use of charitable food pantries has increased in the last ten years, and is expected to increase in the future (United States Conference of Mayors, 1996; Van Amburg, 1997).

Survey of Income and Program Participation (SIPP) which interviews a national sample every four months, and includes information on earnings, hours of work, health insurance coverage, demographics, use of government programs, also has one module on "well-being" which includes the three part food insufficiency question described previously. Gunderson & Gruber (1999) recently conducted a study of the "dynamic determinants of food insecurity." In the draft manuscript they outline an elaborate conceptual model of causal factors of food insecurity with particularly reference to economic, rather than sociological factors. According to their theory, food insecurity is most likely to occur when either: a) average income and assets are too low, resulting in a choice of food deprivation over deprivation of other necessities like medicine (which is particularly likely to occur when the cost of food is high or the other costs are financially demanding) or: b) when there is a unexpected "negative income shock" coupled with lack of savings and liquidity constraints (unable to borrow). Gunderson & Gruber (1999) reported that the economic factors that appeared causally related to food insufficiency included: a) loss of food stamp benefits; b) lack of savings; c) lack of home ownership; and d) lack of health insurance. These factors, coupled with inadequate income, make a household more vulnerable to an "income shock" which can result in food insufficiency.

### **Culture**

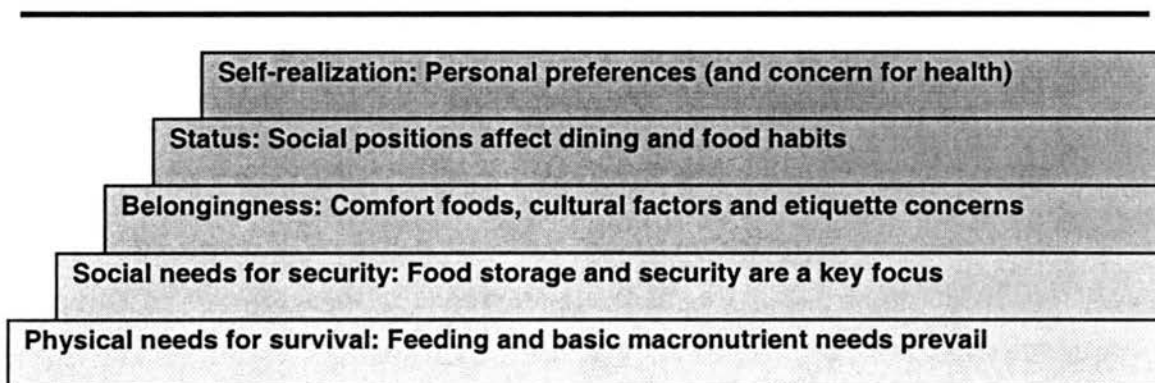
*Culture* is broadly defined as the "learned, non-biological aspects of human existence that are transmitted through language and social interactions in a group" (Caliendo, 1979). These aspects are learned, value laden, and undergo continual change (Foster, 1962). Culture provides rules governing social conduct which allow us to make sense of the world and to interact with common understanding. Ethnicity or geographical residence is often inaccurately

viewed as synonymous with culture. These misconceptions can lead to stereotyping such as "all Asians eat rice" (Terry, 1995). Although some of the largest variations in food choices are attributable to differences between cultures, within a single culture there are also considerable variations in food choices and consumption (Connor, 1994).

Traditional diets of most cultures consist of a foundational "superfood" which often has religious connotations. For instance, traditionally, Hawaiians ate taro which is a cultural symbol of life. Likewise, most traditionally cultures ate a set of core foods that were consumed on a daily basis. When cultural groups migrate to a new environment or land, cross-cultural dietary acculturation occurs. However, culturally-based food habits, particularly the superfood and foods linked with religious or cultural holidays, are often the last habits to change when people emigrate. Dietary acculturation can occur more rapidly if native foods are not available or are very expensive (Kittler & Sucher, 1989).

### **Models of food choices**

Various models describe food choices (Furst et al., 1998). However, the importance of food security and the effect of ethnicity on food choices are most clear in Lowenberg's (1970) model of food choices (Fig 2.2). Lowenberg applied Maslow's hierarchy of human maturation



**Figure 2.2. Lowenberg's Model of Food Choices**  
Adapted from: Lowenburg, 1970.

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to food habits. Importantly, this model of food choices is consistent with the concept that food security is a prerequisite of nutrition security.

It appears from this model that the food insecure are most likely fit into the lower two levels of this hierarchy. Income and factors affecting food acquisition are foundational to our food choices. Cultural considerations appear to dominate once food security is obtained. Nutrition and concern for health are not a high priority unless physical, social and cultural needs are met. Although factors affecting food choices may be hierarchical to some degree, there clearly is a great deal of overlap between stages. For instance, it is well known that hungry people will not eat foods that are strange to them: i.e., when non-fat milk was used for food relief in the 1960's; it was not well accepted despite the perceived nutritional value. Furthermore, expectations that hungry people should eat just any food is callous and unfair (Caliendo, 1979). In conclusion, cultural factors may play a larger, more integrated role in food choices than outlined by Lowernberg.

### **Implications for Nutrition Education**

If guidance is appropriate, perceived well and culturally-sensitive nutritionists and other assistance providers can be effective in modifying the food choices for people of various ethnic groups. Hertzler & Newman (1992) argue that "the goal of cross-cultural sensitivity is not to make the Registered Dietitian an expert in identifying traditional foods but to combine that sensitivity with awareness of individual variation". What is needed is "an understanding of life-styles and food ways characterizing cultural groups including research to understand not only what cultural groups do but why they do it, and acceptance of people who maintain important aspects of their cultural heritage". Hughes & Aluli (1991) have discussed culturally-sensitive approaches to health education for native Hawaiians based on the "Health Information Diffusion Model" (NHLBI, 1988). Particularly relevant components of this model are that:

- a. Strategies developed for and with specific ethnic communities will be more effective than those planned and implemented at the national level; and that
- b. Each community must first be assessed to determine its particular needs.

## Background on Hawai'i

### Brief History of the Islands (Figure 2.3)

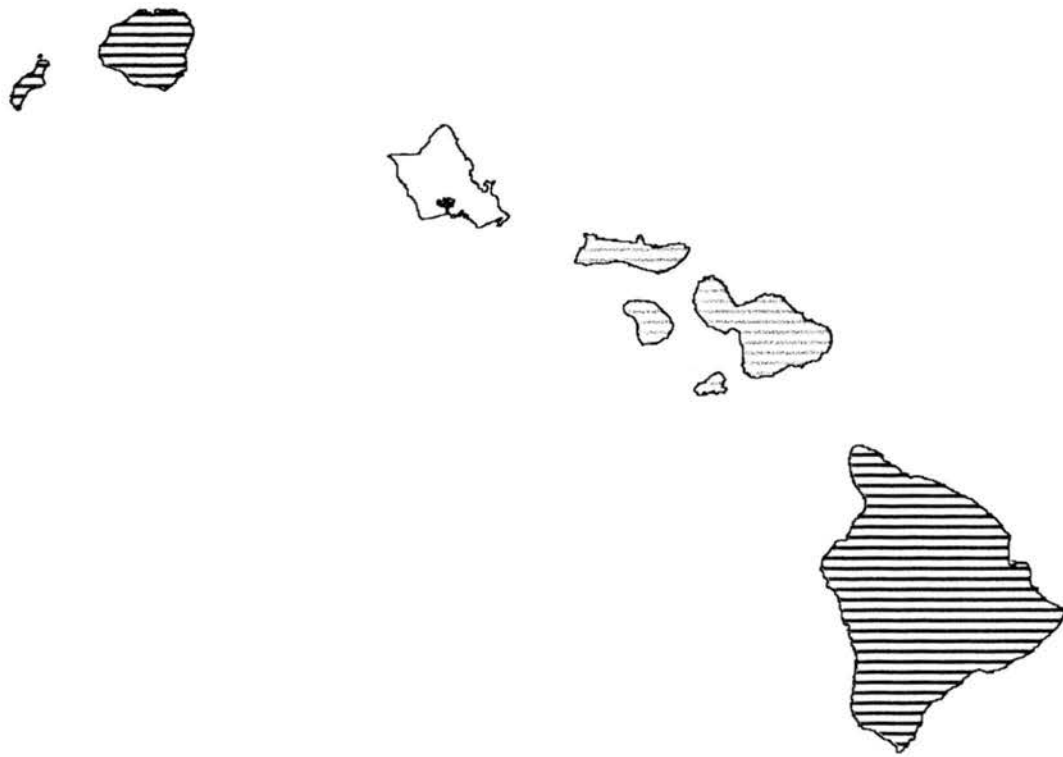
Hawai'i consists of eight major islands located in the middle of the Pacific Ocean: 19 to 21 degrees north latitude and 158 to 160 degrees west longitude. The following brief history is taken from many sources, most notably Kent's second edition of *Islands Under the Influence* (1993). After the first recorded western contact by Capt. James Cook in 1778, Caucasian seamen arrived from Britain, the United States and Russia. These seamen and subsequent Protestant missionaries had a profound influence on the subsequent rapid change in social and political systems and on the health of the Hawaiians. Importantly, a previously food sufficient country deteriorated into islands dependent on profits capitol from sugar exports for basic food supplies. From the mid-1850's to the 1970's land and power in Hawai'i was largely controlled by Caucasians with roots back to missionary times. Hawaiians progressively lost their health, culture, land and way of life as western society replaced and took over most aspects of life.

Ethnic diversity in Hawai'i has multiple roots. Immigrants from China arrived in the 1840s and 1850s to work on sugar plantations as contract laborers. As frugal hardworking Chinese workers left the plantations to form cooperative banks, stores and development companies, Portuguese and Japanese laborers were brought in to replace the Chinese laborers. The Hawaiian monarch Queen Liliuokalani was illegally overthrown in January 1893. In 1900 Hawai'i was annexed as a territory of the United States. Koreans arrived around the turn of the century, and still later, laborers arrived from the Philippines.

World War II and the destruction of Pearl Harbor firmly implanted the military importance of Hawai'i in the Pacific Rim. Since World War II, Hawai'i has played an increasingly important role in national security and economic vitality in the Pacific. Political control changed from a powerful Caucasian Republican elite to an ethnically diverse, union-supported, Democratic majority. The economy has shifted from one dependent on plantation agriculture to an economy dependent on tourism. Hawai'i became the 50<sup>th</sup> state in 1959. Within the last 20 years migrants seeking refuge from political oppression in South East Asia have arrived, as have Pacific Islanders from Samoa and Micronesia. Japanese investors have increasingly bought land and currently control various aspects of tourism in Hawai'i. In the last 10 years, native Hawaiian groups have increasingly pushed for political sovereignty and the return of land and royalties belonging to the Hawaiian nation under Queen Lilioukalani. In addition, Hispanics have arrived in increasing numbers to fill the need for low-cost tourism labor.

### **Island Demographics**

The population of the state was estimated at 1,148,676 in 1996 (DBEDT, 1997, Table 1.29) Seventy-three percent of the population resided in the city and county of Honolulu, on the island of Oahu (DBEDT, 1997). Hawai'i has an ethnically diverse population consisting primarily of Caucasians which includes Portuguese (23%), Japanese (20%), Mixed but non Hawaiian (21% - which may include up to 10% Hispanics), Hawaiian and Part-Hawaiian (21%), Filipino (10%), Chinese (3.1%), African Americans (1.4%) and Samoan/Tongan (0.8%). Many individuals are of mixed heritage, i.e., part Japanese and part Caucasian or part Hawaiian. Ninety-percent reported they could read or speak English (DBEDT, 1997).



**Figure 2.3. State of Hawaii**

Legend: From Left to right: Niihau, Kauai, O`ahu, Molokai, Lanai, Maui, Kahoolawe, Hawaii.



Income and employment. Unlike the rest of the nation, Hawaii's economy is still weak late in the 1990's (DBEDT, March 1997). Tax revenues, hotel occupancy, construction, retail, wholesale jobs, and non-agricultural jobs were all down on O`ahu in 1997. In 1997, the unemployment rate for O`ahu was 5.3% (DBEDT, March 1998), others, who have found work, suffered salary cutbacks. The median income for a four-person household in Hawai`i in 1999 is projected to be \$57,909: where it is 6<sup>th</sup> among all the States (DBEDT, 1997: Table 13.16). In 1996, 10.7% of the population were estimated to live at the poverty threshold. In 1998, the poverty level income guideline in Hawai`i for four-person household (two adults, two children) was \$18,920 (Federal Register, February 24, 1998).

Cost of living. Honolulu was the second most expensive city to live in during 1996: 121% of the national average (DBEDT, 1997: Table, 14.08). Costs of food, housing, and gasoline comprise a large share of these expenses. Costs of food eaten at home are 142% of U.S. urban prices (DBEDT, 1997: Table 14.07). However, unenriched white rice is relatively inexpensive (20-25 pound bag for \$4-5). Renter costs were 159% of the U.S. urban average. Gasoline currently averages \$1.45-1.50 a gallon.

Food Insecurity and Homelessness. Using the CFMS an estimated 9.2% of the household population in Hawai`i were estimated to be food insecure in 1995 (Hamilton, *et al.*, 1997). In 1999 the Hawai`i Housing Authority, which oversees various low-income housing projects, estimated there were 12,629 homeless people in Hawai`i of which 8,357 resided on Oahu (HHA, 1997). The Homelessness and Hunger in Hawai`i report the most comprehensive report of its kind in Hawai`i, indicated there were 176,443 hungry individuals in Hawai`i in 1992 (14.2% of the population); and of these, 58,906 were children (SMS, 1992: Table 2.8). The authors indicated that "hunger affects substantial numbers of people in Hawai`i . . . that visible hunger was a relatively, small part of the problem". An evaluation of demographic profiles indicated the prevalence of hunger was highest among Caucasians (45%) vs. Hawaiians (21%), those with incomes between \$10-30,000 (40%), and among the homeless (59%).

These researchers used the CCHIP measure to measure hunger among households with children and also created a unique term "other hunger" (answering yes to one of three CCHIP questions by a household). However, the implementation of the CCHIP measure has been questioned (Dr. George Kent, University of Hawai'i, personal communications, July 1996) and the report itself acknowledged differences:

"CCHIP interviewers collected information in face-to-face interviews among a sample of households known to have children under 12 and to have experienced some food acquisition problems. The Hawai'i study was conducted among two groups; homeless people and people in households-- that make up the full range of economic and housing conditions in the State. We wanted to tie Hawai'i results to a national standard, and it was necessary to develop a new measure for Hawaii's adult population." (SMS, 1992).

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**Table 2.8**  
**Hunger In Hawai'i, 1992 (SMS, 1992)**

Category	CCHIP hungry	Other hungry	Total hungry	Percent hungry
Households or "parties"	6,538	43,661	50,889	13.6%
Households in Honolulu	3,175	31,024	34,199	12.5%
Total persons	30,930	145,513	176,443	14.2%
Total children	19,143	39,763	58,906	19.9%

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The difference in the methodologies, is not clearly explained nor was the application of the "other hunger" classification validated. Nevertheless, the authors of this landmark study conclude with the following recommendations for policy and research:

"We recommend . . . continuous monitoring of the problems of homelessness and hunger in order to insure against their increases or institutionalization in Hawai'i, and in order to gauge the effectiveness of efforts to eradicate. . . . State of Hawai'i should institute a policy review process to analyze the character, causes and appropriate remedies for hunger and homelessness in Hawai'i (SMS, 1992)

The substance of the suggestions hold true today particularly in light of cutbacks in federal and state welfare assistance.

Food and Nutrition Assistance Programs in Hawai'i. In November 1997, almost 119,000 individuals were beneficiaries of the FSP, of which 75,500 (63%) lived on O`ahu. Based on the number of FSP recipients by zip code (Figure 2.3), the communities of: Waianae (18%), Kapalama (9%), Kalihi (9%), Waipahu (8.8%), Wahiawa (6%), and Kaneohe (5.6%) appear most in need (DHS, 1998). However, smaller geographical areas such as Palolo and the Hawaiian communities of Hauula and Waimanalo are also needy. FSP statistics also suggest that Hawaiians, Filipinos and Samoans are disproportionately likely to be recipients of assistance programs (DHS, 1998). Full FSP benefits for a family of four were approximately \$650 a month in 1998.

Despite the benefits of the FSP, many households reported running out of food (Derrickson & Gans, 1996) while on this "safety net" program. When people run out of food in Hawai'i they turn to their neighbors, friends and to emergency food providers such as their local church pantry, the Salvation Army or soup kitchens i.e. Institute for Human Services, the River of Life Mission, Word of Life Mission, and `Ohana community food service (Derrickson & Gans, 1996). The Hawai'i Foodbank, Inc, a member of Second Harvest, oversees food salvaging and distribution to over 275 non-profit agencies on O`ahu. Brett Schlemmer, the Director of Operations for the Hawai'i Foodbank Inc., indicated that supplies of food were inadequate to meet current needs (Ramirez, 1998).

A 1998 report on 376 clients of emergency food pantries in Hawai'i provided the most comprehensive report on charitable food assistant recipients (VanAmburg, 1998).

Key findings included:

- 80% of four person households had income under \$15,500;
- 73% had no private health insurance;
- 58% of clients had income less than \$10,000;
- 50% of clients received "charitable" food for more than 3 months;
- 60% of clients had been out of a job for more than one year;
- 60% indicated interest in getting more for their money at the grocery store;
- 55% wanted to know how to get help from the government;
- 50% received food stamps;
- 50% wanted to know which foods keep you healthy;
- 48% wanted help with budgeting; and
- 31% had one or more household members in poor health;

Of the 174 agencies surveyed, 46% had to ration or limit food during the last year. Studies of the type and variety of food offered to clients on O`ahu indicate that the foods distributed varied, but were often low in fruits and vegetables (Derrickson, *et al.*, 1994).

Nutrition and Health. Nutrition surveillance in Hawai'i is limited primarily to the Behavioral Risk Factor Surveillance System as reports from the Pediatric and Pregnancy Nutrition Surveillance Systems are not comprehensive nor formally published. Surveillance and other reports on the diet and health of low-income populations in Hawai'i indicate that:

- The diets of many homeless mothers on O`ahu did not include 70% of the 1989 RDAs for iron, calcium, vitamin A, and calcium, and were particularly low in fiber (Derrickson & Gans, 1996);

- Lower income and/or educational attainment is associated with higher fat diets, lower fruit and vegetable consumption and less frequent label reading (DOH, 1993,1994);
- Adults with income less than \$10,000 have higher rates of obesity and a sedentary lifestyle than their more financially well off counterparts (DOH, 1993, 1994); and
- Twelve percent of Head Start preschool children on O'ahu were found to be obese, yet less than 5% of children had lower weight for height suggesting severely inadequate intake (Derrickson *et al.*, 1997).

Based on preliminary findings reported in Chapter 7, the Hawai'i Health Survey (Appendix 10)-the State of Hawai'i, Department of Health's "Behavioral Risk Factor Surveillance Survey"--included six food insecurity questions in their 1999 data collection (Q3, Q4, Q9, Q10, Q12 and Q14). Selected agencies working with the Hawai'i Foodbank are also collecting four of the six question (Q4, Q9, Q10 and Q14). Plans include adding Q3 and Q12 questions later this year.

### **Cultural Diversity and its Affect on Food Choices in Hawai'i**

Cultural heritage or ethnicity has consistently been found to be a factor in differing eating habits in Hawai'i's population (Phillips, 1989; Dannemiller, 1985). While each cultural group has maintained some measure of its homogeneity, all cultures have contributed to the "melting pot" of local food consumed by people from ethnic groups today (Table 2.9). Rice is the predominant starch eaten by most Asian and Pacific Islanders: However, an inexpensive dried noodle product called Saimin is very popular. Although sometimes eaten right out of the package, it is most often cooked and eaten with pork or Spam (processed meat product), green onions and/or fish cake. A plate lunch for many locals consists of two scoops of rice, six to eight ounces of meat, and one scoop of macaroni salad. It appears that over time, diets of many ethnic groups in Hawai'i have become more westernized and the risk of chronic diseases common to the industrialized nations has increased (Egusa *et al.*, 1993). Diets of EFNEP homemakers--the best known analysis of the

**Table 2.9**  
**Ethnic Food Diversity in Hawai'i: Traditional and Modern Diets**

<b>Ethnic group</b>	<b>Traditional diet</b>	<b>Cultural foods commonly eaten in Hawai'i</b>
Hawaiians	Taro, luau leaves fish, salted meats bananas, sweet potato	Luau featuring traditional foods: poi, yams, lomi-lomi salmon, pork and fish laulau (taro leaves), coconut pudding, seaweed
Filipinos	Rice, pork dishes coconut desserts Filipino vegetables	Lumpia (egg roll), fish paste (bagoong), dry salted fish, some dairy products coconut sauces
Samoans	Breadfruit, fish, bananas	Breadfruit, bananas, tapioca coconut sauces, canned meat
Portuguese	Rice, bread products, fish	Portuguese bean soup, malasadas (fried donuts), bread products, pickled pork
Japanese	Rice, beef/vegetable dishes, noodles, soy products	Namasu, sushi, sashimi, kamaboku (fishcake), azuki beans, wasabi, tempura, dried fish
Chinese	Rice, stir fried meat/fish and vegetable dishes sweet and sour sauces	Lychee, eggplant, won bok, Chinese sausages, manapua or steamed breads, char siu

Sources.

Corum, A.K. (1983) Ethnic foods of Hawai'i. Bess Press, Honolulu, HI.

Phillips, J. (1989) Methodology for developing a culturally sensitive food guide. Master's Thesis. University of Hawai'i at Manoa, Honolulu, HI.

Kittler, P.G., Sucher, K. (1989) Food and culture in America. Van Nostrand Reinhold, New York, NY. pp1-18.

diets of low-income families in Hawai'i--are predominately rice-based although the type of meats, and the type and amount of vegetables consumed varied with ethnicity (Phillips, 1989). While Caucasians and Hawaiians ate fewer vegetables, Filipinos ate more vegetables and Samoans consumed much greater quantities of food.

Hawaiians and Part-Hawaiians, Samoans and Filipinos are three ethnic groups, which because of their generally lower incomes became the focus of this study. However, this group of Asians and Pacific Islanders may not be familiar to readers who are not residents of Hawai'i. Since studies evaluating food insecurity differences among these ethnic groups are unknown or not available; a brief background on the food and cultural backgrounds of each ethnic group is presented to provide a framework for the present study. Palafox & Warren (1980) provide the most comprehensive and widely accepted source of ethnic diversity in Hawai'i, and is the primary source of information on these ethnic groups presented herein.

Hawaiians. Ancient Hawaiians ate a diet rich in taro, fish and green leaves. Although Hawaiians in the higher castes received more food, and food of higher nutrient quality, than those in lower castes, early reports suggest that the ancient Hawaiians were in excellent health (Cook, 1778). However, most recently Native Hawaiians have a greater risk of diabetes, obesity and most chronic diseases (DBEDT, 1995). Dietary research suggests that returning to traditional diet may decrease risk of many chronic diseases (Shintani *et al.*, 1991).

Traditionally, Hawaiians valued sharing and caring for a whole group or extended family (*'ohana*); extensive caring or *kokua* was a requirement for life, as was a respect for natural resources. The emotional and spiritual well being of the people was tied to the land and celebrated through music. *Aloha* the Hawaiian word meaning hello, goodbye, and love has come to characterize Hawaiians and Hawai'i as open and friendly. Children in particular were highly loved: families often included adopted or *hanai* children.

Traditionally, feasting was an important aspect of both religious and social events. "Food is the language of all Hawai`i" (Palafox & Warren, 1980; p. 66). Pleasure was found in eating, not simply for satiety, but until one was tired. Likewise large body size was seen as positive and associated with wealth. Starting in the 1970' a "Hawaiian Renaissance" of cultural pride has blossomed. Currently, many part-Hawaiians, who are one quarter or less Hawaiian, identify more with their native Hawaiian roots and culture, than other aspects of their ethnic origins.

Samoas. Samoa is a group of islands in the South Pacific. American Samoan, from which most immigrants to Hawai`i originate is much smaller than Western Samoa. Most immigrants are devoted Protestants, often Congregationalists, Mormons or Seventh Day Adventists. The basic social unit in Samoa and among Samoans in Hawai`i, is the aiga or extended family headed by a matai or chief. The aiga plays a pivotal role in the life of the Samoan community and creates a system of interdependence and unity. Although members are often poor, when the chief asks for money for a funeral or wedding, it is given, traditionally with little sense of ill will or indebtedness. Obedience is a primary responsibility. Inter-dependence is expected. This extensive inter-reliance appears attributable to their cultural heritage, and is likely to affect food acquisition, and therefore, food security. However, Samoan youth educated in an American school system stressing self-reliance have been known to rebel against traditional ways.

Samoans are often stereotyped as large and lazy. Their larger size most often includes height and weight (Derrickson *et al.*, 1997), and to some extent may be due to high caloric intake (Phillips, 1989). Traditional life in Samoa was agricultural and community based. Security and happiness derived from family well being, not material accumulation. Samoans are known to not value compliance with western medical recommendations or time schedules. Like their Polynesian counterparts, Samoans are known to have high rates of hypertension, cardiovascular disease, gout, diabetes, mental illness and obesity; however a large body is traditionally thought to be positive and dignified. The diet of American Samoans in American Samoa has been

documented to be higher in energy, protein, carbohydrate, cholesterol and sodium than that of Western Samoan counterparts (Galanis *et al.*, 1999).

Filipinos. The Republic of the Philippines consists of more than 7,000 islands located southeast of China. Time of arrival to the islands, ethnic subgroup and educational background play important roles in determining the social behavior of this ethnic group. Many dialects are spoken; Tagalog and Ilocano are most commonly spoken in Hawai'i. Many Filipinos can trace the ancestry to their barrios they came from. Barrios created group affiliation and community values. Values of reciprocity, strong family ties, male dominance (machismo), and obedience are common.

Filipinos have been in the islands since the turn of the century, thus some Filipinos may be first generation immigrants, others second, third or fourth generation immigrants. At first single men arrived to work on sugar or pineapple plantations. Recently, most immigrants are relatives of previous immigrants; many are professionals and technicians. Historically, Philippines were under Spanish control Spanish and Catholic influences have now intermingled with traditional culture. Diseases common to Filipinos in Hawai'i include dental caries (specifically baby bottle tooth decay), uremia, gout, and hypertension which are all related to a high sodium, high sugar, and high purine diet. Many believe that illness and pain is the result of guilt or punishment from God. There is often a negative attitude of accepting assistance and wariness of sharing problems with strangers.

## CHAPTER 3

### Face Validity of the Core Food Security Module

#### Introduction

Food security is defined as “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. 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.” Hunger, “the painful sensation of inadequate intake, is a severe form of food insecurity” (LSRO, 1990, p. 1598). If hunger persists over time, it can lead to malnutrition, illness, and delayed growth (CHPNP, 1995).

Although food security is an important aspect of household well being, until recently no benchmark food security instrument was available. Since many food assistance programs are charged directly or indirectly with enhancing food security, it is difficult for policy makers and assistance program managers to make informed decisions without local monitoring of food security status. Furthermore, in light of fears that reductions in funding for food and nutrition assistance programs may negatively affect children state food security surveillance efforts will become increasingly important (Willis *et al.*, 1997)

The Food and Consumer Service, USDA, the Center for Disease Control and Prevention, National Center for Health Statistics, USDHHS, and other food security experts oversaw the development of a scaled measure of household food insecurity called the Core Food Security Module (CFSM).

A summary report of this landmark research effort (Hamilton *et al.*, 1997a), a technical report (Hamilton *et al.*, 1997b), and a guide to implementing the CFSM (Price *et al.*, 1997) document this research. The 18-question CFSM estimates the extent and severity of resource-constrained food insecurity in households within a 12-month period based on the food insecurity definitions outlined above. The severity ranking of the 18 indicator questions and the reliability and the validity of the CFSM, were established through application of the RASCH Bigsteps software program (Wright and Linacre, 1991). The CFSM was found to be a valid measure for households with and without children, although eight of the eighteen questions are only for households with children (Hamilton *et al.*, 1997a).

Theoretical Basis of Food Security Status. Assessment of the face validity of a measure answers the question of whether or not the indicators are appropriate and make sense to an intended target audience or to policy makers. It is an interactive process which involves a comparison of the conceptual definition (as known by the target audience) and the operationalized measurement of the concept (Hessler, 1992.) The qualitative work completed by USDA staff (Christofar & Basiotis, 1992), a group at Cornell University (Radimer *et al.*, 1992), and by the Community Childhood Hunger Identification Project (Wehler *et al.*, 1992), provided the operationalized framework or conceptual basis of the CFSM (Bickel *et al.*, 1996) which is outlined in Appendix 2. Empirically, food insecurity is understood as a managed process of “rational economizing behavior” where hunger is understood as the more severe form of food insecurity. (Radimer *et al.*, 1992; Wehler *et al.*, 1992; LSRO, 1990). As food insecurity worsens, initially household members worry about their food situation and make adjustments accordingly, i.e. eating less expensive foods and unbalanced meals, with little or no evidence of the physical manifestations of hunger. Additional coping behaviors, including cutting back on the size of meals are also employed. If children are in the household, they will be spared as long as possible.

The CFSM classifies households along the unidimensional continuum of food insecurity into one of four food security status categories: food secure, food insecure without hunger, food insecure with evidence of resource-constrained hunger and food insecure with evidence of severe hunger.

Prevalence estimates based on CFSM create the upper bounds of estimates of the number of hungry people in households. In 1995 based on the CFSM, 12% of the US household populations were food insecure and 4% were experiencing resource-constrained hunger (Hamilton *et al.*, 1997a).

Predictive or External Measures of Food Security Status. Measurement is considered a proxy or estimate of the elusive truth (Hessler, 1992). External or predictive validity is assessed by comparing results of the measurement tool to one or more criteria, or gold standards, that are theorized to be related to the construct being measured. At present there is no gold standard for hunger and food insecurity. Efforts to externally validate the CFSM indicated that food security status was related to measures of household food expenditure, to household income, and to food insufficiency (Hamilton *et al.*, 1997b). Using the Radimer/Cornell food insecurity instrument, other researchers have reported that food security was significantly associated with a decreased frequency of fruit and vegetable consumption, the amount of food in the household, an increase in disordered eating, unemployment, use of a food pantry, and family income <\$10,000 (Olson *et al.*, 1996; Frongillo *et al.*, 1997).

CFSM with Asian and Pacific Islanders. Asians and Pacific Islanders are a diverse ethnic class encompassing Japanese, Chinese, Koreans, Vietnamese, Cambodians, Laotians, Filipinos, Hawaiians, Samoans, Tongans, Chamorros, Hmong and others. The percentage of Asian and Pacific Islanders throughout the United States has gone from 3% of the U.S. population in 1990 to 3.7% in 1996 and is expected to increase to 5.1% by 2010 and to 8.7% by 2050 (USDCEA, 1996); however, only 2% of the sample used to develop the CFSM consisted of Asian and Pacific Islander respondents (Hamilton *et al.*, 1997a). Asian and Pacific Islanders make up close to 50% of the population in Hawai'i (DBEDT, 1997).

To our knowledge neither the CFSM, nor the conceptual model it is based on, have been tested with Asian and Pacific Islanders, nor has research been published on the conceptual basis of food

insecurity among Asian and Pacific Islanders living in the United States. Differences in cultural patterns and beliefs associated with food, health care and coping behaviors among the various ethnic in Hawai'i have been documented (Palafox & Warren, 1980). Dietary research in Hawai'i suggests that "ethnicity may be a very important factor in distinguishing dietary patterns among individuals in Hawai'i (Dannemiller *et al.*, 1985). These findings suggest differences among ethnic groups may affect the validity of the CFMS when it is utilized with Asians and Pacific Islanders. Without establishing the validity of the CFMS among Asians and Pacific Islanders, policy makers will not know if this food security classification algorithm is an accurate measure food security among Asian and Pacific Islanders in the United States. Erroneous conclusions may negatively impact vulnerable segments of the population.

Objectives. This manuscript describes the first part of a three-part research project designed to provide an independent validation of the CFMS with a sample of Asians and Pacific Islanders.

The objectives of the first part were to:

1. To assess the face validity of the 18 question CFMS with low income Asian and Pacific Islanders in Hawaii; and
2. To ascertain which survey questions, in a predominately Asian and Pacific Islander low-income population, may be useful "predictors" of food security status.

The specific research question asked in the first part of the research was:

*Based on qualitative research are the unidimensional framework and the 18 indicator questions of the CFMS consistent with the target audience's perceptions of food insecurity (face validity)? If not, what alternative question set provides a better measure of food security status in the target population?*

We hypothesized that the CFMS would not be adequate by itself and that an alternative question set would be needed to accurately measure food insecurity among Asian and Pacific Islanders.

## Methods

Subjects were the food gatekeepers of households with children recruited from the emergency food pantries or from Head Start preschools on the island of Oahu in the state of Hawai'i. Participants represented the four ethnic groups that predominately benefit from the food stamp program in Hawaii: Caucasians, Hawaiians and part-Hawaiians, Samoans and Filipinos (DHS, 1997). Neighborhoods with high rates of poverty and participation in the free school lunch program were targeted (SFSB, DOE, 1995).

The sampling design was an ethnically stratified convenience study. Sampling started via discussions with the charitable food assistance agency personnel in neighborhoods, which were known to contain potential study participants. Key informants were told of the purpose, expected content of interview, and desired sample size, and were then asked to recruit participants. We ended with a total of nine focus groups, with two groups from each ethnic group targeted, and one additional Samoans group. The size of the Hawaiian and part-Hawaiian groups were twelve and eleven: Caucasians were five and eight; Filipinos were five and nine; and Samoans were three, four and four, respectively. Each focus group took 75 and 90 minutes.

The information collected from each participant included participant characteristics, responses to qualitative questions in a focus group format, and responses to the CFSM. Prior to each focus group, participants completed a consent form (Appendix 6) and a survey of demographic information (address, telephone, ethnicity, whether or not they prepared or bought food, household size, number and ages of children, participation in various assistance programs). Participants were also asked to identify their approximate annual household income in ranges of \$5,000 to \$10,000, <\$10,000, \$10,000-14,999, \$15,000-\$24,999, \$25,000-34,999, \$35,000 to \$44,999, and >\$45,000.

Focus group format and planning was guided by the recommendations of Krueger (1994) and the work of Chitharaanjan and colleagues (1996). After a warm-up question about “in which ways do assistance programs help you,” participants were asked four open-ended questions:

1. Definition of hunger: “What does it mean to be hungry, or what does the word hungry mean?
2. Causal factors: What happens before someone is hungry? What causes them to be hungry?
3. Mediating factors: What do you, or someone else you know, do when you run out of food?
4. Consequences: How do people look, feel or act when they are hungry?

The first question was asked to assess whether or not the target audience’s perceptions of the definitions of hunger were consistent with the government’s definitions of food insecurity and hunger. Questions two through four were asked to determine if the characteristics and indicators of the operationalized framework outlined in Appendix 2 were consistent with the descriptions and perceptions of the target audience. Follow-up questions were used to probe responses, i.e. question four probing was conducted to solicit perceived consequences of hunger for both children and adults. The Project Investigator and either a student assistant trained in focus group facilitation, or a staff member of the agency from which the group was formed moderated all focus groups. The group interviews were audiotaped; handwritten notes were also taken.

After the open-ended questions were completed, cognitive testing of the participants’ understanding of the 18 indicators of the CFSM commenced. The moderator read out loud each of the 18 questions. Each participant responded individually by filling in his or her responses on the survey. A co-moderator or another group participant assisted if needed. In one Samoan group the questions were translated for a participant who could not read English. Participants were encouraged to share out loud any questions they had about any of the questions, or statements. After the final question, participants were de-briefed to probe their perceptions of questions, misunderstandings, thoughts on sequencing, and intent of the CFSM. Specifically, participants were asked to define “balanced meals” (Question 4), the difference between most of

the time, and sometimes and if the questions sequentially appeared to indicate more severe hunger.

Qualitative data analysis. Immediately after each focus group, a summary of responses to questions and additional insights were added to hand-written notes. Audiotapes of the focus group sessions were then transcribed and reviewed for key ideas and descriptive quotes. Transcripts were analyzed using constant comparative analysis (Glaser & Strauss, 1967) with assistance from the HyperResearch software program (HyperRESEARCH Version 1.56, Researchware, 1995, Randolph MA). The purpose of constant comparative analysis is to continually compare concepts and themes with other concepts and themes to identify similarities and differences that can lead to a better understanding of the data. The resulting conceptualization produced by all three levels of coding allows for a "weaving of the data back together again" (Glaser, 1978, p. 116). Miles and Huberman's (1994) reference book on qualitative data analysis was utilized throughout data analysis.

In general, level one codes were descriptive quotes of responses to each questions and level two codes were index categories of similar codes. Level three coding, was not formal coding, but a synthesis of level one and two codes to complete the investigate of the face validity of the CFSM and to ascertain relevant predictors. Analysis consisted of an iterative process of coding, comparing findings to the CFSM, recoding, discussing findings with contacts, recoding, etc., following the general sequence outlined below.

Analysis began with Level one or open coding (Miles and Huberman, 1994). Within HyperResearch responses to each question were blocked (highlighted) and then labeled categorically according to the content of the responses to each question asked, i.e., Cause: unemployed, Cause: sold food stamps for drugs, Cause: crippling self. The exact words spoken by participants were used as level one code descriptors whenever possible. Multiple codes were used when a block of text contained various themes. For each focus group a print-out of level

one codes (in alphabetical order by code) attached to highlighted text was compared to the original transcript to determine if any key concepts were missed. A check-off sheet indicating whether or not there appeared to be evidence in support of each of the 18 questions of the CFSM was also completed. Additional coding was then completed to include missed concepts. After level one coding of the first focus group, the transcript, coding, and preliminary summary analysis were shared with a peer reviewer. The reviewer generally agreed with the coding and preliminary findings.

Level two coding began with an assessment of frequency counts of level one codes. Since meaning segments, not words, were coded in this study, frequency counts of level one codes are biased quantitative indicators which will not be presented. Creation of preliminary concept maps for each of the key meaning segments were generated by the content and frequency of level one codes. Contextually similar level one codes, i.e., high cost of rent, high cost of day care, high cost of transportation, etc. were combined into level two or index codes, i.e., Cause: high cost of living.

Concepts and relationships produced by Level two coding were examined across each question and for each ethnic group as the first step in Level three coding (Appendix 7b-d). We reassessed that responses were consistent with the operationalized framework of the CFSM. To complete level three coding, concept maps were refined, findings of Level one and two codes were summarized, and a summary of potential predictor variables was outlined from this summary. A preliminary write-up of these findings was shared with participants and agency cooperator, to confirm findings and to ensure that key quotes were satisfactory to the participants. No changes in the content of findings were made since follow-up conversations with providers and participants only further confirmed findings.

Quantitative data analysis. Sample characteristics and responses from the CFSM were analyzed in SPSS (Version 6.2, SPSS Inc., Chicago IL). The basic scoring algorithm of the CFSM was applied to classify households by the number of affirmative responses: 0-2 affirmative responses

represented food secure households, 3-7 affirmative responses indicated mild food insecurity, 8-12 affirmative responses indicated moderate food insecurity with evidence of hunger for adults, and 13 or more affirmative responses indicated severe food insecurity with evidence of hunger in children. Preliminary assessment of potential quantitative predictor variables was conducted using Pearson correlation coefficients and chi-square analysis. However, since the sample size is small, statistical analysis will not be discussed herein (Appendix 7a)

## **Results**

Sample Characteristics. A total of 61 participants completed one of nine focus groups and the CFMS (Table 3.1). Participants were predominately female (95%) and were all food gatekeepers. Twenty-three (38%) participants considered themselves Hawaiians or part-Hawaiians, 13 (21%) Caucasian, 14 (23%) Filipino and 11 (18%) Samoans. Participants were predominately from dual-parent households with more than one child. Household size averaged  $6.1 \pm 3.5$ . Eighteen percent of households included three or less household members, 36% included four to five family members, 25% included six to seven family members, and 21% contained eight or more household members. Nineteen (31%) participants estimated their household income at or below \$10,000. Six participants indicated incomes over \$35,000.

The mean for the total food security score was 6.06 (range 0-14) with 75% of the sample classified as food insecure. The categorical classification of food security status by ethnic group is presented in Table 3.1. Twenty-one respondents (34%) benefited from the Food Stamp program, 25 (41%) from the Special Supplemental Nutrition Program for Women, Infants and Children program, 21 (34%) from the free or reduced School Lunch program, 41 (67%) from a food pantry and 14 (23%) from Head Start.

Face validity of CFMS. A summary of key quotes summarized by level two codes is presented for

each focus group question. Bulleted statements represent level two codes and quotes in *italics* illustrate key level one codes. In general, findings were similar across ethnic groups; deviations to general themes are presented below.

Question 1. Definitions of food insecurity. Responses to the question “What does the word hungry mean?” conveyed a sense of loss of pride, stress, and not knowing where the next meal is coming from. A cyclical pattern of running out of food at the “end of the month” was commonly reported:

*When you lower your pride and go to the Foodbank.*

*When you don't know when your next meal is coming. Or where it's coming from. Or how.*

*At the beginning of the month like say from the 5th to the 10th they are partying. . . at the middle of the month it's like they mellow down--no more barbecues. They start opening their canned goods and at the end of the month they're like knocking on my door.*

Only two Caucasian participants shared any indications of disordered eating or preoccupation with food:

*When you have a preoccupation with food . . . so you're not thinking about anything but the pain in your stomach.*

Question 2. Causes of food insecurity. Responses to the questions “What happens before someone is hungry? or what causes hunger?” were consistent across all ethnic groups studied. However, the extent of the cultural obligation was most evident among the Samoan families.

◆ Lack of adequate income; high prices:

*Low paying jobs. That's the big thing. If your husband or you don't make enough and rent. Oh, murder. Rent takes all my money.*

*He got laid off and then that was it. His ego went down, his self-esteem went down, and his pride kind of went up.*

◆ Emergency when no savings and no medical insurance:

*Just like me if something would happen to my teeth I would have to pay like \$40.00 just to see the dentist and then whatever the work that would cause my food supply to go down.*

◆ Lack of education and life skills:

*Parents don't cook for them. All they're buying is saimin, saimin that's all they eat is saimin. A lot of people don't know how to prepare anything except for Spam and rice.*

◆ Problems with assistance:

*They just don't know how to go about getting the help. And it's getting more and more difficult to get the help.*

*When you apply for food stamps you have to wait 10 days because you're not an emergency.*

*A lot of people in Hawai'i have just given up hope. . . Because the programs are designed to keep you on them on a somewhat permanent basis and there's such substandard living that people grow up and it keeps perpetuating.*

◆ Shame and cultural obligation, particularly among Samoans:

*It is stupid, the high chief says you put in \$1,000 and then I talk to my husband my husband talk to me and we talk it over and we end up in a fight. We're going to give that \$1,000 how are we going to feed our family? How are we going to pay our bills*

*Go to my in-laws house, go to grandmas, go to Auntie. Yeah, but shame you know, shame. My husband could do better but . . .*

*My stomach says food, food, food, but my mouth cannot open to ask them.*

◆ "Crippling one self" was a term coined by one group that was used to describe selling assistance

benefits for drugs or using them foolishly:

*Sometimes they have food stamps but sometimes they use it foolishly.*

*They use the money from welfare to buy drugs. They don't even care if they eat or what. . . They're way deep into drugs, they have no time for kids . . . That's what you call child neglect.*

Question 3. Coping strategies. In general, the coping strategies that families utilized varied among individuals and varied with the extent of the support system the families had nurtured. Responses to the question "What do you, or someone else you know do when you run out of food?" included:

◆ Living with family or friends:

*It's like an extended family there's us and my sister and her husband and her children living all together in one house because of the price of living here in Hawai'i.*

◆ Sharing resources, despite the shame of asking:

*If I need help I go ask my mom if they need help they ask me if I have something if they need help. We share.*

*Our (Samoan) culture does more sharing. Like if you have a large family living next door you always like giving food.*

- ◆ There was ample evidence of food security as a managed process:

*I don't buy for the whole month because when I used to do that would make just like that in the beginning and have all these things and cook all kine stuff and by the end of the month you're just struggling through. But if I buy on a weekly basis and I kind of plan out like you know certain kind food the things would last longer.*

*Most families feed their children first. Adults go without. So long as the kids eat we are satisfied.*

- ◆ Use of non-profit food resources such as food pantries was not a primary coping strategy for most participants but rather a last effort. However, participants who were closely involved with a non-profit charitable agency and received food regularly appeared to be receiving great benefit:

*The co-op saves us.*

*The Foodbank type of program . . . I'm involved with both as a recipient and a volunteer (has) helped me. It's supplemented my food on a daily basis for a long time.*

- ◆ Eating from garbage, begging, stealing appeared to be desperate measures used only as a last resort when families are quite hungry:

*When kids get hungry they go out and steal. You know go to the store, get a piece of candy or a piece of fruit. It's very very easy to go out and steal.*

*I had kids that come up to my car while I was at the parking lot down here in . . . and the kids said Auntie, can I have 50 cents, my brother and I hungry.*

*I was back by the back dumpster. . . it was this little boy he looks like he's school age, and he's looking in dumpsters for something to eat.*

Question 4. Consequences of food insecurity. In general, the perceived consequences varied with the severity of food insecurity, the causes of a household's food insecurity and household's ability to cope, rather than ethnicity. The following typical pattern of responses emerged from the question "How do people look, feel or act when they are hungry? Participants repeatedly indicated that as mothers or parents they would protect children and sacrifice their own intake for as long as possible. However, if the situation deteriorated further to more severe food insecurity, children were affected;

In a situation of food insecurity without hunger:

- ◆ Financial stress and tension arise from fear of not being able to feed the family.
- ◆ There were reported cutbacks in the quality or variety of food, and reliance on a few, low cost, processed foods. In Hawai'i, these foods tend to be Saimin or Ramen, a fried noodle product:

*Spam, Corned beef, tuna, rice, meat, spaghetti. Same thing every month.*

*Saimin, Saimin, Saimin*

- ◆ Except for a few traditional Filipino families who rely on marrungay (a dark green Filipino leaf) grown in their back yard, little intake of vegetables, particularly at the end of the month was often reported:

*They don't last that long right? So perishables you have to eat it right away -- so you can't (have them) last throughout the whole month.*

- ◆ As the food insecurity situation worsens, further stretching occurs with more frequent skipped meals and smaller portions, resulting in perceived loss of energy and functional ability:

*Fatigue. . "no energy". I get sick, I get weak.*

*Can't think" - dysfunctional -- brain cells are dead*

- ◆ Shame leading to depression and aggression:

*You just get depressed because you know you cannot feed your family.*

*You feel paralyzed. You don't feel like you want to do anything..*

*They get scared. A lot of them are aggressive, man. They pick on all the people.*

- ◆ Physical ailments and children taking care of children:

*When they get cuts they don't heal as well. They have a lot of rashes I noticed.*

*You know they get small babies and they have 5, 6, 7 year olds taking care of them during the middle of the night while the mother and the father are out partying.*

Cognitive Testing. Cognitive testing consisted of unprompted questions or comments about individual questions or the entire survey. The level of probing and responses depended on the

understanding of the phenomenon of food insecurity and each participant's experience of food insecurity. Participants who had never experienced moderate or severe hunger simply could not judge the adequacy of the questions and could not be probed beyond their experience. Key findings include:

- ◆ Question 4. Many participants asked "what does a "balanced diet" mean? When asked in return what they thought it meant, respondents almost uniformly described a meal with meat, starch and vegetables (not fruit or dairy).
- ◆ Several participants either laughed or snickered at question 11 (Adults lost weight and didn't want to). Remarks included *I wish*. One woman stated *we don't lose weight 'cause we eat high-fat foods*.
- ◆ Several participants also snickered at question 12 (Adult did not eat for a whole day) *I could never do dat - I go faint*". Others agreed, that this was not within their experience.
- ◆ Others commented that they could respond positively or had experience with questions 7-10. However, they would never consider letting their children not eat (Question 13-16); *we were raised that children's needs came first*.
- ◆ Responses to questions were also tested. When asked what sometimes true vs. often true meant, most respondents indicated sometimes true meant *anything more than once, to about 70% of the time (5 days of 7)*. Often true was *more frequent*, and never true meant *almost never or never*. Responses were varied regarding whether something that happened once a year was considered sometimes true or never true.
- ◆ In terms of determining whether or not the CFMS appeared to ask the right questions to determine how hungry people were, many could not judge because of their relative food security. One group of Filipino participants argued over this question for several minutes. Some, who were more food insecure but not hungry, felt the questions about hunger were too extreme – *"nobody does dat, dat like people in Africa*. Others, who had personal experience with hunger, argued that *Yes, it happens*. One articulate, severely food insecure woman, without any provocation asked, *Is the survey supposed to differentiate various stages of hunger?*

Variables to Explore for External or Predictive Validity. Table 3.2 lists potential predictor variables found in this study that are relatively easily measured. Predictors include various aspects related to food resource procurement and management and factors related to one's self-perception. Factors labeled as impairing food security provide a more in-depth illustration of food insecurity in Hawai'i, but in general, were thought to be more difficult to quantitatively assess.

### **Discussion**

The trustworthiness of qualitative data, was established through prolonged and varied field experience, member checking, audit trails, triangulation of data sources and investigators, peer examination, a purposeful sample, and a dense description of reports (Krefting, 1990). Triangulation occurred through use of qualitative responses to questions, to responses to and cognitive testing of CFSM, and from responses to demographic, income and program participation. Peer examination occurred during initial data analysis, after qualitative responses were grouped across questions and ethnic groups, and once level three coding was completed. The sample was purposely chosen to not only ethnically, but geographically represent lower income areas on the island of Oahu. Participants of either government (Head Start) or charitable food assistance agencies were gathered to capture different perspectives on how people coped with food insufficiency.

In 1995, 9% of the households in Hawai'i were food insecure, 2% were hungry (Hamilton *et al.*, 1997); 75% of our sample were food insecure: with 34% categorized as moderately or severely hungry. The sample is representative of the four ethnic groups most likely to be benefiting from food stamps on Oahu (29% Hawaiian and part-Hawaiian, 19% Caucasian, 23% mixed Asian, 8% Filipino, 6% Samoan, 15% others (DHS, 1997). Thus, the study sample appears to be reflective of the key food insecure Asian and Pacific Islander groups in Hawai'i. However, it may not be

representative of the myriad of other Asians and Pacific Islanders who live throughout the United States and the world. Therefore, caution must be utilized in extending these findings to other ethnic groups: the validity of these inferences is unknown until further research is conducted. Additional testing with a population sample containing adequate numbers of relatively food insecure individuals is needed to confirm the construct validity of the indicator questions and confirm these findings. Ideally methods would replicate USDA's original work (Hamilton *et al.*, 1997b).

Qualitative Findings and Face Validity of CFMS. Most of the findings confirmed and documented what community nutritionists and agency providers felt they already knew. Qualitative findings generally provide face validation of the 18 CFMS questions and the operationalized framework of food insecurity (Bickel *et al.*, 1996) with the four ethnic groups evaluated. No differences between the ethnic groups appear to affect the measurement of food security, although differences in coping behaviors were noted. Findings support the concept of household food insecurity occurring prior to individual hunger, and that food insecurity is a unidimensional construct for quantitative food sufficiency. No additional questions appear, on the face, to be needed to capture the basic dimensions; however, the definition of food security encompasses two other dimensions of food security: the availability of nutritious and safe foods and how foods are supplied.

The CFMS captures the dimension of food security related to the uncertainty of food supply and, to some extent, the nutritional adequacy, i.e., quality and number of foods consumed. However, in their original work questions related to social acceptability of food resources or resource augmentation (putting off bill-paying, using food pantries) were not included with the basic dimension of quantitative food insufficiency because they did not meet the statistical criteria for inclusion in the scale (Hamilton *et al.*, 1997b). Resource augmentation questions may not scale because of difference in availability, and differences in how willing people are to use alternative resources. Our findings suggest people cope with food insecurity in different ways, and that

coping behaviors vary with they level of food insecurity and with ethnicity. If use of assistance programs or coping behaviors were included in the food security index their presence may confound the CFSM when it is used to assess the effectiveness of assistance programs.

Our research suggests that sharing food is quite common among Asian and Pacific Islanders even when households are food secure. Thus, questions that only ask whether or not one performs a single coping behavior may not be adequate. The extent of use or dependence on coping behaviors may be more useful. Our findings suggest that frequent use of charitable food resources may greatly enhance food security. However, is not clear whether it is the quality, the amount of food supplied, or both that enhance food security. While use of charitable food resources may never be socially acceptable, their personal acceptance will enhance food security. Factors affecting whether or not one used a charitable food pantry appeared to be related to the cultural orientation and openness of the organization to others and reduction of one's pride. Shame or loss of pride appears particularly difficult for some older households and households where male dominance is strong. Needy clients appeared most willing to receive assistance from a church where they were members or a non-profit agency run by people with ethnic backgrounds similar to the client.

Although findings are preliminary, cognitive testing supports use of the instrument across English-speaking audiences of Asian and Polynesian descent. Responses generally conveyed that indicators and possible responses were meaningful to the food insecure and consistent with their understanding of the running out of food. In fact, running out of food appeared to be synonymous with the term food insecure. However, findings also suggest that participants can only be probed within their range of experience and that testing beyond their experience may be invalid. Thus, future researchers must estimate participant's food security status to gauge the relevance of qualitative comments. Additional research with participants categorized as experiencing moderate or severe food insecurity is needed to confirm these findings.

Cognitive testing did not support use of question (Q)11 “loss of weight due to lack of money for food” particularly among Hawaiians and Samoans. Lack of weight loss may be related to intake of high fat foods in Hawai‘i (DOH, 1994), particularly because some foods such as canned meats (Spam) and Saimin (Ramen or dried noodle product made with saturated fats) have relatively long shelf lives and are perceived as inexpensive. Reliance on these foods, combined with relative lack of whole foods and fresh produce items, may further deteriorate nutritional status despite caloric adequacy.

Variables to Explore For Criterion-Mediated Validity. Like researchers at Cornell University, we have found that food security status may be related to vegetable intake and various indices of financial status (Kendal *et al*, 1996; Frongillo *et al.*, 1997). A previous study of hunger in Hawai‘i, using a larger sample with various financial indices suggested that lack of savings is a key factor leading to households who are “at risk of hunger” (SMS, 1992). Unlike these researchers we did not find evidence of disordered eating among all groups, but rather only the Caucasians. The sample used by the Cornell research team was largely Caucasians, and this may explain the difference in reports of disordered eating.

The findings of the current study also suggest differences in reported vegetable intake, except among more traditional Filipinos. Low intake of vegetables has been found among similar homeless mothers by Derrickson and Gans (1996). It is not clear from responses if lower intake is due to periodic shortages at the end of the month, or if vegetable intake is consistently lower among the food insecure, but lowest at the end of the month. Use of assistance programs and other resource augmentation behaviors is an intriguing set of variables deserving further exploration, particularly to ascertain which programs and behaviors appear to enhance food security status the most. Perhaps, because it was not a purpose of the study, our findings do not clarify the extent to which government programs are useful, but do suggest that charitable food assistance programs are valuable. A complete investigation of a household's economic resource, benefits received from assistance and government providers, and the extent of use of

various coping behaviors in relationship to food security status is needed to confirm and clarify findings among Asians and Pacific Islanders.

Finally, findings also suggest, although the sample size is small that more traditional, less acculturated Samoans and “traditional” Filipinos experience less severe food insecurity than their more “Americanized” counterparts. It appears that traditional practices of extensive sharing within the Samoan community, and thriftiness of Filipino families may mitigate circumstances that would otherwise create hunger in households with limited social support.

### **Implications**

This work represents the first time the “operationalized” framework and conceptual model of the CFSM have been challenged. Although the sample is small, and the ethnic groups studied are not conclusive of all Asians and Pacific Islanders, findings cautiously suggest potential Universal application of the instrument across different ethnic groups in the United States. Additional work with Native Americans, Hispanics and African Americans, and other Asians should also be conducted, possibly using the methodology outlined in this manuscript.

According to the Nutrition Action Themes for the U.S. “continued improvement of national nutrition security to achieve a healthier and more productive society” is the U.S. goal for nutrition. Nutrition security encompasses, in addition to food security,” the provision of an environment that encourages and motivates society to make food choices consistent with short-and long-term good health” (CNPP, USDA, 1996). As educators working with diverse audiences, we must understand how our audiences acquire their food, how they cope with food inadequacy, and how to measure improvement in food security.

The goals of more traditional nutrition education programs for low income audiences, such as the Expanded Food and Nutrition Education Program, are primarily directed at improving overall diet quality (CREES, 1997). These goals were established in 1968 before food insecurity was understood and could be measured (Hamilton *et al.*, 1997a). Yet, efforts to improve diet quality may be of secondary importance to program participants who are extremely food insecure. How can a family seriously consider alternations in dietary fat or increases in vitamin A-rich produce when they don't know where their next meal is coming from? Our first priority as food and nutrition educators should be to help program participants obtain adequate food resources to regularly eat balanced meals. To be most effective, nutrition education programs for limited resource audiences may need to assess a participant's stage of food insecurity, tailor education interventions accordingly, and evaluate improvements in food security status and diet quality.

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**Table 3.1**

**Food Security Status by Ethnic Group**

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<b>Ethnicity</b>	<b>n</b>	<b>Food secure</b>	<b>Food Insecurity</b>	<b>Food Insecurity w/Adult Hunger</b>	<b>Food Insecurity w/Child Hunger</b>
Caucasian	13	5 (38%)	4 (30%)	3 (23%)	1 (9%)
Filipino	14	6 (43%)	4 (28%)	3 (22%)	1 (9%)
Hawaiian	23	4 (17%)	9 (39%)	8 (35%)	2 (10%)
Samoaan	11	1 (9%)	7 (64%)	2 (19%)	1 (10%)

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**Table 3.2**

**Factors Related to Food Insecurity Among Asians and Pacific Islanders**

- 
- ◆ Knowledge of how to get free food
  - ◆ Cooking skills
  - ◆ Vegetable consumption
  - ◆ Budgeting practices
  - ◆ Extent and pattern of use of assistance programs
  - ◆ Self-worth or self-esteem
  - ◆ Depression
  - ◆ Inadequate savings
  - ◆ Low income; Unemployment; Underemployment
  - ◆ Families, particularly single parent families with many, or older children
-

## CHAPTER 4

### Pilot and Stability Test of the Core Food Security Module

#### Introduction

The Core Food Security Module (CFSM) was developed by the federal government to estimate the extent and severity of food insecurity in a 12-month period. The CFSM was found to be a valid measure for households with and without children, although eight of the 18 questions are only for households with one or more children (Hamilton *et al.*, 1997b).

Reliability is commonly understood as the ability to reproduce the same measure. Reliability assessment includes measures of internal consistency and test-retest stability (Zeller & Carmines, 1980). Measures of internal consistency include inter-item correlations and Chronbach's alpha. Stability assessment includes an assessment of the association between measures over time. McGuinness assessed the stability of the CFSM using the 1995 national sample data for 1159 households in 1996 (McGuinness, 1996). In general, findings suggested no difference in response variance between adult only and child households and moderate variance in all food insecurity items except the severe hunger items where there were too few responses to adequately assess reliability. However, the stability of the categorical algorithm was more problematic with high variance.

Preliminary Work. Prior to this study we conducted a qualitative study to assess the face validity of the CFSM with Caucasians, Hawaiians and Part-Hawaiians, Filipinos, and Samoans low-

income food gatekeepers in Hawai'i (Chapter 3). Sixty-one participants completed a total of nine focus groups; two focus groups with each ethnic group under study, except for the Samoans, which due to small sample size required three groups to confirm findings. Responses confirmed the operational framework or conceptual basis of the CFMS (Bickel *et al.*, 1996), suggesting that the CFMS was an appropriate instrument to use to measure food security status in Hawai'i.

Objectives. This was the second of a three-part independent validation of the CFMS with Asians and Pacific Islanders in Hawai'i. The primary objective of this study was to assess the stability of the CFMS with at least 50 respondents who completed the survey twice, 10-14 days apart. We were also interested in the reliability of the CFMS and whether the severity or order of item responses from limited-resource Asians and Pacific Islanders were similar to those from a national sample (Hamilton *et al.*, 1997b).

### **Methods**

Sample. A random sample was chosen from a database of recent recipients of charitable food provided by the O'hana Community Food Service (O'hana), one of the largest non-profit charitable food providers on the island of O'ahu in Hawai'i. O'hana provides monthly food distribution in Hauula in northeast O'ahu, and Waianae in southwest O'ahu. At least 30% of the households receiving monthly food distribution were households with one or more children. O'hana also serves weekly meals at two downtown Honolulu sites. Over 90% of meal recipients were single adults, with many over age 60. Some meal recipients were homeless or living in transitional shelters. Others were older Filipinos who primarily speak one of the many Filipino dialects.

A total of 203 households made up the sample database from Hauula, 158 from Waianae, and 1,107 were meal recipients. However, of the 361 households who received monthly food

packages in Hauula or Waianae, 278 (77%) had phones or phone numbers where they could be reached. Of the population of 1,107 meal recipients only 196 (17%) had given a phone number where they could be reached. Thus, a total of 474 food recipients with phone numbers were considered eligible to be survey participants.

Survey Instrument. Preliminary testing was initiated with a single survey based on the national CFSSM (Price *et al.*, 1997). Initially, this draft survey was tested with five participants of varying household description and food security status. Next to assure compatibility to the CFSSM and accuracy of data collection, Dr. Gary Bickel, an authority on the CFSSM at USDA (Bickel *et al.*, 1995; Carlson *et al.*, 1999), reviewed this draft survey. Several questions, which were inadvertently altered for better grammatical presentation, were reverted back to the wording of the CFSSM to assure exact comparability. A master draft of the survey was then completed. To minimize errors in skip patterns and to facilitate accurate terminology, four color-coded versions of the CFSSM were created based on household description: 1) single adult; 2) two or more adults; 3) single parent with one or more children; and 4) two or more adults with one or more children. Each of the four surveys was then tested with appropriate clients for a total of 10 preliminary surveys that were not included in data analysis. The final instrument can be found in Appendix 8.

An introductory statement was used to share the purpose of the study and to obtain verbal consent. To screen for the correct instrument respondents were then asked general demographic questions pertaining to household size, the number of children under 18, the number of seniors age 60 or older, ethnicity of the respondent, and zip code. The question "With which ethnic group do you identify with most?" that has been used in previous research in Hawai'i was used to assess ethnicity (Derrickson *et al.*, 1995). Food security questions were preceded by the four-part food insufficiency question (Rose *et al.*, 1995): Question (Q) 1. Which of these statements best describes the food eaten in your household in the last 12 months, that is, since July 1997?

- a) we always have enough and the kinds of foods we wanted;

- b) we have enough to eat but NOT always the KINDS of foods wanted;
- c) sometimes we don't have ENOUGH to eat, or
- d) often we don't have enough?"

The food security questions included the 18 CFMSM questions outlined in Appendix 3. Responses to Q2-7 were "often true, sometime true, or never true". Responses to other questions Q8-16 were "yes" or "no". Responses to the three temporal duration follow-up questions (Q8a, 12a and 15a) were "almost every month, some months but not every month, or only 1 or 2 months". Skip patterns, recommend by USDA (Price *et al.*, 1997), were employed to decrease the response burden of more food secure respondents.

Data collection. Households were randomly selected from a printout of clients who had recently received food from O`hana using a random number table (Snedecor, 1980). To secure a sample of 50 respondents, who completed both surveys, we sought to complete the first survey with at least 75 respondents. A total of 195 (41% of eligible) households were called. The disposition of non-successful calls was recorded to track reasons for non-response. A survey protocol used previously in Hawai`i with an ethnically diverse, limited income audience was utilized (Derrickson *et al.*, 1995). Each household was called at least three times, on different days and at different times. In general, the best times to call were 9-11 AM, 4-5PM and 7-9PM, and on Sundays. All surveys took between 8-15 minutes and were conducted over the phone. If the individual in O`hana's database was not available and another adult in the household was interested in completing the survey, the survey was completed by the interested individual (most often a wife, grandmother, or other adult family member). Respondents who completed both surveys were mailed a 10-dollar supermarket gift certificate.

Two experienced survey collectors, including one of the project investigators (JD) collected surveys. Both collectors participated in piloting the survey. Surveys at time one were conducted at the end of the month and the first week of the next month. To minimize surveyor fatigue

surveyors arbitrarily took turns in surveying, and did not continuously survey for more than one hour. All follow-up surveys were planned to be completed within 10-14 days of completion of the first survey. The survey protocols at time 2 were the same as those used at time 1, except that only respondents who completed the survey at time 1 were eligible to complete the survey at time 2. At least five unsuccessful calls were made before a respondent was dropped at time 2. On the second round of data collection, the interviewers were blind to the time 1 results. At both times interviewers recorded insights and comments on the survey.

Data Analysis. Numerical and categorical scoring of affirmative responses to food security questions were completed according to the Guide to Implementing the Core Food Security Module (Price *et al.*, 1977). Responses “yes, most of the time, sometimes, almost every month or some months but not every month” were all categorized as an affirmative dichotomous response (1); all other responses were categorized negatively. Missing responses were left blank. After assessment of the frequency of responses, the following indices or reclassifications were completed:

- ◆ Summed index scores were created from affirmative responses for: food insecurity items (Q2-6: maximum score of 5); moderate hunger items (Q7-11 maximum score of 6); severe hunger items (Q12-16: without individual level questions: maximum score of 7); and for a sum of all affirmative responses called the food security sum.
- ◆ Ethnicity was classified into one of six categories: Hawaiian or part Hawaiians, Caucasians, Filipinos, Other Asians (Japanese, Chinese and Mixed Asian), Other Pacific Islanders (Samoan, Tahitian, Micronesian and Tongan), and American Indians.
- ◆ The CFMS food security categorical algorithm was applied to classify households as either food secure, food insecure without hunger, with moderate hunger, or with severe hunger (Price *et al.*, 1997; Appendix 5).

Statistical analysis was completed with SPSS (Ver. 6.01). Assessment of the internal consistency of the 18-question CFSSM was completed using the SPSS reliability procedure for Chronbach's alpha. Assessment of test-retest reliability was completed using correlations and student's paired comparison t-test between item responses at time 1 and time 2, between scale scores for summed food security items, moderate hunger items, adult hunger items, and for the 18 question sum. Correlation analysis of the stability of items was conducted on all households, but only reported for all households with children (n=59). Stability assessment of the food security algorithm was analyzed using Pearson's chi-square analysis. The significance level for all statistical tests was established at  $p = 0.05$ .

## **Results**

Response rates. Of the 195 respondents who were called, 77 (40%) completed the survey at time 1. The disposition of the 118 who did not respond was primarily related to not being able to reach the participant on the phone: 26 (21%) of phone numbers were disconnected numbers; 31 (25%) we were unable to reach within the necessary time frame after three or more calls on different days and times; 23 (18%) were wrong numbers; 20 (16%) were not interested; 13 (10%) had moved; 8 (6%) were meal site participants who indicated Filipino language as a barrier to participation; and 4 (3%) were interested but the first survey could not be completed within the desired time frame. Of the 77 first survey respondents, 61 (80%) also completed the survey at time 2, a mean of eleven days later (range 9-14). Twelve of the 16 who did not complete the survey at time 2 were not available within the desired time frame.

Sample description. Table 4.1 indicates there were no differences in ethnicity, sex, household description, or food security status between samples over time. Sixty-five (84%) of respondents at

time 1 were women. Eighteen (23%) were from households without children: the remaining 59 (77%) were from households containing one or more children. Twenty respondents (26%) at time 1 were classified by the CFSM as food secure, 37 (48%) as food insecure without hunger, 11 (14%) as experiencing moderate hunger, and 9 (12%) as experiencing severe hunger due to inadequate money for food during the last 12 months. Thirty-five of 77 respondents (45%) at time 1 described themselves as Hawaiian or part-Hawaiian, the remaining classified themselves as Caucasian, Filipino, or of various Asian or Pacific Islander backgrounds. Although there were no statistically significant differences in ethnicity among this sample (Pearson  $\chi^2=7.5$ ,  $p=0.82$ ), none of the Filipino respondents were classified as experiencing either moderate or severe hunger.

Item hierarchy. Table 4.2 depicts the item hierarchy or the percentage of affirmative responses by households with children at time 1 and time 2. An inspection of the item hierarchy indicated a pattern consistent with the national scale of indicators (Hamilton *et al.*, 1997b).

Internal consistency. Overall, findings outlined in table 4.2 suggest a moderately high level of internal consistency between items. In terms of the relationship between the individual items all correlation coefficients between an item and the next question were significant except between the least severe food security items Q3,4,5. In general, the highest inter-item correlations were between Q8, Q12, Q15 and their temporal duration follow-up questions (Q8a, Q12a and Q15a) and between the moderate hunger items (Q8-Q10). ANOVA of the items between measures and for non-additivity, were found to be statistically significant for both the first and second survey ( $F = 24.9$  and  $22.8$ ,  $p=0.00$  for both tests). There were no difference in reliability statistics at time 1 and time 2, thus henceforth all further internal consistency statistics reflect data collected at time 1. For households with children, Chronbach's alpha was 0.90: when item were individually removed from the scale, the alpha level remained at 0.88 or higher. Chronbach's alpha for households without children was 0.79.

Stability assessment of summed scores. As indicated in Table 4.2 the highest and most consistent statistically significant item correlations over time were found between the moderate hunger items (Q8-10:  $r = .48-.75$ ). However, only the correlation coefficient of Q8 was above .70. Correlations of food insecurity items over time (Q2-6) were all significant except for question Q3 which approached significance ( $p=.06$ ). Of the severe hunger items responses related to adults not eating for a whole day (Q12) and children in the household being hungry (Q14) appear reasonably stable despite a low number of affirmative responses.

Various sums of food security indicators are depicted in Table 4.3. Findings suggest that sums of the various item scales are associated, stable over time and not statistically different. Responses to the food insufficiency question although not statistically different over time, were not as highly correlated over time ( $r = 0.41$ ) as the other sum scores.

Stability analysis of the national food security categorical algorithm. Table 4.4 depicts frequency comparison of the national food security categorical algorithm at time 1 and time 2. Although the classifications were dependent over time ( $\chi^2 = 68.6, 3 \text{ df}, p = 0.00$ ), only 62% were consistently classified in the same category over time. Particularly alarming were low rates of sensitivity and specificity at the junction between classification as food secure or food insecure. Of the 14 households classified as food insecure at time 1, only 9 (64%) were classified as food insecure at time 2. Likewise, of the 28 households classified as food insecure at time 1, six (22%) were classified as either food secure or adult hungry at time 2, and only 16 (57%) were consistently classified as food insecure.

Without prior evaluation of food security status or knowledge of responses at time 1 the lead surveyor (JD) noted after the survey was completed at time 2 that three of the 61 respondents appeared "not with it" due to general fatigue or distractions in their home. Of these three respondents, two were misclassified by two categories (moved from severe hunger on the first

survey to food insecure), and the third moved from food insecure to adult hunger. No formal analysis was completed with these individuals removed.

Visual analysis of the item responses indicated that very few respondents were following the modal pattern of responses to the food security items. Of the nine respondents who were given a score of two only one responded consistently with the modal pattern, seven had respondent affirmatively to Q5 or Q6 (for households with children) or Q9 (for two households without children). Thus, the experience of food insecurity short of hunger appeared to vary widely.

In addition, many households, particularly households with children who were required to respond to Q13-16 asked "Why are you asking me this again?" The interviewers sensed their concern and felt they participants didn't generally value the difference between questions. Many commented that they were perturbed at being repeated asked questions that made them feel they were poor parents.

### Discussion

Due to the size of this generally food insecure sample of Asians and Pacific Islanders, caution should be utilized in interpretations of these findings to other samples. Furthermore, since females are likely to first experience food deficits in their families, responses may be somewhat inflated by the relatively high number of females respondents. Nevertheless our findings regarding the internal consistency, item severity, reliability and stability of the 18 items, and sum of affirmative responses are remarkably consistent with the work completed to create and establish the reliability of the CFSS (Hamilton *et al.*, 1997b; McGuinness, 1996). Yet, variability is apparent although it did not affect the sum of affirmative responses. However, with only a 62% accuracy rate, the national food security categorical algorithm is not stable, and for various reasons may not be valid either.

CFSM Categorical Algorithm. 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 (LSRO, 1990, p. 1598). The CFSM food security categorical algorithm classifies households with either 1 or 2 affirmative responses as food secure (Hamilton *et al.*, 1997b). This means that households who respond affirmatively to any two items, most likely “worried food would run out” (Q2) and “that food didn’t last” (Q3) are classified as food secure despite affirmation of signs of food insecurity. This author believes this aspect of the national food security categorical algorithm runs counter to an intuitive understanding of food insecurity and is intrinsically very conservative. It is difficult for many respondents to admit their food insecurity to a phone interviewer, particularly very proud respondents. Thus, the probability of a false positive seems low, while the probability of a false negative seems more likely.

Based on our findings and the rationale outlined above it is recommended that alternative food security algorithms be explored, possibly with no affirmative responses indicating food security. Due to the respondent burden placed on food insecure households with children we also believe that assessment of shorter scales are needed to minimize respondent burden and loss of self-respect. Since use of only dichotomous variables are needed to create the CFSM scale measure and categorical algorithm the need to differentiate “Almost always true” from “sometimes” true is questioned. Maintaining a simple “yes” or “no” to all questions will also simplify the instrument.

#### Practical applications to food security measurement: Lessons learned

Findings on response rates and the high number of households that could not be reached over the phone also question the representativeness of surveillance efforts which depend solely on telephone protocols. Clearly, the food insecure are more likely to not have phones (or houses) than their food secure counterparts, and therefore are likely to be underrepresented. In

order to get accurate food security status prevalence rates in person sampling methods may be required.

In addition, our unintentional editorial revision of the wording of the questions in the initial questionnaire design suggest that the wording of the questions themselves may not be “locally-appropriate” in Hawaii, or in other communities. As suggested in Chapter 5 for question (Q)4 which pertains to balanced meals, local adaptations which maintain the integrity of the intent of the question, may be needed to enhance cultural-sensitivity and validity of responses.

Limitations. Variance in interviewers, timing and the condition of interview are all known to affect the stability of an instrument (McGuinness, 1996). Due to the nature of the questions asked, the CFMS is difficult to administer in person or over the phone. It is an invasion of privacy and particularly difficult for parents struggling with hard times. Care was taken to keep a non-judgmental, empathetic phone atmosphere, to use standard protocols, and to minimize bias (Lavarkas, 1988). One would think that the timing of the survey--at the end of the month for survey 1—could have also affected responses to food security questions pertaining to experience within the last 12 months. However, previous work in a similar setting did not find differences in the week (first, second, third or last week) of the month to affect responses to the food insufficiency question (Derrickson et al., 1999b). Given the apparent stability and reliability of results it would appear adequate care was taken to minimize bias.

The sample was a convenience sample that contained ethnic groups likely to be food insecure. It did not contain a proportionate number of ethnic groups who are unlikely to use food pantries in Hawai'i, i.e. Japanese, and thus the instrument was not adequately tested with all ethnic groups in Hawai'i, only ethnicities which were most likely to receive either charitable or government food assistance (DHS, 1997). It was a convenience sample, not a random sample; thus findings may not represent a true cross section of the ethnic groups studied.

## Implications

Results of this preliminary assessment suggest that reliability of the CFMS individual items response and summed scores were consistent with those from a national data set (Hamilton *et al.*, 1997b). Thus, these preliminary findings suggest that the 18-question CFMS is likely reliable and valid to use among Asians and Pacific Islanders in Hawai'i. Additional work replicating methods used to originally create the CFMS are needed to confirm this implication. However, the validity and reliability of the categorical algorithm is questioned. Additional research with alternative food security algorithms is recommended. Similarly, due to the response burden on the respondents efforts to validate a reliable shorter food security measure are also warranted.

**Table 4.1**  
**Selected Sample Characteristics of Respondents at Time 1 and Time 2**

Characteristics	Time 1 (n=77)		Time 2 (n=61)	
	n	Percent	n	Percent
<b>Female</b>	65	84%	51	84%
<b>Household description</b>				
- Single	6	8%	5	9%
- Adults only	12	16%	9	15%
- Single parent	9	12%	9	15%
- Two adults with one or more child	29	38%	23	38%
- 3+ adults with one or more child	21	27%	15	25%
<b>Ethnicity</b>				
- Caucasian	13	17%	12	20%
- Filipino	8	10%	6	10%
- Hawaiian or Part-Hawaiian	35	45%	26	43%
- Other Asians	12	16%	9	15%
- Other Pacific Islanders	9	12%	8	13%
<b>Food Security Status</b>				
- Food Secure	20	26%	14	23%
- Food Insecure without hunger	37	48%	28	46%
- Food Insecure w/ moderate hunger	11	14%	11	18%
- Food Insecure w/ severe hunger	9	11%	8	13%

**Table 4.2**  
**Reliability and Stability Assessment of Households with One or More Children**

Items	Time 1 (n=59)		Time 2 (n=47)		Correlation between surveys (p value)
	N and % Affirmative responses	r. with item below (p value)	N and % Affirmative responses	r. with item below (p value)	
Q2	47 (80%)	.50 (0.00)	38 (81%)	.44 (0.00)	.50 (0.00)
Q3	44 (75%)	.19 (0.15)	30 (64%)	.37 (0.00)	.27 (0.06)
Q4	43 (73%)	.13 (0.34)	38 (81%)	.11 (0.38)	.31 (0.04)
Q5	45 (76%)	.42 (0.00)	31 (66%)	.53 (.00)	.59 (0.00)
Q6	36 (61%)	.54 (0.00)	27 (57%)	.46 (.00)	.59 (0.00)
Q7	18 (31%)	.32 (0.00)	15 (32%)	.38 (0.00)	.39 (0.00)
Q8	25 (42%)	.94 (0.00)	23 (49%)	.95 (0.00)	.75 (0.00)
Q8a	21 (36%)	.94 (0.00)	22 (46%)	.95 (0.00)	.63 (0.00)
Q9	24 (41%)	.88 (0.00)	19 (40%)	.89 (0.00)	.48 (0.00)
Q10	14 (24%)	.52 (0.00)	9 (19%)	.89 (0.00)	.67 (0.00)
Q11	14 (24%)	.77 (0.00)	5 (11%)	.41 (0.00)	.29 (0.05)
Q12	6 (10%)	.41 (0.00)	8 (17%)	.79 (0.00)	.67 (0.00)
Q12a	5 (8%)	.85 (0.00)	6 (13%)	.85 (0.00)	.49 (0.00)
Q13	5 (8%)	1.0 (0.00)	8 (17%)	.54 (0.00)	.21 (0.16)
Q14	9 (15%)	.79 (0.00)	8 (17%)	1.0 (0.00)	.46 (0.00)
Q15	4 (7%)	1.0 (0.00)	5 (11%)	.88 (0.00)	.18 (.235)
Q15a	4 (7%)	.67 (0.00)	5 (11%)	.76 (0.00)	.39 (.008)
Q16	--	--	1 (2%)	--	NA

Note.

NA= test could not be preformed due to limited paired comparisons.

**Table 4.3**  
**Mean and Standard Deviations of Food Security Sums Over Time (n=61)**

Variables	Maximum Possible	Mean + Stnd. Dev.		Correlation Coefficient		Student's t-test	
		Time 1	Time 2	r	p of r	t	p
Food insufficiency item <sup>a</sup>	4	2.13±0.74	2.09±0.63	.41	0.00	.34	0.74
CFSM sum	18	5.74±4.62	5.66±4.34	.77	0.00	.21	0.83
Food insufficiency sum <sup>b</sup>	5	3.24±1.67	3.24±1.59	.66	0.00	.34	0.24
Moderate hunger sum <sup>b</sup>	6	1.82±2.2	1.70±1.90	.72	0.00	.58	0.57
Severe hunger sum <sup>b</sup>	7	0.54±1.2	0.68±1.36	.60	0.00	-.90	0.37

Notes:

a. The four-part food insufficiency question (Rose *et al.*, 1995): Question (Q) 1. Which of these statements best describes the food eaten in your household in the last 12 months, that is, since July 1997?

- a) we always have enough and the kinds of foods we wanted;
- b) we have enough to eat but NOT always the KINDS of foods wanted;
- c) sometimes we don't have ENOUGH to eat, or
- d) often we don't have enough?"

b. Summed index scores were created from affirmative responses for: food insecurity items (Q2-6: maximum score of 5); moderate hunger items (Q7-11 maximum score of 6); severe hunger items (Q12-16: without individual level questions: maximum score of 7); and for a sum of all affirmative responses called the food security sum.

**Table 4.4**  
**Stability Assessment of the CFSM Categorical Algorithm<sup>a</sup>**

Food Security Time 2	CFSM Categorical Algorithm-- Time 1				
	Food Secure	Food Insecure w/o hunger	Moderate hunger	Severe hunger	Total
Food Secure	9	6	-	-	15 (25%) <sup>b</sup>
Food Insecure w/o hunger	5	16	4	1	26 (42%) <sup>b</sup>
Moderate hunger	---	6	7	1	14 (23%) <sup>b</sup>
Severe Hunger	--		--	6	6 (10%) <sup>b</sup>
Total	14 (23%) <sup>c</sup>	28 (46%) <sup>c</sup>	11 (18%) <sup>c</sup>	8 (13%) <sup>c</sup>	61

Note.

- a.  $\chi^2 = 68.6$ , 3 df,  $p = 0.00$
- b. Percent of those classified at time two in each category.
- c. Percent of those classified at time 1 in each category.

## CHAPTER 5

### Assessment of the Term “Balanced Meals”

#### Introduction

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 (LSRO, 1990, p. 1598). The Core Food Security Module (CFSM) is an 18-question measure of the extent and severity of food insecurity in the United States (Hamilton *et al.*, 1997). Responses to Q4 “We were able to eat balanced meals” indicate whether or not the respondent perceives that foods consumed in the household were balanced or not. Qualitative research using the CFSM with Asians and Pacific Islanders in Hawai`i indicated that the term “balanced” is unclear to many participants, although it was generally interpreted to mean a meal with meat, starch and vegetable: no dairy products or fruit (Chapter 3). The objective of this study was to quantify and clarify interpretations of the term “balanced meals” among Asians and Pacific Islanders in Hawai`i.

#### Methods

A complete description of the sample, data collection and data analysis methods have been described elsewhere (Chapter 4). The sample comprised a convenience sample of 77 charitable food recipients on the island of O`ahu, Hawai`i. The telephone survey included demographic questions, CFSM food security questions, questions pertaining to income, use of various

resource augmentation behaviors, and dietary measures. After respondents answered Q4, “We couldn’t afford to eat balanced meals”, they were asked to define what a balanced meal meant. Responses regarding perceived definitions were transcribed verbatim and then classified into categories based on the content of response. The CFMS categorical algorithm was then also applied to categorize food security status (Price *et al.*, 1997).

## **Results**

The sample consisted of 77 respondents, of whom 65 (84%) were women. Twenty (22%) were classified as food secure, 37 (48%) as food insecure without hunger, and 20 (25%) as experiencing hunger. Thirty-five (43%) described themselves as Hawaiian or part-Hawaiian, 20% as Caucasian, 10% as Filipino, 15% of various Asian ancestries, and 13% of other Pacific Islander backgrounds. Fifty-nine (76%) households had one or more children; and 18 (24%) had no children.

Twenty-four respondents (31%) indicated that a balanced meal meant all or four food groups; 16 (21%) indicated three food groups most commonly “starch, meat and a vegetable;” and three (4%) mentioned “following the food guide pyramid” (Table 5.1). Thus, a total of 43 respondents (56%) indicated balance consisted of at least three or more food groups. Four (5%) mentioned variety. A total of 30 respondents (39%) indicated something other than three or more food groups; five individuals (6%) had no idea what balanced meals meant. Findings did not vary with sex, ethnicity, household or food security status.

## Discussion

Balance means proportion or of equal weight (Guralnick, 1979: p. 47). As used by Nutritionists, variety commonly means eating a wide selection of foods within and among food groups as depicted by the Food Guide Pyramid (USDA, 1992) and the dietary guideline “eat a variety of foods” (USDA, 1995). Use of the term “(un)balanced meals” was first articulated by Radimer (Radimer, 1990). In her interviews with primarily Caucasian mothers, Radimer cited responses such as *“not having foods like juice, fruits and vegetables, not having milk or meat, not eating healthfully or eating starch foods repetitively”* (p. 209). These were issues of food inadequacy that interviewees described and related to not eating properly. She eloquently argued that societal norms or stereotypes of “what we should eat” apply even to the disadvantaged.

Poor diet quality is a measurable indicator of food insecurity (Tarasuk *et al.*, 1999). However, until this study, interpretation of the term “balanced meals” in the context of food security assessment, has not been questioned. In our sample, interpretations of the term “balanced meals” were diverse, although to many respondents it meant eating at least three food groups or eating a variety of foods among, although not necessarily within, food groups. Findings are consistent with our previous qualitative research (Chapter 3). In addition, using the same sample as this study, a low correlation coefficient between responses to Q4 “unable to eat balanced meals” over time ( $r=.31$ ,  $p=0.04$ ) were also found (Chapter 4). Thus, findings raise the question of the validity and stability of responses to Q4. Since a majority indicated consumption of foods from at least three or more food groups, it appears that rewording the question to “a variety of food groups, such as a meal with a starch like rice or bread, meat or beans, and a vegetable” could be justified and would be consistent with USDA nutrition education efforts (USDA, 1995: USDA, 1992). However, consumption of three or more food groups does not necessarily indicate nutritious food selections, e.g., unfortified rice, salted meat and iceberg lettuce.

Limitations. All indications suggest that the sample was representative of the major food insecure groups in Hawai'i (SMS, 1992; Van Amburg, 1998; Chapter 9-10), but not the overall residents in Hawai'i (DBEDT, 1997), nor the U.S. population in general.

### **Implications**

This is the first study to explore understanding of the term “balanced meals” as it is used in the context of food security measurement. Findings indicate inconsistent interpretation of the term, which likely affects the validity and reliability of responses to questions containing the term “balanced meals”. A more precise and vernacular wording of the term “balanced meals” may enhance the validity and reliability of responses to “balanced meal” food security questions.

**Table 5.1**  
**Responses to “What Does Balance, as in Balanced Meals Mean to You?”**

<b>Response Category</b>	<b>Number (percent)</b>	<b>Typical response(s)</b>
Three food groups	16 ( 21% )	“Starch, meat and vegetable”
Other – mixed responses	16 ( 21% )	“Nutrition wise, Whatever I want”, “leftovers”
General food groups	14 (18% )	“All food groups”
Basic four food groups	10 (13% )	“Four food groups”: Basic food groups”
Vegetable	5 (6% )	“Having salad, fruit and vegetables everyday”
No answer	5 (6%)	“No idea”
Variety	4 ( 5%)	“Enough variety of foods”
Pyramid	3 (4%)	“Follow the food guide pyramid”
Two food groups	3 (4%)	“Meat and vegetable”
Dietary guidelines	1 (2%)	“Follow the dietary guidelines”

## CHAPTER 6

### Accuracy and Stability of a Single Estimate of Vegetable Intake

#### Introduction

Dietary frequency methods can result in over reporting (Krebs-Smith *et al.*, 1995) and high variability of responses (Derrickson *et al.*, 1995). The question “Not counting salad or potatoes, on average, how many servings of vegetables do you eat a day?” has been used in 5 A Day studies to adjust total frequency estimates downward to more accurately reflect intake (Block *et al.*, 1990; Subar *et al.*, 1995). This question has been found to typically have “good face validity” among Hawai'i residents (Glanz *et al.*, 1994). Validation of this single question has been recommended (Krebs-Smith *et al.*, 1995), but to our knowledge, has not been reported.

We sought a simple, reliable and valid indicator of vegetable intake to estimate vegetable intake in a phone survey. Our objective was to examine the validity of this single question of vegetable frequency compared with a 24-hour recall of vegetable intake and to assess the stability of responses over a 10-14 day time period.

#### Methods

Respondents were a convenience sample of 77 charitable food recipients, of whom 61 or 80% were available and resurveyed a mean of 11 days later (time 2). The survey included questions pertaining to sample characteristics, food security status, food assistance programs and dietary

measures (Chapter 4). Questions about vegetable intake were asked at the end of the telephone interview. At time 1 participants responded to two series of questions about their vegetable intake:

- ◆ Frequency question: Not counting salads or potatoes, how many servings of vegetables do YOU usually eat each day? Count ½ cup, the size of a pudding cup, as one serving.
- ◆ Vegetable recall questions: Think about what you ate in the last 24 hours (from \_\_\_ o'clock yesterday)-- What vegetables did you eat? How much of each? Is this typical of what you usually eat?

At time 2, only the single item frequency question was asked.

For the vegetable recall question interviewers, a registered dietitian (JD) and interviewer trained by the dietitian, consistently probed by asking about meals eaten throughout the day, portion sizes and whether vegetables were consumed in any combination foods. A standard ½ cup “pudding cup” was used to estimate the amount eaten unless the respondent reported a different serving size portion.

Servings sizes were based on the Food Guide Pyramid serving sizes (USDA, 1992) and estimated to a quarter of a serving. After visual analysis of the distribution of intake, both vegetable frequency and recall scores were grouped into four categories (less than 1 serving, 1-1.75 serving, 2-2.75 servings, 3 or more servings). To assess the accuracy of the reported frequency measure, frequency estimates were compared to the recall measure for respondents who indicated that their diet recall was typical (n=59) using paired comparison student's t-test, correlation analysis, and Pearson's Chi-Square analysis for categorical groups. To assess the stability of the frequency question, estimates were compared over time using the same statistical techniques. Statistical analysis was completed with SPSS (Version 6.2, SPSS Inc., and Chicago, IL).

## Results

Sample description. There were no statistically significant differences in ethnicity, sex, or food security status between 77 respondents at time 1 and 61 respondents at time 2. Eighty-four percent of respondents at time 1 were women. Thirty-five (43%) were Hawaiian or part-Hawaiian, 20% Caucasian, 10% Filipino, 15% of various Asian ancestries, predominately Japanese, and 13% Pacific Islander backgrounds, predominately Samoan. Twenty respondents (26%) were classified as food secure, 37 (48%) as food insecure without hunger, 11 (14%) as experiencing moderate hunger, and 9 (12%) as experiencing severe hunger (Hamilton *et al.*, 1997b).

Recall vs. frequency estimate. For the 59 who indicated that their recall was typical at time 2 (Table 6.1) analysis indicated that mean values of the two vegetable indices ( $1.61 \pm 1.15$  for recall, and  $1.54 \pm 1.21$  for frequency) were highly correlated ( $r=.81$ ,  $p=0.000$ ), and were not statistically significant different over time ( $t= -0.7$ ,  $p=0.40$ ). Although the categorization of the two measure were dependent (Pearson  $\chi^2=42$ ,  $p = 0.0003$ ), only 29 (49%) were classified in the same category in both dietary methods.

Frequency estimate over time. For the 59 respondents who reported frequency responses at both times, the mean estimate of vegetable intake at time 1 and time 2 were  $1.47 \pm 1.11$  and  $1.60 \pm 1.34$ , respectively. Although the correlation between measures over time was not significant ( $r= 0.24$ ,  $p=0.073$ ), measures were not statistically significantly different over time ( $t=-67$ ,  $p=. 50$ ). The categorization of the two estimates bordered on statistical significance ( $\chi^2=16.5$ , 9df,  $p=0.055$ ). However, only 25 (43%) were classified in the same category over time.

## Discussion

In person dietary assessment is costly and is not applicable in many monitoring studies (Pao & Cypel, 1996; Briefel, 1996). Dietary vegetable intake of 1 ½ servings is consistent with vegetable intake of participants enrolled in the Expanded Food and Nutrition Education Program in Hawai'i where a 24-hour food recall is used (CSREES, 1998). Furthermore, given daily fluctuations in vegetable intake and recall bias, one would not expect the frequency estimate to exactly replicate a 24-hour estimate (Pao & Cypel, 1996).

Findings confirm earlier hypothesis that responses to this single question of reported daily frequency of vegetable consumption are reasonably valid in comparison to a 24-hour recall estimate of vegetable intake (Krebs-Smith *et al.*, 1995), and are acceptably stable over time. Although mean values were not statistically significantly different, the variance of mean responses was moderately high. Although high variability in dietary data is quite common (CSREES, 1998), variance affected the categorization of vegetable frequency responses. With fewer than 50% of respondents being categorized in the same category over time, the categorization was not stable. Finally, the effect of the sequencing of vegetable questions and ability to accurately visualize a ½ cup, despite a visual cue of a pudding cup, is unknown.

## Implications

Findings indicate that the single indicator of reported frequency of daily vegetable intake serves as a reasonably stable and valid measure of mean vegetable intake among lower-income Asians and Pacific Islanders in Hawaii. Categorization of responses using a single question is not recommended. Additional studies are needed to confirm the utility of this measure with more diverse audiences.

### **Acknowledgements**

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**Table 6.1**  
**Comparisons of Categorical Responses: 24-hour Vegetable Recall and Single Vegetable Frequency Question<sup>a b</sup>**

Vegetable Recall	Vegetable Frequency at Time 1 Number of Servings				Total
	< 1	1-1.75	2-2.75	≥3.0	
< 1	5	3			8 (13%) <sup>c</sup>
1-1.75	6	10	5		21 (36%) <sup>c</sup>
2-2.75		7	9		16 (27%) <sup>c</sup>
≥3		3	6	5	14 (24%) <sup>c</sup>
Total	11 (19%) <sup>d</sup>	23 (39%) <sup>d</sup>	20 (34%) <sup>c</sup>	5 (8%)	59

Notes.

- a. For respondents who indicated recall was typical (n=59) at time 1.
- b. Pearson's  $\chi^2 = 42.6$ , 9df, = .0003: 49% were consistently classified over time.
- c. Percent of those classified at time 2 in each category.
- d. Percent of those classified at time 1 in each category.

**Table 6.2**  
**Comparisons of Categorical Responses: Vegetable Frequency Question Over Time<sup>a</sup>**

Vegetable Frequency Time 1	Vegetable Frequency - Time 1 Number of Servings				
	< 1	1-1.75	2-2.75	≥3.0	Total
< 1	8	4	1	1	14 (24%) <sup>b</sup>
1-1.75	2	10	7	2	21 (36%) <sup>b</sup>
2-2.75	3	4	6	1	14 (24%) <sup>b</sup>
≥ 3	1	2	6	1	10 (16%) <sup>b</sup>
Total	14 (24%) <sup>c</sup>	20 (34%) <sup>c</sup>	20 (34%) <sup>c</sup>	5 (8%) <sup>c</sup>	59

Note.

- a. Pearson's  $X^2=16.5$ , 9df,  $p=0.055$ : 43% were consistently classified over time.
- b. Percent of those classified at time 2 in each category.
- c. Percent of those classified at time 1 in each category.

## CHAPTER 7

### Scale Validity Assessment of the CFSM

#### Introduction

Food security, defined as “access by all people at all times to enough food for an active, healthy life”, is recognized nationally and internationally as a key to nutrition security and health (LSRO, 1990; CNPP, 1996). Food security status has been traditionally measured on an ordinal scale beginning with food security through various levels of food insecurity, and terminating in severe hunger among children (Radimer *et al.*, 1992, Wehler *et al.*, 1992). The importance of food security measurement was recognized in The Ten-year Comprehensive Plan for Nutrition Monitoring and Related Research Programs (Federal Register, 1993). With this recognition, the Food and Consumer Service, USDA and the Center for Disease Control and Prevention, National Center for Health Statistics, USDHHS, and other food security experts oversaw the development of an ordinal scale of household food insecurity called the Core Food Security Module (CFSM: Carlson *et al.*, 1999). A summary report of this landmark research effort (Hamilton *et al.*, 1997a), a technical report, (Hamilton *et al.*, 1997) and a guide to implementing the CFSM (Price *et al.*, 1997) document this research. The CFSM depicted in Table 7.1 is used to assess the extent and severity of food insecurity of households in the 12 last months due to inadequate money for food.

Rasch Model. The CFSM was developed using a log-linear measurement model called the Rasch model (Hamilton *et al.*, 1999a: Hamilton *et al.*, 1997b). The simple Rasch model, developed by George Rasch, is a methodology for constructing reliable and valid measures (Rasch, 1966,

Wright and Stone, 1979). Applied to the CFSSM, the assertions of the simple Rasch model are:

- ◆ the more food secure a respondent the more likely they are to respond negatively to easier items, i.e., those indicating food insecurity such as question (Q) 2 and
- ◆ food insecurity items are more likely to be answered affirmatively by respondents than the hunger items.

Rasch computer programs such as “FACETS” or “BIGSTEPS” model these assertions mathematically (Linacre, 1986-1994). Rasch programs transform raw item scores into equal-interval scales (Wright & Masters, 1982). The basic Rasch model estimates the log-odds probability of a given score as:

$$\text{Log} (P_{ni}/1 - P_{ni}) = B_n - D_i$$

$P_{ni}$  = the probability of an affirmative response from a respondent  $n$  on item  $i$

$B_n$  = the food security measure of respondent  $n$

$D_i$  = the item hunger severity calibration of question  $i$

Because the logits are equal units of measures they are additive. Both item hunger severity and respondent food security measures are calibrated on the same line. The item calibration values represent the position of the item along the constructed food security measurement scale. As depicted in Table 7.1 an item such as Q16, with a high positive item calibration value (4.82), indicates more food insecurity and hunger, while an item with a low negative calibration value, i.e. Q2: -4.99, indicate more food security or less food insecurity or food secure (Hamilton *et al.*, 1997). Likewise, for respondent food security measure which pertains to the degree of food security the respondent experiences, a higher number of affirmative responses indicates greater household food insecurity or hunger and will result in a higher positive placement on the food security scale. Few affirmative responses indicate less food insecurity and therefore a negative placement on the food security scale.

An inspection of the ordering of the items by calibration values can be used to examine the conceptual validity of the scales. Those items, i.e. Q2, Q3, which should be “easy or less severe”

are at the food secure end of the scale and those that are “harder or more severe” are at the food insecure (hungry) end of the scale. The item calibration values can also be examined for gaps in the scale. Gaps in the scale can result in less sensitive or less reliable measurements (Fisher, 1993). Standard errors of the item and respondent food security measures provide an estimate of reliability.

Mean square residuals (MnSq) are used to assess the goodness-of-fit of each item compared to the assertions of the Rasch model. MnSq are ratios of the observed versus the expected scores. The expected values of the MnSq are 1.0. For the development of the CFSM, fit statistics  $> 1.2$  were judged as a poorly fitting or erratic item that was targeted for removal from the scale. Fit statistics  $< 0.8$  indicates the item was redundant with respect to the information it shares with another item (Hamilton *et al.*, 1997b, p. 15), particularly when values of  $z$ , the standardized residual  $\geq 2$ , (Wright & Stone, 1979). Redundant or poorly fitting items were also removed.

An additional advantage to Rasch measurement is that calibration values are calculated independent of the respondents tested and independent of the questions asked. Thus, responses from households with and without children, who answer a different number of responses can be assessed using the same scale. Also, missing data does not create a barrier to comparable data analysis (Wright & Stone, 1979).

The Core Food Security Module. The 18 CFSM items were the best fitting items from 58 food security items in the 1995 food security supplement of the Current Population Survey. Original research findings indicated that the 18 item CFSM is a unidimensional food security scale which demonstrated adequate fit and an adequate dispersion of items to assess the spectrum of food insecurity experienced in the United States (Hamilton *et al.*, 1997b). Goodness-of-fit statistics of the respondent measures were not reported. Analysis of fit across subgroups, i.e., households with children under 18, elderly households with no children, and households with neither elderly

nor children (single or multiple adults) indicated the CFSM was robust across diverse household types.

CFSM with Asian and Pacific Islanders. The sample data set used to create and test the CFSM came from a national sample of 44,730 households. At most 2% were households from non-White, non-Black, non-Hispanic households (Hamilton *et al.*, 1997a). Therefore, no more than 2% of the population who responded to the CPS survey were Asians and Pacific Islanders. Frongillo (1999), although supporting the construction of the CFSM, cautioned that studies with subgroups of the population and studies to validate the use of the instrument for monitoring in other than national contexts were needed. Furthermore, to our knowledge, research used to develop conceptual models of food insecurity did not include a diversity of Asian and Pacific Islander participants in their samples (Radimer *et al.*, 1990, 1992; Wehler *et al.*, 1992).

Asians and Pacific Islanders are a diverse ethnic category encompassing Japanese, Chinese, Koreans, Vietnamese, Cambodians, Laotians, Filipinos, Hawaiians, Samoans, Tongans, Chamorros, Hmong, and others. The percentage of Asian and Pacific Islanders throughout the United States has gone from 3% of the U.S. population in 1990, to 3.7% in 1996, and is expected to increase to 5.1% by 2010 and to 8.7% by 2050 (USDCEA, 1996). However, Asian and Pacific Islanders make up close to 50% of the population in Hawaii (DBEDT, 1997). Differences in cultural patterns, beliefs associated with food, and coping behaviors among the major ethnic groups which reside in Hawai'i, suggest that perceptions of food insecurity might vary among these ethnic groups (Palafox & Warren, 1980).

Previous work. We initially hypothesized that the CFSM would not be valid and reliable among Asians and Pacific Islanders and that an alternative set of items would be needed. A qualitative study of 61 Caucasian, Hawaiian and Part-Hawaiian, Samoan and Filipino low income gatekeepers of households with children in Hawaii indicated that the conceptual basis of the CFSM described in Appendix 2 held true for the ethnic groups we studied (Chapter 3). Qualitative

findings did not indicate that a different food security measure was needed, but that the CFMSM was likely to be valid and reliable with our target audience. However, question (Q) 4. “We couldn’t afford to eat balanced meals” was troubling for many respondents who asked, “What does a balanced meal mean?” When asked in return what they thought it meant, respondents predominantly described a meal with meat, starch and vegetables-no fruit, and no dairy products. However, some respondents could not define a balanced meal. Pilot findings with a sample of charitable food recipients also indicated that the CFMSM was likely to be reliable and valid with Asians and Pacific Islanders in Hawai‘i, despite weakness with the “balanced meal” question (Chapters 4 and 5).

Objectives. The purpose of the following research was to determine whether or not the CFMSM is a reliable and valid instrument for use in Hawai‘i, where at least 50% of the population is of Asian or Pacific Islander descent. Thus, an independent assessment of the robustness of the CFMSM was completed by replicating the Rasch analysis methods used by Hamilton and colleagues (1997b) with a sample from Hawaii.

### **Methods**

Samples. To validate the full range of food insecurity in a state where 9.2% of the population is thought to have experienced some degree of food insecurity (Hamilton *et al.*, 1997) three samples were surveyed (n=1664):

1. A convenience sample of 144 food pantry recipients thought likely to be hungry;
2. A retest sample that included 61 of the initial 77 food pantry respondents who completed the CFMSM a second time; and
3. A statewide sample of 1469 respondents gathered through the Hawaii Health Survey (HHS).

All data were collected in Hawai‘i between June and November 1998 using the same instrument and similar data collection methods. Prior to data collection, all participants confirmed verbal

consent required by a university Human Subjects Review Committee.

Names and phone numbers of food pantry recipients were gathered from three non-profit charitable food providers on O'ahu. Sampling methods and findings have been described in more detail elsewhere (Chapter 4). Data collection began with a pilot study of 77 food pantry respondents who completed the survey once and 61 (80%) of whom also completed the survey again, an average of eleven days later. Data were gathered by experienced interviewers (Derrickson *et al.*, 1994) using standard telephone survey methods to enhance response rates and minimize interviewer bias (Lavarakas, 1988). To the extent possible, retest interviews were conducted "blind" of the knowledge of the first data collection responses.

An additional 67 food pantry participants and HHS participants were gathered from September through November 1998. The HHS is a telephone interview survey of approximately 3,500 households each year. It is modeled after the National Household Interview Survey (NHIS) conducted by the National Center for Health Statistics (SMS, 1998). Households were chosen randomly from local phone books. Over-sampling of households residing in the counties of Maui and the Big Island of Hawai'i was conducted to further study households in these districts. Once a household was chosen they were sent a letter from the Director of the Department of Health encouraging survey participation. Data collection of the remaining 67 food pantry respondents and data for all the HHS respondents was administered by phone interview using a Computer Assisted Telephone Interviewing (CATI) system (SMS, 1998). A complete description of the data collection methods used in the HHS are described elsewhere (SMS, 1998): the complete survey is enclosed in Appendix 10.

Survey Instrument. We used the “Guidelines for using the Core Food Security Module” (Price *et al.*, 1997) to direct data collection. The survey instruments are provided in Appendices 7 and 8. Basic demographic information (sex, household composition, and ethnic disposition) were asked prior to the food security questions. Thus, questions which did not apply to households without children were not asked, and the terminology “I” or “We” was appropriately used. The question “With what ethnic group do you identify with most?” was used to assess ethnicity. A total of 19 ethnic response categories were collected, including one for no response and another for “mixed” ethnicity.

As outlined in the “Guidelines” (Price *et al.*, 1997), the 18 food security questions were preceded by the four-part food insufficiency question (Rose *et al.*, 1995). Exact wording of the questions and responses were maintained and suggested “skip patterns” were employed to decrease response burden (Price *et al.*, 1997). Questions pertaining to use of various coping behaviors (Hamilton *et al.*, 1999), use of assistance programs, income related indices and dietary indices were completed after the food security questions. Findings pertaining to additional data collected are reported elsewhere (Chapter 8 and 9). In the HHS, food security questions were asked after other behavioral questions but prior to more in-depth responses on income and other demographics.

Data analysis. For final analysis all data were coded in the same manner. Food security responses were coded as 0 = negative response and 1 = affirmative response (Price *et al.*, 1997). However, instead of assuming negative responses for questions that were not answered because the participant was “screened out”, we left responses to questions that were not asked blank. However, if a participant responded negatively to a question with a temporal duration follow-up question i.e., “how often did this happen?” (Qs.8-8a, Qs.12-12a, and Qs.15-15a), a negative response was assumed for the follow-up question as well.

After preliminary assessment of the frequency responses, the following indices or reclassifications were completed to assist in data analysis. Ethnic classification were grouped into one of eight categories: Hawaiian or part-Hawaiian, Caucasian, Filipino, Japanese, Other Asian (Chinese and Mixed Asian), Pacific Islanders who were primarily Samoan, Mixed or Unidentified, and a combined category of African Americans, Hispanics and Native Americans. Using the national food security categorical algorithm (Price *et al.*, 1997), the sum of affirmative responses, and household description (with or without children) each respondent was classified into one of four household food security categories: food secure, food insecure without hunger, food insecure with moderate hunger, and food insecure with severe hunger.

Analysis was completed with the FACETS Rasch computer program (Linacre, 1986-94). The final sample used for Rasch analysis comprised the 362 respondents who responded affirmatively to one or more items (the 1300 who had no affirmative responses and 2 who had no negative responses were automatically removed from the data set). Including the 61 food pantry survey responses that comprised the retest sample was not viewed as a threat to validity. Results of the analysis without the 61 time 2 respondents were similar, are available in Appendix 11, and will not be discussed.

Concurrent presentation of findings and methods used to assess item scale validity, respondent validity and reliability of the measure is the most succinct approach, they are described conjointly, both are discussed in the next section. Statistical analysis was completed using SPSS (Ver. 6.01). The alpha value was set at .05.

## **Results**

Sample characteristics. Table 7.2 depicts the household and ethnic description of the three samples. Overall, the food pantry, sample consisted of more Hawaiians than the HHS sample

(41.0% vs. 14.0%. respectively), more Samoans (7.0% vs. 0.5%), more families (75.0% vs. 38.0%), less food secure respondents (25.0% vs. 93.2%), and more female respondents (80.5% vs. 58.2%). The pantry and retest samples were quite similar except that Samoans comprised a greater percentage of the retest sample (6.9% vs.13.1%). Overall, 1411 (84.8%) were classified by the national food security categorical algorithm as food secure, 158 (9.5%) as food insecure without hunger, 64 (3.8%) as food insecure with moderate hunger, and 31 (1.2%) as food insecure with severe hunger.

Scale validity. To examine scale validity, we examined a number of variables. First, we examined the goodness-of-fit of the items to the expectations of the Rasch model. The goodness-of-fit of the items is shown in Table 7.3. Q8 and Q8a “adults cut the size or skip meals/often” and Q4 had goodness-of-fit values  $>1.2$  and  $> 2$  for MnSq and z, respectively. We therefore concluded that these items failed to meet our criteria for goodness of fit. The item separation index of 9.3, calculated by dividing the adjusted standard deviation of 2.29 by the real mean SE of .24, indicated adequate separation of items. The mean of the item calibration was zero logits; the mean item SE was -0.23 logit.

Next, as depicted in Table 7.4 we compared USDA’s scale of food security item calibration values (Hamilton *et al.*, 1997b) with the Hawai`i scale food security item calibration values. To determine if there were significant differences between the item calibration values, we calculated the standardized difference (Z). A Z value  $\geq 2$  indicates a significant difference. As shown in Table 7.4 and illustrated in Figure 7.1. Z values for Q2, 3, 4, 8, 8a, 11, 15 and 15a of  $\geq 2$  were significantly different. Most of the food insecurity items, Q2-5, Q8 and 8a, items were “harder to respond to” in the Hawai`i sample compared to the national sample. However, hunger items Q11, Q15, Q15a and Q16 were all more severe or harder to respond to in the national sample. Scales were most comparable in the middle around zero logit, for Q8a, Q7 and Q10. Finally, the range of the Hawaii scale also was shorter than the range of the national scale. There were also significant

gaps between the item calibration values within the Hawai'i data. Notably, the gap between Q2 and Q3 was .75 logit, and the gap between Q4 and the next most severe item answered by all households, Q9, was 1.8 logits.

Figure 7.1 displays a vertical illustration of the item calibration values for both the national sample (Hamilton *et al.*, 1997) and the Hawai'i sample. To demonstrate how respondent food security measures also fit on the scale the respondent measures of the Hawai'i sample are depicted in the middle of the sample. The value shown by an asterisk represents four participants, whereas a period (.) indicates one participant.

Goodness of fit of the respondents. To examine person response validity, we examined goodness-of-fit of the respondents to the expectations of the Rasch model. Our criteria for acceptable goodness-of-fit was the same criteria described previously for item fit. Seventeen people or 4.7% "misfit" or had values  $>1.2$  and  $> 2$  for MnSq and z. An expected rate of misfit is 5%. As indicated in Table 7.4, although there were no apparent differences in fit by site of the sample or by household type, five of the 17 misfitting persons were Samoan.

Reliability. To examine reliability we examined the percentage of the total number of item ratings that misfit, the test-retest correlation coefficients between food security measures at time 1 and 2, the SE of the respondent food security measures, and the respondent separation index. We found that overall item misfit rate was 4.1% (186 of 4542 measurable responses). Based on a standard expected 5% misfit item misfit was acceptable. Q4 was the only item to have unacceptable reliability with a misfit rate of 6.7% (24 of 357measurable responses).

The mean respondent scale score of the 55 respondents who had scale scores at two times of -1.22 $\pm$ 2.04 logits at time 1 and -1.22 $\pm$ 2.01 logits at time 2, was not statistically significantly different

statistically over time ( $t=-0.2$ ,  $df=54$ ,  $p=0.98$ ). The Pearson product moment correlation coefficient of the respondent food security measures over time was  $r=0.75$  ( $p=0.00$ ). The mean respondent food security scale value was  $-1.80$  logits with a relatively high standard error of  $1.13$  logits. Finally, the respondent separation index, an index of the adjusted standard deviation of response measures to the real mean SE of response measures ( $1.76/1.17$ ) of  $1.51$ , indicated that person response measures could only be reliably split into two categories (references Wright and Masters, 1982).

### **Discussion**

The purpose of this research was to determine whether or not the CFMS scale measure is a reliable and valid instrument to use in Hawai'i where at least 50% of the population is of Asian or Pacific Islander descent. Reliability refers to the "consistency or stability of an operational definition." Validity refers to the "goodness of fit between an operational definition and the concept it is purported to measure" (Singleton *et al.*, 1993, p. 131). Validity also includes goodness-of-fit between an operational definition and the response patterns of respondents to the items that comprise the operational definition. The definition of food insecurity used by the federal government is a condition which "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" (LSRO, 1990, p. 1598.) This definition, the operational definition of food security outlined in Appendix 2 (Bickel *et al.*, 1996), and the responses of a sample of residents from Hawai'i who demonstrate evidence of food insecurity or hunger provide the basis for judging the validity of CFMS scale measure. Based solely on the LSRO definition of food insecurity it is immediately apparent that the CFMS scale measure only captures the "availability of nutritionally adequate food" aspect of this definition of food insecurity: not the safety of foods, or the social-acceptability of food acquisition methods.

Overall scale validity and reliability. Findings related to goodness-of-item fit of the items suggest that overall, the CFSM scale defines a single construct at least as well with Hawai'i residents as it did in the national sample (Hamilton *et al.*, 1997b). Similar questionable fit statistics indicating redundancy between Q8 "adults skip or cut the size of meals" (Outfit MSR = 76,  $z=-4.6$ ) and the follow-up question Q8a. "How often" (Outfit MSR=.77,  $Z=-2.6$ ) were noted in the original national fit (Hamilton *et al.*, 1997). Similarly, high outfit statistics of Q2 "worried" (3.04  $z=9.4$ ), and Q4 (1.61,  $z=7.9$ ) were also noted in the national fit (Hamilton *et al.*, 1997b). That is, the threats to the unidimensionality were comparable between the Hawaiian and national samples, indicating a potential problem of the CFSM wherever it is used.

The findings that only 4.7% person response misfit suggests the CFSM was scored reliably in a manner that was consistent with the expectations of the Rasch model: that the hungry respondents generally responded affirmatively to the early food insecurity indicators (Q2-4), but failed (negative response) the more severe hunger indicators (Q12-16) and that more food insecure participants responded affirmatively to more severe hunger items. Table 7.4 also indicates that the rate of misfit among households of different composition, site of sample, and food security status were consistent with the proportion of respondents in these groups. However, with a total of 23 Samoan respondents, five (21.7%) misfits among this ethnic group, which is greater than the 5% that would be expected to misfit by chance, indicates an inadequate fit of the CFSM with the Samoans. However, sample size limits our confidence in this conclusion as does the relatively higher number of Samoans who were classified as experiencing either adult vs. child hunger (8/17 = 47% Samoans vs. 26% overall:  $n=362$ ). Thus, it is unclear as to whether the high rate of misfit is because of an ethnic difference in reporting of the Samoans or because the Samoans were more hungry, and thus answered more responses. Findings also indicate an acceptable level of stability of the CFSM scale measure over a mean of 11 days. McGuinness (1996) also found acceptable stability of the CFSM with a national sample. Thus, overall findings indicate that, except for the Samoans, the CFSM scale measure is as reliable and valid with

Asians and Pacific Islanders in Hawaii as it was among the National sample (Hamilton *et al.*, 1997b).

Q4 “(un)able to eat balanced meals”. When we examined the items associated with a higher percentage of misfitting individuals and/or unacceptable goodness-of-fit statistics, we found Q4. “(un)able to eat balanced meals” to be ambiguous with responses that are likely to cause random errors and lower response rates. Our previous work indicated there were different interpretations for the meaning of this question (Chapter 3 and 5), and a relatively low correlation of responses to Q4 over time ( $r = 0.3$ ,  $p=0.04$ ,  $n=59$ ). Thus, findings confirm a more salient wording of Q4 is needed to improve the reliability and the validity of responses to Q4. Suggestions previously made in Chapter 5 address this issue.

Respondent response validity and reliability. If the purpose of the CFISM “is to accurately identify the extent and severity of food insecurity of the respondents” (Carlson *et al.*, 1999), findings outlined in this study indicate that the CFISM measure may be inadequate in differentiating multiple levels of food insecurity. Given that a majority of respondents were at the least severe end of the scale, (Figure 7.1) where relatively large gaps in the item calibration values occur, the targeting of items appears less precise where it needs to be strongest. A respondent separation index of 1.5 indicates that respondents can be reliably classified into only two categories. More items, especially more food insecurity items at the easier end of the scale are recommended.

CFISM Food security categorical algorithm. Although not discussed in this study, findings suggest that the application of the CFISM food security categorical algorithm may be suspect particularly in more food insecure samples than the national CPS sample. The CFISM food security algorithm relies on the national modal pattern of affirmative responses or item response hierarchy, which is different with the modal response pattern in the Hawai`i data (see Figure 7.1). The CFISM categorical algorithm uses Q4 and Q8a, which misfit in our data, as the threshold items of the

food insecurity and moderate hunger categories. Despite an acceptable rate of respondent misfit, the high standard error (1.13 logits) of the mean respondent's scale value (-1.80 logits) suggests higher variability in responses than may be acceptable to consistently categorize responses. Additional research assessing the utility and validity of the categorical algorithm is needed to confirm and explore these concerns.

Food security monitoring. Findings regarding the validity and reliability of item and respondent validity are paramount if the instrument is used as a standard to develop smaller scales based on a few indicators that are used for food security status monitoring across diverse samples. Currently, researchers at the National Center for Health Statistics are investigating use of threshold items and a set of six items which include questions Q3, Q4, Q8, Q8a, Q9 and Q10 (Blumberg *et al.*, 1998) for monitoring applications. Given that the item calibration of Q8 in the Hawai'i sample was more than 2.0 logits different than from the original national sample ( -.78 Hawai'i and -1.72 national ), that Q8 and Q8a were redundant, and previously mentioned issues with Q4, dependence on these three items (without rewording Q4) in a sub-scale of only six items appears problematic. Given that our findings also question the validity and reliability of the categorical algorithm as well as the ability of the longer 18 items to differentiate food security status between groups, further development of sub-scales, prior to reassessment of the categorical algorithm, may be misguided.

Is the CFMS scale measure the gold standard of food security measurement? Rasch methods create scale measures for respondents who answer one or more questions affirmatively and who don't answer all questions asked of them affirmatively. Out of the 1664 possible respondents, responses from 362 (22%) were available for Rasch analysis. While all food insecure and hungry respondents have scale measures, respondents who did not respond to any items affirmatively did not have a scale measure. Given that criterion-mediated validity can not be confirmed without comparisons between the most and least food secure respondents using criteria such as income

and dietary variables (Frongillo *et al.*, 1997, Kendall *et al.*, 1996, Tarasuk, 1998) use of the respondent food security scale measures appears limited. Perhaps additional food security items are needed so that all respondents will most likely respond to one or more items.

This implication raises the critical question of whether or not the CFMS, as is, can be considered the “gold standard” for measuring household food security status. Particularly, if a sub-scale is created from the 18 items that is more widely used for monitoring purposes. Despite evidence of “unidimensionality” of the 18 CFMS items (Hamilton *et al.*, 1997b) problems identified herein may be due to the measurement of multiple phenomenon of food insecurity within the CFMS:

- ◆ the psychological affect: Q2;
- ◆ diminishing diet quality: Q4-6;
- ◆ food insufficiency among adult members the household : Q3, Q8-10, Q12
- ◆ hunger among children: Q5, Q6, Q7, Q13-16;
- ◆ hunger of the respondent--for themselves--rather than for their household: Q9-11;

within a scale that is supposed to measure the extent of household food insecurity. As the CFMS captures only perceptions of the respondent, not other members of the household, an additional layer of variability is introduced. Perhaps, a measure that isolates one or more components of food security status that is of particular concern to the public, i.e., hunger among individuals in the household would be more reliable and valid.

Specific recommendations for use of the CFMS. We used the “Guidelines for using the CFMS” to guide data collection (Price *et al.*, 1997). Based on our experience we would recommend that those interested in basic research with the CFMS do not use skip patterns since the pattern of responses is variable and use of skip patterns limits measurement of variable responses. If the skip patterns are employed, to minimize data assumptions, data input for missed questions should be blank rather than zero for a negative response. However, for applied uses we believe that decreased response burden which lowers cost and decreased interviewer fatigue justifies use of

skip patterns.

Limitations. Reference to the robustness of the instrument among Asian and Pacific Islanders is truly limited to Hawai'i. Given the myriad of Asian and Pacific Islander groups, differences in acculturation within groups, additional studies ideally combining qualitative studies and studies with Rasch scaling, are needed prior to any conclusions on the robustness of the CFMS with different ethnic groups. The small number of Samoans sampled limits the certainty of this finding and suggests that additional work, ideally with Samoans of varying degrees of "Westernization", i.e. from Western Samoan, American Samoa, and Samoan-Americans.

### **Implications**

Preliminary findings and implications that were shared in a preliminary form at the Second Food Security Measurement and Research Conference (Derrickson *et al.*, 1999) have now been identified as priority areas for food security research (USDA and USDHHS, 1999). Our findings suggest, except with Samoans, a promising "ethnic" robustness of the CFMS among the ethnic groups studied in Hawai'i, at least to the extent that the CFMS is valid nationally. These findings support the potential application of the CFMS to measure the extent and severity of food insecurity among various ethnic groups throughout the world and in samples that are more diversified than national samples. However, identified weakness in the 18 item scale--gaps in the scale, poor fit of Q4, Q8 and Q8a--are important when one considers that regardless of the validity and utility of the scale measures for research purposes, it is the national food security categorical algorithm that will be used for monitoring and is likely to be used as the basis for policy decisions. Revision of Q4, Q8, Q8a and possible addition of new food insecurity items are worthy of consideration. Given the significance of application of the CFMS, we caution that prior to implementing any changes in the CFMS scale of indicators, the categorical algorithm or the use of subscales, that additional studies with diverse food insecure audiences be completed.

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**Table 7.1****Item Calibration and Standard Errors of the Core Food Security Module Scale Measure<sup>a</sup>**

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	National	
Core Food Security Module Items (In National modal order)	Item Calibration	Standard Errors
2. Worried food would run out	-4.99	.03
3. Food did not last	-3.73	.03
4. Adults (did not) eat balanced meals	-3.42	.03
5. Children rely on few foods	-3.10	.04
8. Adults cut/skip size meals	-1.72	.03
6. Children did not eat balanced meals	-1.64	.04
9. Respondent ate less than should	-1.56	.03
8a. Adults cut/skip meals often <sup>b</sup>	-0.70	.03
7. Children did not eat enough	-0.15	.05
10. Respondent hungry	0.27	.04
11. Respondent lost weight	1.54	.05
13. Children cut size meals	1.69	.07
12. Adult did not eat for a whole day	1.82	.05
14. Children were hungry	1.88	.07
12a. Adults did not eat whole day often	2.55	.06
15. Children skip meals	2.86	.10
15a. Children skip meals often	3.48	.12
16. Children did not eat a whole day	4.92	.20

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**Notes.**a. Hamilton *et al.*, 1997b, p. 21.b. Often: In 3 or more months out of a year.

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**Table 7.2.**  
**Demographic and Food Security Status Characteristics of Various Samples**

<b>Characteristic</b>	<b>Total</b>	<b>Hawaii Health Survey</b>	<b>Pantry</b>	<b>Retest</b>	<b>Rasch sample</b>
Sample size	1664	1459	144	61	362 <sup>a</sup>
<b><u>Ethnicity</u></b>					
Caucasian	626 (37.6%)	580 (39.8%)	34 (23.6%)	12 (19.7%)	103 (28.5%)
Hawaiians	289 (17.4%)	204 (14.0%)	59 (41.0%)	26 (42.6%)	114 (31.5%)
Samoans	26 (1.6%)	8 (0.5%)	10 (6.9%)	8 (13.1%)	23 (6.4%)
Filipinos	204 (12.3%)	183 (12.5%)	15 (10.4%)	6 (9.8%)	53 (14.6%)
Japanese	299 (18.0%)	288 (19.7%)	6 (4.2%)	5 (8.2%)	20 (5.5%)
Other Asians	91 (5.5%)	85 (5.8%)	6 (4.2%)	0 (0.0%)	13 (3.3%)
Hispanic/African Americans/Native Americans	64 (3.8%)	52 (3.6%)	8 (5.6%)	4 (6.6%)	24 (6.6%)
Mix/Unidentified	65 (4.2%)	59 (4.0%)	6 (4.2%)	0 (0.0%)	12 (3.3%)
<b><u>Household</u></b>					
Single	302 (18.1%)	274 (18.8%)	22 (15.3%)	5 (8.2%)	57 (15.7%)
Adults-only	653 (39.2%)	631 (43.2%)	13 (9.0%)	9 (14.8%)	53 (14.6%)
Family	431 (25.9%)	351 (24.1%)	58 (40.3%)	22 (36.1%)	135 (37.3%)
Single Parents	82 (4.9%)	48 (3.3%)	23 (16.0%)	11 (18.0%)	48 (13.3%)
Multi-Family	197 (11.8%)	155 (10.6%)	28 (19.4%)	14 (23.0%)	69 (19.1%)
Female	1016 (61.0%)	849 (58.2%)	116 (80.5%)	51 (83.6%)	225 (62.2%)
<b><u>Food Security Status</u></b>					
Food Secure	1411 (84.8%)	1360 (93.2%)	36 (25.0%)	15 (24.6%)	111(30.7%)
Food Insecure	158 (9.5%)	72 (4.9%)	60 (41.7%)	26 (42.6%)	157 (43.4%)
Moderate Hunger	64 (3.8%)	20 (1.4%)	30 (20.8%)	14 (23.0%)	64 (17.7%)
Severe Hunger	31 (1.8%)	7 (0.5%)	18 (12.5%)	6 (9.8%)	30 (8.3%)
	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD
Mean Respondent Scale Measure (Logits)	-1.79 $\pm$ 2.11 (n=362)	-2.47 $\pm$ 2.9 (n=181)	-1.02 $\pm$ 2.05 (n=124)	-1.33 $\pm$ 2.07 (n=57)	-1.79 $\pm$ 2.11
Mean CFSSM Sum	1.10 $\pm$ 2.77	0.46 $\pm$ 1.65	5.81 $\pm$ 4.40	5.59 $\pm$ 4.15	4.90 $\pm$ 4.24

**Note:**

<sup>a</sup> The final sample used for Rasch analysis comprised the 362 respondents who responded affirmatively to one or more items (the 1300 who had no affirmative responses and 2 who had no negative responses were automatically removed from the data set).

**Table 7.3**  
**Hawaii Item Measurement Report of the CFSM (n=364)**

Item responses		Rasch Item Calibration		Goodness-of-fit statistics				Question/Item: In the last 12 months have . . .(item) because of not enough money for food
Affirmative response	Item Sample Size <sup>a</sup>	Value <sup>b</sup>	Standard Error	Infit Statistics <sup>c</sup>		Outfit Statistics <sup>d</sup>		
				Mean Square Residual	Standardized Z	Mean Square Residual	Standardized Z	
5	123	4.35	.55	0.8	0	0.2	0	16. Children not eat 1 day
25	179	2.44	.27	0.9	0	1.7	0	12a. Adults not eat- whole day often
19	119	2.32	.31	1.0	0	0.9	0	15a. Children skip meals often
23	120	2.07	.30	0.9	0	0.8	0	15. Children skip meals
37	182	1.76	.23	1.0	0	2.0	1	12. Adults not eat- whole day
28	122	1.72	.27	1.0	0	0.8	0	13. Children cut size meals
33	121	1.37	.26	1.0	0	1.4	1	14. Children hungry
59	353	.93	.19	1.0	0	1.0	0	11. Respondent lost weight
73	356	.49	.18	1.0	0	0.7	-1	10. Respondent Hungry
60	245	.17	.21	1.0	0	0.9	0	7. Children not eat enough
102	353	-.31	.18	0.8	-2	0.6	-2	8a. Adults size meals often
126	354	-.88	.17	0.8	-3	0.6	-2	8. Adults Cut size meals
143	355	-1.26	.15	1.0	0	0.9	0	9. Respondent eat less
120	250	-1.72	.17	1.0	0	0.9	0	6. Children unbalanced meals
159	251	-2.77	.17	1.0	0	0.8	0	5. Children rely few foods
235	357	-3.06	.15	1.1	1	2.1	2	4. Adults eat unbalanced meals
256	361	-3.43	.14	1.0	0	1.1	0	3. Food did not last
289	359	-4.93	.19	1.0	0	1.0	0	2. Worried food would run out

7-20

**Notes:**

- a. Total number indicates the number of respondents who were asked the question.
- b. Item calibration value is the Rasch model scale value indicating item severity.
- c. Outfit MnSq= Outfit mean square residual goodness-of-fit statistic, and standardized Z.
- d. Infit Mnsq = Infit mean square residual goodness-of-fit statistic, and standardized Z.

**Table 7.4**  
**Item Calibration Values of 18 CFSM indicators: Difference between National<sup>a</sup> and Hawaii Data (n=362)**

Items (National modal order)	Item Calibration	Standard Error	Item Calibration difference <sup>b</sup>	z score of difference <sup>c</sup>
2. Worried food would run out	-4.18	.19	.81	4.63
3. Food did not last	-3.43	.14	.30	2.09
4. Adults eat unbalanced meals	-3.06	.15	.36	2.35
5. Children rely on few foods	-2.77	.17	.33	1.94
8. Adults cut/skip size meals	-0.88	.17	.84	4.87
6. Children eat unbalanced meals	-1.72	.17	.08	0.47
9. Respondent ate less than should	-1.26	.15	.30	1.96
8a. Adults cut/skip meals often	-0.31	.18	.39	2.14
7. Children not eat enough	0.17	.21	.32	1.48
10. Respondent hungry	0.49	.18	.22	1.19
11. Respondent lose weight	0.93	.19	.61	3.10
13. Children cut size meals	1.72	.27	.03	0.10
12. Adults not eat whole day	1.76	.23	.06	0.25
14. Children hungry	1.37	.26	.51	1.89
12a. Adults not eat whole day often	2.44	.27	.11	0.30
15. Children skip meals	2.07	.30	.79	2.50
15a. Children skip meals often	2.32	.31	1.04	3.52
16. Children not eat a whole day	4.35	.55	.57	0.97

**Notes.**

- a. National data obtained from Hamilton *et al.*, 1997b, p. 21.
- b. Difference in item calibration values between the national item calibration value and the Hawaii item calibration value.
- c. The z scores were calculating by dividing the difference between the item calibration values of the samples by the square root of the sum of squared values of each sample items standard error.

**Table 7.5**  
**Person response validity: 17 misfitting respondents**

<b>Site</b>	<b>Family status</b>	<b>Ethnicity</b>	<b>CFSM Food security category</b>	<b>Misfit items</b>
Pantry	Family	Samoan	Severe Hunger	8,8a,10,13
Pantry	Single Parent	American Indian	Moderate Hunger	2,3,12a
Pantry	Family	Samoan	Moderate Hunger	8,9,12a
HHS <sup>a</sup>	Family	Filipino	Moderate Hunger	6,15,15a
Pantry	Multi-Family	Filipino	Moderate Hunger	2,4,5,12,12a
HHS	Single Parent	Samoan	Moderate Hunger	3,12
Pantry	Adults only	Hawaiian	Moderate Hunger	6,15,15a
HHS	Family	Caucasian	Food Insecure	4,5,11
Pantry	Family	Hawaiian	Food Insecure	4,10,13,14
Pantry	Multi-family	Hawaiian	Food Insecure	3,4,15
HHS	Single	Caucasian	Food Insecure	2,3
HHS	Single	Caucasian	Food Insecure	2,8a
HHS	Family	Caucasian	Food Insecure	2,8,8a
Retest	Multi-family	Hawaiian	Food Insecure	2,8,8a
Retest <sup>b</sup>	Multi-family	Samoan	Food Insecure	2,8,8a
Pantry <sup>b</sup>	Multi-family	Samoan	Food Insecure	12,12a
HHS	Adults only	Caucasian	Food Secure	9,11

**Notes:**

<sup>a</sup> HHS refers to the Hawaii Health Survey sample.

<sup>b</sup> Indicates the same respondent misfit twice.

**Figure 7.1**  
**Comparison of CFSSM Item Calibration Values: USDA Data Versus Hawaii Data**

National Item calibration values	Logit Scale	Hawaii respondent <sup>a</sup> measures	Hawaii items ordered by item calibration values
16. Children not eat whole day	5	<b>Hunger</b> . .	16. Children not eat whole day
15a. Children skip meals often	4	* .	
15. Children skip 12a Adult not eat often	3	*. *. .	12a /15a. Children skip often
12. Adult not eat/14. Children hungry 13. Children cut size 11. Respondent lose weight	2	. **. *. *. .	15. Children skip 13.Children cut size/12.Adult not eat 14.Children hungry
10. Respondent hungry	1	*. *. .	11. Respondent lose weight 10. Respondent hungry
7. Children not eat enough	0	***** .	7. Children not eat enough 8a. Adult cut meals often
8a. Adult cut meals often	-1	***. **. **. *****..	8. Adults cut size of meals 9. Respondent ate less than should
9. Resp.ate less/6. Child unbalanced 8. Adults cut size of meals	-2	** ***** *. ** *****	6. Children unbalanced meals
5. Children - Rely on few foods	-3	***. *. *****. *****.	5. Children - Rely on few foods 4. Unbalanced meals
4. Unbalanced meals 3. Food would not last	-4	***** *. .	3. Food would not last 2. Worried food would run out
2 – Worried food would run out	-5	*****. *****. <b>Food Secure</b>	

**Note:** <sup>a</sup>. For respondent data each \* represents four respondents, each ., one respondent.

## CHAPTER 8

### Assessment of the Various Food Security Categorical Algorithms

#### Introduction

To measure the extent and severity of household food insecurity over a 12 month period both a scale measure and a categorical algorithm were developed from affirmative responses to the Core Food Security Module (CFSM): Hamilton *et al.*, 1997b, Carlson *et al.*, 1999). Yet, because of its utility and simplicity it is likely that the categorical algorithm, which categorizes households into one of four food security status categories, will be widely applied to monitor food security status. However thus far, no research team has independently evaluated the CFSM algorithm, nor compared the stability and validity of other categorical food security algorithms (Wehler *et al.*, 1992; Radimer *et al.*, 1997). We previously presented our validation of the CFSM scale measure with a sample from Hawai'i (Chapter 7). The purpose of this paper is to assess various food security categorical algorithms applied to the 18 CFSM items with an ethnically diverse sample.

CFSM Food Security Categorical Algorithm. Respondents who completed the April 1995 food security supplement in the Current Population Survey (CPS) comprise the original national data set used to develop the CFSM scale measure and categorical algorithm (Hamilton *et al.*, 1997a: 1997b). This was a national cross-sectional sample of which Asians and Pacific Islanders comprised less than 2% of the sample. As indicated in Table 8.1, the 18 question CFSM includes a maximum of 10 questions asked of households without children, and a maximum of 8 additional questions asked of households with children. Questions are generally asked in order of severity

from the least severe food insecurity question, i.e. Question (Q) 2, to the most severe Q16 “children did not eat for a whole day”.

The CFISM categorical algorithm referred to herein as the “*CFISM algorithm*” was designed to be consistent with the operationalized framework of food insecurity (Bickel *et al.*, 1996: Appendix 3). Four food security status categories were created: food secure, food insecure without hunger, food insecurity with moderate hunger, and food insecurity based on adult hunger. Although the categories were designed to reflect conceptual understanding of food insecurity (Bickel *et al.*, 1996), face validity was not a priority (Bickel, 1999). Furthermore, a pattern of sequential affirmative responses, equivalent to a total set number of responses, i.e. 8 for classification as “hungry”, was viewed as stronger evidence of a certain severity of food insecurity than an affirmative response to one or two specific items, i.e. Q10 “respondent hungry”. The complete rationale for the categories, cut-offs between food security categories, and “threshold items”, which were designed to capture the typical experience of each category are summarized herein (Hamilton *et al.*, 1997b).

- Evidence of food security. Food security is defined by USDA as “access by all people at all times to enough food for an active, healthy life and includes at a minimum: a) the ready availability of nutritionally adequate and safe foods, and b) the assured ability to acquire acceptable foods in socially-acceptable ways (without resorting to emergency food supplies, scavenging or other coping strategies)” (LSRO, 1990). This category includes households that are completely “worry free” and can, for the most part, purchase what they want to eat when they want to eat it. Therefore, these food secure respondents would not respond affirmatively to any of the CFISM items. According to CFISM algorithm it also includes households who are beginning to experience food resource economizing resulting in substitution of “cheaper” foods and a more monotonous diet (Bickel *et al.*, 1996). Thus, households who have one or two affirmative responses are considered food secure.

- ◆ Evidence of food insecurity: 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” (LSRO, 1990). Neither an affirmative response to just Q2 or affirmative responses to any two questions, i.e., Q2, and either Q3 or Q4, were judged as sufficient evidence to classify a household as food insecure (Hamilton *et al.*, 1997b). Rather, affirmative responses to any three or more items such as Q2, Q3 and Q4, “unequivocally establish that severity had reached the threshold required for a categorical measure of food insecurity” (Hamilton *et al.*, 1997b, p. 51). Q4 “unable to eat balanced meals”, the third in the series of food insecurity items, was deemed the threshold food insecurity item, even though an affirmative response to Q4 is not required for categorization as food insecure.
  
- Evidence of hunger. Hunger is defined by USDA as an “uneasy or painful sensation caused by a lack of food” (LSRO, 1990, p. 1598). The critical question for this level was the number of affirmative responses that were needed to demonstrate a repeated pattern of inadequate food intake. A total of eight affirmative responses were deemed necessary for assurance of “food insecurity with hunger”; six for households without children. Q8a, “adults repeatedly cutting the size of meals or skipping meals,” was deemed adequate evidence of adult hunger, and thus the item distinguishing the threshold between food insecurity without hunger and food insecurity with hunger. Q8a was also eighth in the severity order.
  
- Evidence of severe hunger among adults and hunger among children. Severe hunger is understood as extensive inadequacy resulting in not being able to eat for an entire day or/and extremely inadequate intake among children (Radimer *et al.*, 1992). For households with children, classification of severe hunger is based on 13 or more affirmative responses and 8 or more affirmative responses for households without children. The presence of hunger among children is understood as the most salient,

measurable characteristic of severe hunger Q14, “children hungry” for consistency with the rationale described above was initially considered as the threshold item for this category. However, this item is not useful for households without children, thus, Q12, “adults did not eat for a whole day” was chosen as the threshold item of severe hunger.

In summary, the CFMS algorithm is based on:

- The modal response pattern of respondents in the April 1995 CPS used to create the CFMS algorithm (Hamilton *et al.*, 1997b).
- The total number of affirmative responses, regardless of which items a participant responded affirmatively to; and
- Whether or not the household contained one or more children which affects the number of affirmative responses needed for categorization (Price *et al.*, 1997)

The modal pattern is simply the hierarchy of item response rates from the most frequently affirmatively answered item (Q2) to the least frequently affirmatively question (Q16), as illustrated in Figure 7.1. Where it is generally expected that when a participant has responded affirmatively to a severe hunger item then have also responded affirmatively to all the less severe items as well. In the original sample 82% of households without children included in the sample followed the CFMS modal pattern, however 65% of these households responded “no” to all items (Hamilton *et al.*, 1997b, p. 45). Of the households responding to at least one item affirmatively, 49% followed the modal pattern (Hamilton *et al.*, 1997b, p. 45), moreover a majority of these respondents affirmatively answered only two or three items. Modal pattern response rates for more food insecure respondents were not reported.

Bavier, (1999) at the Second Food Security Research and Measurement Conference, cast doubt on the credibility and face validity of the CFMS algorithm by noting that those classified as experiencing “moderate hunger” did not always respond affirmatively to Q10 respondent indicates “they have experienced hunger because of not enough money for food” (Bavier, 1999). Alternatively, some respondents who did respond affirmatively to Q10, were not classified as

experiencing hunger. McGuinness (1996) in a study assessing the stability of the CFMS scale measure and CFMS algorithm found the algorithm to have high or problematic variance.

Alternative food security categorical algorithms. The CFMS items and categorical algorithm were fundamentally based on work conducted previously by researchers at Cornell University with the Radimer/Cornell (RC) food insecurity measure (Radimer 1990: Radimer et al., 1992) and the research team of the Community Childhood Hunger Identification Project (CCHIP: Wehler et al., 1992) which is designed to measure the extent of household hunger among children. Since both of these alternative food security measures were developed prior to the CFMS, the RC and CCHIP measures contain some, but not all, of the 18 CFMS items. Likewise, both research teams had developed their own food security categorical algorithm to classify respondents prior to the development of the CFMS categorical algorithm.

Despite use of different items and a different number of items, all three algorithms break down to similar composite categories (Table 8.2):

1. no hunger (CCHIP) or food secure (RC and CFMS);
2. at risk of hunger (CCHIP) or household level hunger (RC), or food insecurity (CFMS); and
3. hunger among adults (RC) and/or children (RC, CCHIP) referred to as moderate and severe hunger in the CFMS algorithm (Hamilton *et al.*, 1997a, 1997b).

As indicated in Table 8.2 in both the CCHIP and RC algorithms when a respondent does not respond affirmatively to any items they are categorized as “not hungry”, or as “food secure”. Thus, unlike the CFMS algorithm, the RC and CCHIP research teams felt a single affirmative response was indicative of being “at risk of hunger” or household food insecurity (Radimer *et al.*, 1992; Wehler *et al.*, 1992). Both the RC and CCHIP algorithms classify a household as having “hunger among children” if the respondent indicated an affirmative response to any child hunger item including Q7 “My child(ren) is/are not eating enough because I just can’t afford enough food.” Compared to the CFMS algorithm, the RC algorithm also classifies a household as experiencing “individual” level hunger, if the respondent indicates that they ate “less than they

should" (Q9) because of not being able to afford enough money for food. Thus, in comparison to the CFMS algorithm the CCHIP and RC categorical algorithms more liberally define food insecurity and hunger, and are consistent with the content of the affirmative responses rather than a total number of affirmative responses.

Despite recognition of the accuracy of the CFMS scale measure (Carlson *et al.*, 1999; Frongillo, 1999), both the RC and CCHIP food security research teams continue to use either the RC food security categorical algorithm (Frongillo *et al.*, 1997; Olson 1999), or the CCHIP algorithm (Murphy *et al.*, 1998; Kleinman *et al.*, 1998), rather than the newer CFMS algorithm. Why? One possible reason is that these food security research teams may not fully agree with how the CFMS algorithm categorizes respondents.

Previous work. With a sample of 1664 ethnically-diverse residents from Hawai'i we found the 18 items to have "goodness of fit" statistics that were similar to the CFMS fit of items (Hamilton *et al.*, 1997b), and did not vary among the major ethnic groups studied, except possibly with the Samoans (Chapter 7). Thus, the CFMS items and scale measure were as valid with a ethnically diverse sample from Hawai'i as they were with a cross sectional national sample. However, there were large differences in item calibration values of Q2, Q8, and Q8a between the original national and Hawai'i samples. The threshold items, which were designed to capture the essence of food category, Q4, and hunger, Q8a, did not fit well with data from Hawai'i, nor with the national data (Hamilton *et al.*, 1997b). A "respondent separation index" of 1.51 suggested that based on the 18 CFMS items respondents with one or more affirmative responses could be accurately split into no more than two categories. Finally, although the correlation coefficient of the respondent scale measures over time was 0.75, stability assessment of the CFMS food security algorithm indicated that only 62% of those classified as food insecure at time 1 were consistently categorized as food insecure at time 2 (Chapter 4). In summary, our CFMS scale measure validation findings suggested that the application of the CFMS algorithm with our

“Hawaii” sample, and probably other samples, was likely to be neither valid nor reliable in test-retest measurement.

Face Valid Categorical Algorithm. Face validity is achieved when an instrument is true “on its face” to the actual experience measured, and the more technical definitions and operationalized framework of a measure (Hessler, 1992). Our initial study confirmed the face validity of the CFMSM conceptual framework (Bickel *et al.*, 1996) with Caucasian, Hawaiian and part-Hawaiian, Filipino and Samoan food gatekeepers in Hawai`i (Chapter 3). Respondents consistently reported their experience of “hunger” meant a cyclical pattern of inadequate intake, “*When you don't know when your next meal is coming. Or where it's coming from. Or how.*” often precipitated “*lowering your pride and going to the food bank*”. Thus, our qualitative research clearly indicated that an uncertainty of their food supply which is consistent with definition of food insecurity used to create the categorical algorithms (LSRO, 1990)

Based on our qualitative findings and the CFMSM scale validation an alternative algorithm called “the face valid algorithm” was developed to be true to the “grounded experience” (Glaser & Strauss, 1967) reported by low income Hawai`i residents. Like the adapted RC and CCHIP algorithms, in the face valid algorithm any affirmative response was initially classified as “at risk of hunger”. The term “at risk of hunger” was preferred rather than food insecure, since food insecurity is a complex, multi-dimensional phenomenon not generally used or understood by the public. No one in our focus groups mentioned the term food insecurity. However, unlike the RC or CCHIP algorithms, in order to be undeniably classified as either adult hungry or child hungry in the face valid algorithm an affirmative response to either Q10 “respondent hunger” or Q12 “any adult did not eat for a whole day” were required for adult hunger, and an affirmative response to Q14 “any child hungry” was required for classification of child hunger. Q12 was added in addition to Q10, since Q10 only captures the hunger of the respondent, not of other adult members of the household. However, Q11 was not used since qualitative research indicated that many

households reported “loss of weight” due to factors other than inadequate food resources (Chapter 3).

Objectives. Our objectives were two-fold:

1. to determine the validity and stability of the CFSM food security categorical algorithm; and
2. if the CFSM categorical algorithm did not appear valid and reliable to determine which of the three categorical measures available to us (Table 8.2) was most consistent with definitions and conceptual understanding of food insecurity and related variables.

We hypothesized that that one of the alternative algorithms (adapted RC, adapted CCHIP or face valid) would be more valid and stable algorithm to use in Hawai‘i to measure food security status in population surveys and in applied work with food pantry recipients rather than the CFSM algorithm.

### **Methods**

Samples. The samples and data collection methods have been described previously (Chapter 7).

To validate the full range of food insecurity in a state where 9.2% of the state population was thought to have experienced some degree of food insecurity (Hamilton *et al.*, 1997) three samples were surveyed:

- 1) A convenience sample of 144 food pantry recipients thought likely to be hungry;
- 2) A convenience sample of 61 who repeated the CFSM again a second time; and
- 3) A statewide sample of 1469 respondents gathered through the Hawai‘i Health Survey (HHS);

Survey Instrument. We used the “Guidelines for using the Core Food Security Module” (Price *et al.*, 1997) to direct food security data collection. The 18 CFSM questions were preceded by Q1, the four-part food insufficiency question (Rose *et al.*, 1995) and basic demographic questions (age, household composition, and ethnic disposition). The question “With what ethnic group do you identify with most?” was used to assess the ethnic background of the respondent. Questions pertaining to the use of various resource augmentation behaviors, (Hamilton *et al.*, 1997), to

income-related indices, and to dietary indices were completed after the food security questions were asked.

Four resource augmentation questions:

- 1) Using charitable food assistance;
- 2) Delaying bill payments;
- 3) Borrowing money for food; and; and
- 4) Sending children over to someone else's house (for households with children only).

that were previously used the CFSM researcher team (Hamilton *et al.*, 1997b) were asked as a measure of "coping behaviors" used to enhance either the household food supply or money for food. In addition, follow-up questions "how often did you . . ." were asked if the initial response was affirmative to determine how reliant a household was on each particular coping behavior.

Responses to the follow-up questions were consistent with those asked of the follow-up questions in the CFSM (almost every month, some months but not every month, or only 1 or 2 months).

Thus, a maximum of eight resource augmentation questions were asked of households with children; six for households without children. Affirmative responses were summed to create the "Resource Augmentation Index" (RAI).

Categorical questions about finances included:

- ◆ reported earned household income per month or per year: > \$5,000, in 5,000 intervals until \$59,999, \$60,000-\$74,999K, \$75,000-\$99,999, \$100,000-\$149,999, \$150,000 and above; which after preliminary analysis was regrouped as: <\$5,000, \$5000-14,999, \$15,000-\$34,999, \$35,000-\$54,999, \$55,000 and above; and
- ◆ estimated household savings: <\$250, \$250-500, \$501-\$1,000, \$1,000-\$5,000, \$5,001 to \$10,000, and more than \$10,000.

Dietary-related questions were developed from our qualitative work which indicated in food insecure households vegetable intake was low, particularly at the end of the month, and that also

many families relied on a cheap high-fat dried noodle product (locally called Saimin) to help feed their household at the end of the month (Chapter 3). Households were specifically asked:

1. Not counting salad or potatoes, how many servings of vegetables do you usually eat a day? Count 1/2 cup, like the size of a pudding cup, as one serving.
2. How many times last month did you or the child/children (whoever ate more) eat Saimin that was purchased dried not frozen?

Analysis of responses to the food frequency question was based on the serving sizes of the Food Guide Pyramid and rounded to the nearest quarter of a serving (Chapter. 6). Validity and stability testing of this single estimate of vegetable intake indicated that responses were highly correlated to ( $r=.81$ ) and not statistically different from a 24-hour vegetable recall, and that reported mean vegetable frequency intake did not vary significantly over time ( $t = -.67, p =.51$ : Chapter 6).

Responses to the Saimin question were all converted to monthly frequency by multiplying weekly response rates by 4. The instrument used is included in Appendix 9. The CFSM was replicated for the 61-retest respondents.

Preliminary data analysis. A description of how food security responses were coded and Rasch analysis which was used to create the respondent food security scale measure and item calibration values have been described elsewhere (Chapter 7). Scale values and measures range from negative values indicative of “mild” food insecurity to positive values indicative of severe hunger. The respondent food security sum was calculated from the total number of affirmative responses. Based on this sum, and whether or not a household had children, the CFSM categorical algorithm was applied (Price *et al.*, 1999). All other algorithms were applied as outlined in Table 8.2. Since both the CCHIP and RC measures do not contain all the CFSM items both algorithms were “adapted” to the CFSM items and accordingly called the adapted RC algorithm, and the adapted CCHIP algorithm. Most importantly, since the CCHIP algorithm does not include Q2, a separate category of food insecurity called “only worried about food insecurity” was created as a unique food security category to study the responses of those who responded affirmatively to Q2 but not any other item. Creation of the “only worried” category in the adapted

CCHIP algorithm, is an applied research artifact, not in anyway meant to discredit or alter the original CCHIP algorithm designed to measure hunger among children (Wehler *et al.*, 1992).

To better study the affect of modal response rates on the categorical algorithm a “Hawai`i modal pattern” variable was created. Specifically, those who followed the modal pattern outlined in Table 7.4 were scored as a 1, those who didn’t a 0. Further data analysis can be broken into two parts:

1. Evaluation of the application of the CFSM categorical algorithm; and
2. Comparative analysis of the four food security algorithms with dietary measures, financial status indices and resource augmentation behaviors.

Since concurrent presentation of findings and methods used to assess modal pattern responses and the validity and stability of various algorithms are more succinct when they are presented conjointly both are discussed in the following section. Statistical analysis was completed with SPSS (Version 6.2, SPSS Inc., Chicago IL). Analysis included Pearson’s Chi-square analysis for all categorical analysis, One way ANOVA and Tukey’s post-hoc tests. The alpha value was set at  $p=0.05$ .

## Results

Modal pattern response comparison. The CFSM algorithm is fundamentally based on the original CFSM modal response pattern. Thus, if the modal response pattern was much different than the original CFSM modal response pattern one would expect that application of the categorical algorithm would be affected. For households with children the modal response pattern of the original data sample and the Hawai`i sample were:

CSFM: 2,3,4,5,8,6,9,8a,7,10,11,13,12,14,12a,15,15a,16

Hawaii: 2,3,4,5,6,9,8,8a,7,10,11,14,13,12,15,15a,12a,16

As highlighted by shading the fifth through eighth items (Q6, Q8, Q9) and the twelfth through seventeenth (Q12-Q15a) were not in the same sequence. Most importantly, while both Q4 and

Q8a, threshold items were in the same order as the CFSM modal pattern, Q12 and Q14, the threshold items of severe food security were not. Q14 was 12<sup>th</sup> in the Hawai'i modal response pattern, but 14<sup>th</sup> in the CFSM modal pattern response.

Further analysis of the Hawai'i modal pattern responses rates indicated that 129 (36%) of respondents with one or more affirmative responses (n=364) followed the Hawai'i modal pattern. One hundred (77%) of those who followed the Hawai'i modal pattern (n=129) had five or fewer affirmative responses. Thirty-two (52%) of the 62 respondents with one only affirmative response comprised 25% of the respondents who followed the Hawai'i modal response pattern. Twenty-four (39%) of these 62 respondents answered only either Q3 (12) only or Q4 (12). Thus, more than a third of respondents who admitted to some degree of food insecurity did not admit to being "worried" about the situation. Only eight (11%) of the 76 households with eight or more affirmative responses followed the modal pattern. There was no statistically significant difference in modal pattern response by family status (Pearson  $\chi^2 = .83$ ,  $p = .36$ ).

Assessment of the CFSM food security categorical algorithm. To further clarify the relationship between the Hawai'i response pattern, its relationship to the national response pattern, and the CFSM categorical algorithm Table 8.3 was created. Both the respondent food security sum and the item responses were compared to the Hawai'i modal response pattern across food security categories and across family status. In addition, the item calibration value corresponding to each CFSM item were included: Items with calibration values that were significantly different between the Hawai'i and national data (as reported in Chapter 7) were highlighted (via a dashed box).

Most notably findings indicated that differences in item calibration values and the pattern of modal pattern response most notably affect the application of the categorical algorithm when the sequencing involved a threshold item, which because of a different sequencing was sequenced in a different category. For instance, the considerable difference in the item calibration values of Q8 "adults skip or cut the size of meals" (Hawai'i  $-.88$ : CFSM data  $-1.72$ ) of  $.84$  moved Q8 from fifth

in the CFISM item hierarchy to seventh in the Hawai'i hierarchy, but did not affect the application of the CFISM algorithm for households with or without children, as in both samples the item remained in the "food insecurity without hunger" category. Similar differences were noted with Q6, Q9, Q11, Q12, Q12a, Q13, Q15, Q15a, and Q16 with no apparent change in the application of the CFISM food security categorical algorithm. However, the difference in the item calibration of Q14 "children hungry" (Hawaii: 1.37: CFISM 1.88) of .51 of a logit, moved Q14 to twelfth in the item hierarchy in the Hawai'i data, when it is fourteenth in the national item hierarchy (Hamilton *et al.*, 1997b). As depicted in Table 8.3 this implies that households in Hawai'i with children who followed the modal pattern and responded affirmatively to Q14, with no other affirmative responses to other items would be classified as experiencing moderate hunger rather than "severe hunger" conceptually associated as hunger among children (Radimer *et al.*, 1992). The implication is even more significant when one considers that few (<12%) of households classified as experiencing hunger by the CFISM algorithm followed the Hawai'i modal response pattern.

The issue of "misclassification" was further elucidated in the comparison of affirmative response rates of selected items by the CFISM algorithm (Table 8.4). Although many findings are noteworthy, the most important findings question the credibility of CFISM algorithm in each category:

- ◆ Food secure. Given that 1300 of the 1411 households categorized as food secure had no affirmative response, a relatively high percentage of the remaining 111 had an unexpected response pattern: 30 or 27% responded affirmatively to Q4 "unbalanced meals", and 7 or 6.3% responded affirmatively to Q9, "adult not eating enough".
  
- ◆ Food insecure. Seventeen of the 158 (10.9%) households classified as food insecure responded affirmatively to Q10, "respondent hungry"; 5 (3.2%) to Q12, "adults did not eat for a whole day; and, 4 (2.5%) to Q14, "children hungry".

- ◆ Moderate Hunger. Only 32 of 64 (50%) households classified as experiencing moderate hunger responded affirmatively to Q10 “respondent hungry”; 14 (22%) responded affirmatively to Q12 “adults not eat for a whole day” a key indicator of severe hunger (Hamilton *et al.*, 1997b).
  
- ◆ Severe hunger. Only 21 of 31 (67%) households classified as experiencing severe hunger responded affirmatively to Q12. Twelve of the 33 (36%) of households admitting to experiencing hunger among children (Q14) were classified as experiencing food insecurity without hunger (n=4) or food insecurity with moderate hunger (n=8).

An additional noteworthy finding is the comparison of responses to Q10 “respondent hungry” with Q11 “respondent lost weight”. Of those who responded affirmatively to Q10 only 40 of 72 (55%) responded affirmatively to Q11. Of those who responded affirmatively to Q11 only 40 of 60 or two-thirds responded affirmatively to Q10. The Pearson’s correlation coefficient between the two items was 0.52 ( $p=.058$ ).

Comparison of various food security categorical algorithms (Tables 8.5-8.9). As indicated in Table 8.5 an investigation of the prevalence rates of food security status was first used to assess and compare differences in classification across algorithms tested. Although not unexpected, the 6.7% difference in the percentage classified as food secure between the CFMS categorical algorithm and other algorithms is perhaps most important. Also, noteworthy are the distinctions in the percentages classified as hungry. Both the adapted CCHIP and adapted RC method classified 4.4% of the sample as experiencing hunger among children; more than double the rate classified by either the CFMS or face valid algorithm. The adapted RC method yielded the highest percentage classified as experiencing either adult hunger (7.2%) or any type of hunger (11.6%). It also noteworthy that despite completely different criteria the total number and percentage of households classified as experiencing the severest category of hunger in both the

CFSM and face valid algorithms, 1.9% (n=31) versus 2.0% (n=33) respectively, were quite similar.

The CFSM is fundamentally designed to reflect the social phenomenon of resource-constrained hunger (Bickel *et al.*, 1996; Hamilton *et al.*, 1997b). To assess income-related criterion-mediated validity and test-retest reliability of the various algorithms Table 8.7 was created. All algorithms displayed significant dependent relationships with total household income classification in Pearson's *chi*-square testing however ( $X^2 > 1500$ ,  $p=0.00$ ), the pattern of decreasing rates of food insecurity and hunger with incomes  $> \$54,999$  was evident only with the CFSM and the face valid algorithm. Retest comparisons are summarized in Table 8.6 for all algorithms, in Table 4.4 for the CFSM categorical algorithm and in Table 8.6 for the face valid algorithm. The number and percent consistently identified as food insecure or at risk of hunger was highest for the face valid (31/39=80%) and the adapted RC algorithm (15/20 = 75%), where as only 9/15 or 60% were consistently classified by the CFSM food security algorithm as food insecure. The number of households in each other category was too few to make valid comparisons.

Table 8.8 depicts comparisons of Scheffe's post-hoc test results of the mean values of the summed resource augmentation index, respondent daily vegetable intake, monthly Saimin intake, and the respondent food security scale measures created from Rasch analysis (n=362) by each of the four algorithms tested. The mean respondent food security scale measures by food security category were then compared to the closest item calibration values to determine which item or items best corresponded to the mean respondent scale values. All categorical algorithms displayed characteristics that were expected – as the severity of food insecurity worsened there was an increased utilization of resource augmentation behaviors, a general decrease in vegetable intake, and an increased dependence on Saimin, a low cost food product. The mean resource augmentation index values for all algorithms were significantly different between food security categories, and generally went from less than 0.25 for food secure respondents to at least 4.2 for respondents classified as experiencing hunger among children. The categorical

distinction in reduced vegetable intake was most pronounced and statistically different between the food secure and those classified as food insecure with the face valid method where food secure respondents reported a mean vegetable intake of 2.02 servings, and respondents in households with hungry children averaged only 1.00 serving.

Comparison of mean respondent scale measures. While the results of post-hoc comparisons were similar between algorithms, the comparison of respondent food security measures and the corresponding closest item calibration value were quite different. It is important to recall that no respondent food security measures could be calculated for 1302 respondents (Chapter 7: Wright & Stone, 1980). Thus, only 362 respondents had respondent food security measures, all of whom responded affirmatively to one or more items. Therefore, only the CFSM algorithm had a mean respondent food security measure for households deemed food secure: it was consistent with the item calibration of Q2, "worried food would run out". Mean respondent measures corresponded of the other categories in the CFSM corresponded well with the item calibration value of the closest corresponding item .

Mean respondent measures of adult hunger in the adapted RC algorithm and the adapted CCHIP algorithm corresponded well to how the algorithms were conceptually developed. However, for the moderate hungry category both fell short of the comparative Q10 in which the respondent indicated they had experienced hunger. Also, the mean respondent food security scale values for those classified as hungry in both adapted algorithms were consistent with Q7 "children not eating enough" but fell short of Q14 "hunger among children". The face valid algorithm did yield mean scale measures for each food security category which were consistent with conceptual understanding, and was the only algorithm for the hunger categories that consistently corresponded with a respondent's report of experiencing "hunger".

"Only worried." Finally, as indicated in Table 8.7 and 8.8 via the "only worried" category of the adapted CCHIP algorithm those who were "only worried" were clearly more food insecure than

those classified as “not hungry” (with no affirmative responses). Compared to those classified by the adapted CCHIP algorithm as “not hungry” a higher percent of worried participants reported low income (15.0% worried versus 2.6% food secure). Respondents who were “only worried:” reported significantly higher use of resource augmentation behaviors, (mean of 1.2 vs. 0.2), lower vegetable intake (1.44 serving vs. 2.02 serving) and significantly greater reliance on Saimin (10.4 times a month vs. 3.7 times a month) than food secure households.

### **Discussion**

We hypothesized that the CFMS categorical algorithm would not be acceptable, and that an alternative categorical algorithm could be created with improved validity and stability. Despite a relatively small, ethnically distinct sample, the evidence presented herein, as summarized in Table 8.9, suggests that the CFMS food security categorical algorithm, although consistent with having adequate scale fit (Chapter 6: Hamilton *et al.*, 1997b) and consistent with its operational definition (Bickel *et al.*, 1996), does not categorize households consistently based upon the face validity of affirmative responses; nor does the algorithm have acceptable test-retest reliability over time. Probable causes include:

1. The relatively inconsistent experience or perception of the experience reported by respondents thereby increasing measurement variability.
2. Dependence on a modal response pattern which has certain inherent weaknesses including limited face validity unless the experience measured is reported in a highly consistent manner;
3. Summation of ordinal scales does not result in a number that is a valid means of making quantitative comparisons: the same total score can result for different reasons (Fisher, 1993).

This suggests that a categorical algorithm fundamentally based on a modal response pattern categorical can only be “categorically-valid” and classify respondents consistently if response variance is low.

A return to technical definitions of food insecurity provides a reassessment of operational and conceptual intent of food security measures and a basis for evaluating our applied findings. 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” (LSRO, 1990). Thus, uncertainty would appear a key component in food security measurement. Our findings indicate those who were “only worried food would not last” were more likely to have reported lower household income, less vegetable consumption, greater reliance on a low cost noodle product, and on average, used one resource augmentation behavior. This preliminary evidence strongly suggests that those who responded that they were “worried that food won’t last”, without any other affirmative responses, met the conceptual definition of food insecurity. However, only half of those with a singular affirmative response indicated they were “worried.” The remaining half indicated relatively more severe food insecurity without apprehension. Perhaps food insecurity “without” worry, occurs because of faith in God (Olson, 1999), or because the situation has occurred for so long, or so consistently that household members cease to worry, or because the family has more severe problems, i.e., abuse, drugs, or homelessness. Nevertheless, findings suggest that the experience and reported perception of household food insecurity varies and therefore requires various indicators to adequately capture all households experiencing shortages in food supply due to economic reasons.

It is disturbing that the relationship between Q10 “respondent hungry” and Q11 “respondent lost weight” is so inconsistent. Our qualitative experience in testing Q11 revealed that it was difficult for some respondents to differentiate loss of weight due to resource constrained hunger, versus loss of weight due to a desire to lose weight (Chapter 3). Therefore, related to food security categorization, some affirmative responses to Q11 would appear to be false positives. Again,

qualitative findings indicated that despite periodic hunger, many hungry respondents are overweight and eat relatively high fat diets. Thus, loss of weight is often desirable, although a perceived negative consequence of food insecurity. It is also questionable how many regularly weigh themselves on accurate scales. Thus, Q11 is likely to be a confounded or bias item that perhaps should not be included in CFMS, nor should be the basis for categorizing a household as hungry.

Is there a “best food security categorical algorithm”? This author believes the CFMS food security categorical algorithm runs counter to an intuitive or “grounded” understanding of food insecurity and is intrinsically very conservative. It is difficult for many respondents to admit their food insecurity to a phone interviewer, particularly very proud respondents. Thus, the probability of a false positive seems low, while the probability of a false negative seems more likely. Based on our findings and the rationale outlined above an alternative national food security algorithm should be explored, with no affirmative responses indicating food security.

Findings also suggest that if a new algorithm is created with serious consideration of the face validity or content of responses, then the CFMS algorithm currently being used underestimates the prevalence food insecurity. In relatively food secure populations the difference may be small (1-2%), however in relatively food insecure populations, like recipients of charitable food, the difference may be large (5-15%) and have practical significance particularly when one counts the number of people in households rather than just the percent of households experiencing food security. If an unreliable or insensitive food security categorical algorithm is used as a risk criterion for assistance, as a screening tool, and even in comparative surveillance efforts vulnerable segments of the population might be affected adversely.

The following criteria may be worthy of consideration in the reassessment of the CFMS categorical algorithm

- a. The algorithm should be consistent with the experience of the food insecure, and with definitions of food insecurity and hunger (LSRO, 1990: Radimer 1990: Wehler *et al.*, 1992: Chapter 3);
- b. The algorithm should be consistent with what policy makers and the public expect the “measure” to measure (Mayer, 1999);
- c. The algorithm should yield the most valid, reliable, culturally-sensitive and cost-effective method to meaningfully monitor food insecurity status across diverse population groups.

Based on these “grounded definitions” and years of experience in working with low income audiences and food pantry recipients and with policy makers in Hawai‘i, this researcher believes that the face valid categorical algorithm is worthy of consideration as a preferred food security categorical algorithm because:

1. by design, it possesses undeniable and consistent face validity across the full spectrum of food insecurity;
2. it has a strong relationship to the CFSM item calibration thereby verifying its accuracy (Table 8.8);
3. its criterion-mediated validity” with income and dietary variables is most consistent with expectations (Tables 8.7 and 8.8);
4. it appears to have good stability (Table 8.7, and 8.6); and
5. its simplicity may be ideal for monitoring with shorter food security measures.

As Embretson (1996, p. 343). argues “shorter tests can be more reliable than longer tests”. A drawback of this simplicity is that it may underestimate the severity of the food insecure who “didn’t quite feel they were hungry”, but perhaps did not eat enough. On the other hand, because it relies heavily on a few indicators, one might consider that the rates of false positives would be high. However, our experience is that self-reporting of hunger-related items is a sensitive domain, one more likely to be underreported than overreported (Chapter 3), which will likely counter any false positives.

Food security, although becoming more recognized and understood by nutrition professionals, (ADA, 1998) is still not the term used among those who work with the needy, or expressed by the needy themselves (Chapter 3). This researcher prefers labeling the food insecurity categories consistently with the CCHIP algorithm—"at risk of hunger" and hunger—because it is relatively simple, consistent with what has been used in many studies in the past, and minimizes confusion or lack of knowledge regarding the term food insecurity. Delineation between hunger experienced among adults (Q10)--the only kind that could be experienced in households without children--and hunger experienced among children, with or without adult hunger, also is preferred. However, as many other researchers have done, it may be more useful for monitoring purposes to simply combine the two most severe hunger categories into one "hunger" category (Frongillo *et al.*, 1997, Murphy *et al.*, 1999, Rose *et al.*, 1995), and then report affirmative responses to Q10 and Q14 to indicate the severity of hunger respectively experienced among adults and children. This approach is consistent with our finding that the 18-item scale only can divide respondents into no more than two categories (Chapter 7). Reporting prevalence estimates directly from affirmative responses to Q10, in which the respondent indicates their personal experience rather than experience for the entire household, may also eliminate the need for a separate individual hunger index for food security monitoring purposes. Similarly, straightforward application of Q14 in this manner may eliminate the need for a specific child level hunger index for household food security monitoring purposes. In all cases, any categorical method and any reliance on single questions should only be considered for monitoring and applied research. The entire 18-question instrument, ideally with additional items to clarify the degree of early food insecurity, should be considered for food security research and clinical purposes.

All the algorithms tested had merit. Yet, if the algorithm is going to be used for food security monitoring which should be a guiding factor in health and domestic food assistance policy, then understanding of public's--and particularly policy makers--interpretation of these reported statistics is crucial (Bickel, 1999; Mayer, 1999). The importance of linking measurement to real

life experience in ways that are consistent with perceptions and experiences of individuals and policy makers cannot be underestimated. Studies documenting perceptions and interpretation of what presented statistics mean across policy makers, program managers, those involved in charitable food assistance and individuals with past or present experience of food insecurity are needed to guide reassessment of the categorical algorithm.

Limitations. Without further studies, ideally of diverse subgroups and CFMS data, these specific findings, particularly the prevalence statistics must be interpreted cautiously. The data set represents an ethnic distribution that differs from the ethnic distribution of the United States CFMS population (DBEDT, 1997). The food pantry sample was a convenience survey biased towards those who had phones and had someone in the house that could adequately speak English. The Hawaii Health Survey data set is biased towards households with phones and over-sampled households in Maui and Hawai'i counties (SMS, 1998), and thus may not be a true prevalence estimate of food security status of the Hawai'i resident population.

Data was also limited to the 18 food security questions and selected predictors. Data on income were limited to categorical choices and this could not be compared against the poverty level income guidelines for household size. Dietary assessment was based on a single valid measure of daily vegetable intake (Chapter 7) rather than a more complete diet history or full diet recall.

### **Implications**

Findings reported and discussed suggest a reassessment of the CFMS food security algorithm is warranted. Ideally, relatively soon since errors may affect vulnerable segments of the population, domestic food and nutrition policy, and use of subsets of items may further jeopardize the comparability of findings. All the algorithms tested had merit. Yet, if the algorithm is going to be used for food security monitoring which should be a guiding factor in health and domestic food assistance policy, then understanding of public's--and particularly policy makers--interpretation of

these reported statistics is crucial (Bickel, 1999; Mayer, 1999). Studies documenting perceptions and interpretation of what presented statistics mean across policy makers, program managers, those involved in charitable food assistance and individuals with past or present experience of food insecurity are needed to guide reassessment of the national categorical algorithm.

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**Table 8.1.**  
**CFSM Items in Modal Order: Adult and Child Items**

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<b>Item Type</b>	<b>Essence of Item. In the last 12 months. . . because there wasn't enough money for food/couldn't afford it?</b>
------------------	---

---

**ADULT ITEMS**

- |    |  |
|----|--|
| FI | 2. Worried about whether food would run out, etc.                            |
| FI | 3. The food we bought just didn't last and we didn't have money to get more. |
| FI | 4. We couldn't afford to eat balanced meals.                                 |
| FI | 8. Any adult in household ever cut the size of meal or skip meals?           |
| FI | 9. Did you ever eat less than you felt you should?                           |
| MH | 8a. How often? (More than three months)                                      |
| MH | 10. Were you ever hungry but didn't eat?                                     |
| MH | 11. Did you lose weight?   |
| SH | 12. Any adult ever not eat for a whole day?                                  |
| SH | 12a. How often? (More than three months)                                     |

**CHILD ITEMS**

- |    |   |
|----|---|
| FI | 5. We relied on only a few kinds of low cost foods to feed our children, etc. |
| FI | 6. We couldn't feed our children a balanced meal because, etc.                |
| MH | 7. Children were not eating enough because just couldn't afford enough food.  |
| MH | 13. Did you ever cut the size of any of your children's meals?                |
| SH | 14. Were the children ever hungry, but you could not afford more food?        |
| SH | 15. Did your children ever skip meals?  |
| SH | 15a. How often? Three or more months.   |
| SH | 16. Did any child ever not eat for a whole day?                               |
- 

Note: FI = Food Insecurity Item, MH= Moderate Hunger Item, SH=Severe Hunger Item.

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**Table 8.2**  
**Comparison of Food Security Algorithms Evaluated**

Category	CSFM	Adapted Radimer/Cornell	"Face valid"	Adapted CCHIP
Food secure	<3 affirmative responses	0 affirmative responses	0 affirmative responses	0 affirmative responses
"Worried"				Affirmative response only to worried questions
Household food insecure - "At risk of hunger"	Adults only: 3-6 Affirmative responses; With 1+ child: 3-7 affirmative responses	Any affirmative response to food insecurity indicators	Any affirmative response to food insecurity indicators	Any affirmative response to food insecurity indicators except Q2. "Worried"
Moderate Hunger - Adult Hunger	Adults only: 7-8 affirmative responses With 1+ child: 8-12 affirmative responses	Affirmative response to Q. 8, 8a, 9-12a without affirmative response child indicators: Q7,13-16	Affirmative response to Q10 or 12	Affirmative response to Q10, 11, 12 or 12a.
Severe/Child - Hunger	Adults only: 9-10 affirmative responses With 1+ children: 13+ affirmative responses	Affirmative response to any one of the following: Q. 7, 13-16	Affirmative response to Q14	Affirmative response to any one of the following: Q7, Q13-16
<b>Summary</b>	Based on pattern of modal responses	Based on responses to specific indicators	Based on responses to specific indicators	Based on responses to specific indicators *
	Moderate and Severe categories both include hunger among children	Separate hunger categories for adults and children	Separate hunger categories for adults and children	Separate hunger categories for adults and children
	Conservative, particularly in classifying food insecurity	More liberal classification of all categories	More liberal food insecurity classification: but most strict hunger classification	More liberal food insecurity and child hunger: more strict adult classification

Note: The CCHIP 8 item scale does not include a comparable item assessing "worry that food would run out: nor comparable adult hunger indicators.

**Table 8.3**  
**Comparison of the Food Security Sum Vs. Item Response by Household and Food Security Status for Hawaii data (n=1664)**

CFSM Categories	Food Security Sum <sup>1</sup>				Individual Items				
	Total (n)	Adults only (n)	Family (n)	Summed Score	Hawaii modal Pattern <sup>2</sup>	Item calibration Value <sup>3</sup>	Total Affirmative (n)	Adults only affirmative (n)	Family (n)
Food Secure	1300	843	457	0	Items	--	--	--	--
	63	28	35	1	2	-4.18	291	77	214
	48	23	25	2	3	-3.43	258	83	175
Food Insecure	51	18	33	3	4	-3.06	238	71	166
	41	10	31	4	5	-2.77	159	--	159
	29	7	22	5	6	-1.72	120	--	120
Moderate Hunger	34	12	22	6	9	-1.26	144	48	96
	22	8	14	7	8	-.88	127	40	87
	16	3	13	8	8a	-.31	103	31	72
Severe Hunger	14	4	10	9	7	.17	60	--	60
	1	4	10	10	10	.49	74	21	53
	7	--	7	11	11	.93	60	22	38
	7	--	7	12	14	1.37	33	--	33
	7	--	7	13	13	1.72	28	--	28
	7	--	7	14	12	1.76	40	8	32
	4	--	4	15	15	2.07	23	--	23
	6	--	6	16	15a	2.32	19	--	19
	3	--	3	17	12a	2.44	26	4	22
			18	16	4.35	5		5	

**Notes:**

1. The food security sum is the sum of all affirmative responses. 2. Highlighted areas in the modal indicators indicate that the item hierarchy of the Hawaii data is inconsistent with the national hierarchy: which is 2,3,4,5,6,8,9,8a,7,10,11,13,12,14,12a,15,15a and 16 (Hamilton et al., 1997). 3. Dashed lines around item calibration values indicate that the item calibration with the Hawaii data was more than .5 of a logit different than the item calibration of the original national CSFM dataset (Hamilton et al., 1997). The item calibration for items with difference greater than .5 of a logit are Q.2: -4.99, Q.8: -1.72, Q.11: 1.54, Q.15: 2.86, Q.15a: 3.48, Q. 16: 4.92.

**Table 8.4**  
**Affirmative Responses to CFSM Items by the CFSM Algorithm**

Item	Total Affirmative Responses	Food Secure	Food Insecure	Moderate Hunger	Severe Hunger
N	1664	1411	158	64	31
	N	N (%) <sup>a</sup>	N (%) <sup>a</sup>	N (%) <sup>a</sup>	N (%) <sup>a</sup>
Q2.	291	61 (4.3%)	137 (86.7%)	62 (96.9%)	31 (100%)
Q3.	258	40 (2.8%)	126 (79.7%)	61 (95.3%)	31 (100%)
Q4.	237	30 (2.1%)	119 (75.3%)	59 (93.7%)	29 (96.7%)
Q7.	60	1 (1.7%)	15 (12.5%)	20 (50.0%)	24 (88.9%)
Q8.	127	1 (0.9%)	40 (25.8%)	56 (87.5%)	30 (96.8%)
Q9.	144	7 (5.9%)	54 (34.6%)	52 (82.5%)	31 (100%)
Q10.	74	--	17 (10.9%)	32 (50.0%)	25 (80.6%)
Q11.	60	2 (1.7%)	9 (5.8%)	25 (39.7%)	24 (77.4%)
Q12.	40	--	5 (3.2%)	14 (21.9%)	21 (67.7%)
Q14	33	--	4 (2.5%)	8 (12.5%)	21 (67.7%)

Note:

a. Percentages indicate the percent of respondents in that food security category who responded affirmatively to the respective question.

**Table 8.5.**  
**Food Security Status Prevalence Rates by Categorical Algorithms**

Algorithm/ Hunger categories	Overall	Family Status		Site		
		Adults only	1+ Child	HHS <sup>a</sup>	Food Pantry	Re-test
N	1664	957 (57.5%) <sup>b</sup>	707 (42.5%) <sup>b</sup>	1459 (87.7%) <sup>b</sup>	144 (8.7%) <sup>b</sup>	61 (3.7%) <sup>b</sup>
<b>CFSM</b>	<b>N (%)<sup>c</sup></b>	<b>N (%)<sup>c</sup></b>	<b>N (%)<sup>c</sup></b>	<b>N (%)<sup>c</sup></b>	<b>N (%)<sup>c</sup></b>	<b>N (%)<sup>c</sup></b>
Secure	1411 (84.8%)	894 (93.3%)	517 (73.2%)	1360 (93.2%)	36 (25.0%)	15 (24.6%)
Insecure	158 (9.5%)	36 (3.8%)	122 (17.3%)	72 (4.9%)	60 (41.7%)	26 (42.6%)
Moderate	64 (3.8%)	24 (2.5%)	40 (5.7%)	20 (1.4%)	30 (20.8%)	14 (23.0%)
Severe	31 (1.9%)	4 (0.4%)	27 (1.6%)	7 (0.5%)	18 (12.5%)	6 (19.4%)
<b>Adapted Radimer/Cornell</b>						
Secure	1300 (78.1%)	843 (88.0%)	457 (64.6%)	1278 (87.6%)	18 (12.5%)	4 (6.6%)
Insecure	172 (10.3%)	56 (5.9%)	116 (16.4%)	108 (7.4%)	44 (30.6%)	20 (32.8%)
Adult	119 (7.2%)	58 (6.1%)	61 (8.6%)	53 (3.6%)	46 (31.9%)	20 (32.8%)
Child	73 (4.4%)	0	73 (10.3%)	20 (1.4%)	36 (25.0%)	17 (27.9%)
<b>Face Valid</b>						
Food Secure	1300 (78.1%)	843 (88.0%)	457 (64.6%)	1278 (87.6%)	18 (12.5%)	4 (6.6%)
At risk	259 (15.6%)	92 (9.6%)	167 (23.6%)	147 (10.1%)	73 (50.7%)	39 (63.9%)
Adult	72 (4.3%)	23 (2.4%)	50 (7.1%)	30 (2.1%)	32 (22.2%)	10 (16.4%)
Child	33 (2.0%)	0	33 (4.7%)	4 (0.3%)	21 (14.6%)	8 (13.1%)
<b>Adapted CCHIP</b>						
Not hungry	1300 (78.1%)	843 (88.0%)	457 (64.7%)	1278 (87.6%)	18 (12.5%)	4 (6.6%)
Worried	31 (1.9%)	9 (0.9%)	23 (3.3%)	28 (1.9%)	4 (2.8%)	0
At risk	197 (11.8%)	75 (7.8%)	122 (17.3%)	108 (7.4%)	57 (39.6%)	32 (52.5%)
Adult	62 (3.7%)	30 (3.1%)	32 (4.5%)	25 (1.7%)	29 (20.1%)	8 (13.1%)
Child	73 (4.4%)	0	73 (10.3%)	20 (1.4%)	36 (25.0%)	17 (27.9%)

**Notes:**

a. HHS indicates the Hawai'i Health Survey. b percentages indicate row totals. c percentages indicate column totals.

**Table 8.6**  
**Stability Assessment of the Face Valid Categorical Algorithm**

Face Valid Time 2	Face Valid Algorithm– Time 1				
	Food secure	At risk of hunger	Adult hunger	Child Hunger	Total
Food secure	2	2	-	-	4 (7%)
At risk of hunger	2	31	3	3	39 (64%)
Adult hunger	---	3	5	1	9 (15%)
Child Hunger	--	3	1	5	9 (15%)
Total	4 (7%)	40 (66%)	9 (15%)	9 (15%)	61

Note: Pearson  $X^2 = 68$ , 9 df,  $p = 0.00$ .

**Table 8.7**  
**Comparison of Food Security Algorithms by Income and Stability Assessment<sup>a</sup>**

Algorithm	Total Household Income			Categorical Stability	
	Total N	< \$5,000	> \$54,999	Total N <sup>c</sup>	N (%) <sup>c</sup>
N responses	1023	71 (6.9%)	296 (28.9%)	61	
		n (%) <sup>b</sup>	n (%) <sup>b</sup>		n (%) <sup>c</sup>
<b>CFSM</b>					
Food Secure	873	33 (3.7%)	289 (33.1%)	14	9 (64.3%)
Insecure	97	24 (24.7%)	4 (4.1%)	28	16 (57.2%)
Moderate Hunger	33	24 (72.7%)	3 (9.1%)	11	7 (63.6%)
Severe Hunger	25	5 (25.0%)	0	8	6 (75.0%)
<b>Adapted Radimer Cornell</b>					
Food Secure	812	21 (2.6%)	282 (34.7%)	4	2 (50.0%)
Food Insecure	101	18 (17.8%)	9 (8.9%)	20	15 (75.0%)
Adult Hunger	69	21 (30.4%)	3 (4.3%)	20	14 (70.0%)
Child Hunger	41	11 (26.8%)	2 (4.9%)	17	10 (60.0%)
<b>Face Valid</b>					
Food Secure	812	21 (12.6%)	282 (34.7)	4	2 (50.0%)
At risk of hunger	151	34 (22.5%)	11 (3.7%)	42	31 (73.5%)
Adult Hunger	45	12 (7.3%)	3 (6.8%)	10	5 (50.0%)
Child Hunger	15	4 (25.0%)	-	8	5 (62.5%)
<b>Adapted CCHIP</b>					
Not hungry	812	21 (2.6%)	282 (34.7%)	4	2 (50.0%)
Only worried	46	31 (67.4%)	1 (0.5%)	-	-
At risk of hunger	116	24 (20.6%)	10 (8.6%)	32	19 (59.4%)
Adult Hunger	34	12 (35.3%)	1 (2.9%)	8	3 (37.5%)
Child Hunger	15	11 (26.8%)	2 (4.9%)	17	10 (58.8%)

**Notes:**

- Pearson Chi-Square of all four categories and total household income were statistically significant  $X^2 > 150$ ,  $p=0.000$ .
- Percentage indicates row percentage, i.e. the % of those identified as food secure by the national algorithm who indicated household income of <\$5,000.
- Numbers indicate the number classified in category at time 1. Percentage indicates the percent who were consistently classified in the same category over time (mean of 11 days apart: Ch.4).

**Table 8.8**  
**One way ANOVA of Selected Numerical Variables by Food Security Categorical Algorithms**  
**(n=1603)<sup>1</sup>**

Algorithm	RAI <sup>2</sup>	Daily Vegetable Intake <sup>3</sup>	Monthly Saimin <sup>4</sup>	Scale Measure	Item with item calibration value closest to mean scale measure
<b>CFSM</b>					
Food Secure	0.2 <sup>a</sup>	2.00 <sup>a</sup>	3.9 <sup>a</sup>	-4.05 <sup>a</sup>	Q2. Worried food would run out
Food Insecure	2.3 <sup>b</sup>	1.72 <sup>a</sup>	9.5 <sup>b</sup>	-1.96 <sup>b</sup>	Q5. Reliance on- low cost foods
Moderate Hunger	3.7 <sup>c</sup>	1.18 <sup>b</sup>	7.7 <sup>b</sup>	0.53 <sup>c</sup>	Q8a Adults skip/cut size often
Severe Hunger	5.2 <sup>d</sup>	1.29 <sup>a</sup>	14.2 <sup>c</sup>	2.52 <sup>d</sup>	Q12a Adults not eat -1 day often
<b>Adapted Rad-imer Cornell</b>					
Food Secure	0.2 <sup>a</sup>	2.02 <sup>a</sup>	3.7 <sup>a</sup>	---	---
Food Insecure	1.4 <sup>b</sup>	1.75 <sup>a</sup>	6.8 <sup>b</sup>	-3.39 <sup>a</sup>	Q3. Food didn't last
Adult Hunger	3.0 <sup>c</sup>	1.40 <sup>b</sup>	8.4 <sup>b</sup>	-1.01 <sup>b</sup>	Q8/9. Adult not eat enough
Child Hunger	4.1 <sup>d</sup>	1.36 <sup>b</sup>	12.9 <sup>c</sup>	0.67 <sup>c</sup>	Q7. Children ate less than should
<b>Face Valid</b>					
Food Secure	0.2 <sup>a</sup>	2.02 <sup>a</sup>	3.7 <sup>a</sup>	---	---
At risk of hunger	1.8 <sup>b</sup>	1.67 <sup>b</sup>	8.4 <sup>b</sup>	-2.84 <sup>a</sup>	Q4/5. Adults-balanced meals
Adult Hunger	3.8 <sup>c</sup>	1.45 <sup>b</sup>	7.9 <sup>b</sup>	0.10 <sup>b</sup>	Q8a/Q10. Respondent hungry
Child Hunger	5.0 <sup>d</sup>	1.00 <sup>b</sup>	13.5 <sup>c</sup>	1.61 <sup>c</sup>	Q13/14. Children hungry
<b>Adapted CCHIP</b>					
No hunger	0.2 <sup>a</sup>	2.02 <sup>a</sup>	3.7 <sup>a</sup>	---	---
Only Worried	1.2 <sup>b</sup>	1.44 <sup>a</sup>	10.4 <sup>b</sup>	-4.54 <sup>a</sup>	Q2. Worried food would run out
At risk of hunger	1.8 <sup>c</sup>	1.67 <sup>a</sup>	8.1 <sup>c</sup>	-2.72 <sup>b</sup>	Q4 Adults unbalanced meals
Adult Hunger	3.4 <sup>c</sup>	1.52 <sup>a</sup>	5.5 <sup>b</sup>	-0.34 <sup>c</sup>	Q8a Adult often cut size/skip
Child Hunger	4.2 <sup>d</sup>	1.36 <sup>b</sup>	12.9 <sup>c</sup>	0.67 <sup>d</sup>	Q7. Children ate less than should

Notes:

1. The sample size of 1603 includes all respondents from the Hawaii Health Survey and all food pantry respondents. All tests were conducted with Tukey's post-hoc test after significant F tests. Subscripts indicate that mean values down a column were not statistically significantly different from mean values marked with the same letter.
2. The range of RAI (resource augmentation index) values are from 0 to 8 for households with children and a maximum of 6 for households without children.
3. Represents average daily vegetable intake of respondent.
4. Indicates the maximum Saimin intake of any one in the household in the last month.

**Table 8.9**  
**Summary of Findings of Food Security Categorical Algorithms Assessed**

Algorithm	Positive attributes	Uncertainties
<b>CFSM</b>	<ul style="list-style-type: none"> <li>a. Algorithm consistent with conceptual understanding of income constraints, reduced vegetable intake, increased resource augmentation and increased use of low cost foods.</li> <li>b. Mean respondent food security scale values of those classified as either moderate and severe hunger categories are consistent with comparative item calibration values.</li> </ul>	<ul style="list-style-type: none"> <li>a. Relies on response to all 10/18 items.</li> <li>b. Most conservative measure.</li> <li>c. Classification of food secure corresponds to the item calibration value of Q2 “worried food would run out”.</li> <li>d. Questionable face validity: inconsistent classification of those indicating hunger</li> <li>e. Dependent on national modal response pattern.</li> <li>f. No clear classification of hunger among children.</li> <li>g. Relatively poor stability of food insecure classification over time.</li> </ul>
<b>Adapted Radimer/ Cornell Measure</b>	<ul style="list-style-type: none"> <li>a. As above</li> <li>b. Clear delineation of hunger among adults and children.</li> <li>c. Stable “food insecurity” classification.</li> <li>d. Classification of hunger among children consistent with CCHIP.</li> </ul>	<ul style="list-style-type: none"> <li>a. Most liberal classification of hunger among children and adults.</li> <li>b. Classification of child and adult hunger not consistent with response to hunger items (Q10/Q14), but rather “not eating enough” (Q9/Q 7).</li> </ul>
<b>Face Valid</b>	<ul style="list-style-type: none"> <li>a. As above</li> <li>b. As above</li> <li>c. As above.</li> <li>d. Assured face validity of categorization</li> <li>e. May be best for sub-scale/monitoring.</li> </ul>	<ul style="list-style-type: none"> <li>a. Relies on responses to a few critical indicators to classify hunger categories, which may simplify design and validity of a sub-scale but also increases likelihood of false negatives.</li> <li>b. Those who indicate they “are not eating enough”, cutting the size or skipping meals’, or losing weight without indicating hunger or missing meal for a entire day are “merely” classified as “at risk of hunger or food insecure”.</li> </ul>
<b>Adapted CCHIP</b>	<ul style="list-style-type: none"> <li>a. As above.</li> <li>b. As above.</li> <li>c. Clearly separates those who are just worried food would not last, short of “running out of food”.</li> </ul>	<ul style="list-style-type: none"> <li>a. As tested, contains five categories, with a small number of participants classified as worried.</li> <li>b. Child hunger category most consistent with children experiencing “not enough food”.</li> <li>c. Stability of categorization not strong in this sample</li> </ul>

## CHAPTER 9

### Concurrent Validity of the Core Food Security Module

#### Introduction

Criterion-related assessment involves a comparison of the results of a measurement tool to one or more criteria theorized to be related to the construct being measured. Criterion measures include concurrent validity and predictive validity. Singleton and colleagues define concurrent validity as "the ability of a measure to indicate an individual's present standing on the criterion variable" (1993, p. 124) e.g., intake of dairy products to estimate calcium intake.

Food insecurity is understood as an experience of severe economizing of food resources which can affect the quality and quantity of food consumed, and result in hunger--the painful physical sensation of inadequate intake (Bickel *et al.*, 1996; LSRO, 1990). Poverty is understood as a root cause of hunger and food insecurity (Wehler *et al.*, 1992; Rose *et al.*, 1995). Generally socially-unacceptable food acquisition methods such as using a food pantry, borrowing from others, etc., are employed to maximize food resources. Adverse affects to health and nutrition status may or may not occur depending on the extent of the deprivation, coping tactics and food choices. As the situation deteriorates, there is generally first an increased reliance on low cost foods and decreased quality in the diet. As financial security weakens further there is a generally a reduction in food intake. Most of the time, parents will protect their children from hunger as long as possible (Radimer *et al.*, 1992).

Deteriorating food security status has been associated with various indicators of concurrent poor financial status (Frongillo *et al.*, 1997; Hamilton *et al.*, 1997; Gunderson & Gruber, 1999); dietary deterioration (Cristofar & Basiotis, 1992; Kendall *et al.*, 1996); adverse psychosocial functioning, and behavioral and emotional correlates in low-income American children (Murphy *et al.*, 1998; Kleinman *et al.*, 1998). Alaimo and colleagues (1998) found a strong relationship between food insecurity with age of less than 60, with the head of household not having a high school diploma, and with households not having health insurance. Although differences in measurement make comparisons between studies difficult, the preponderance of evidence confirms the operational framework or conceptual basis of food security (Appendix 2: Bickel *et al.*, 1996).

Higher rates of food insecurity have been reported among ethnic minorities, particularly African-American women (Cristofar & Basiotis, 1992) and Mexican-Americans (Alaimo *et al.*, 1998). Few studies have had adequate samples of Asians and Pacific Islanders to conduct research with this consolidated ethnic group. Yet, Asians and Pacific Islanders are expected to increase from 3% of the U.S. population in 1990, to 3.7% in 1996, to 5.1% by 2010 and to 8.7% by 2050 (USDCEA, 1996abc). Asians and Pacific Islanders make up close to 50% of the population in Hawai'i (DBEDT, 1997): 23% Caucasians, 21% Mixed non-Hawaiians, 21% Hawaiians and Part-Hawaiians, 20% Japanese, 10% Filipinos 3% Chinese, 1.4% African Americans and 0.8% Samoan/Tongan. Participation in the Food Stamp Program in Hawai'i is most likely among Caucasians, Hawaiians, Filipinos and Samoans (DHS, 1997). Other researchers have reported the prevalence of hunger in Hawai'i to be highest among Caucasians, the homeless, and those with annual incomes between \$10,000 and \$30,000 (SMS, 1992).

Previous Work. The underlying purpose of this work was to determine whether or not the National Core Food Security Measure (CFSM) is a valid and reliable measure to use with Asians and Pacific Islanders in Hawai'i. Prior to this research, a qualitative study was conducted to assess the face validity of the CFSM with Caucasians, Hawaiian and Part-Hawaiian, Filipino and Samoan low-income food gatekeepers in Hawai'i. Qualitative findings suggested that variables

thought to be related to food insecurity among this target audience included: knowledge of how to get free food, cooking skills, vegetable consumption, budgeting practices, extent and use of assistance programs, self-esteem, depression, savings, income and household description. A study of scale validity (Chapter 7) confirmed the utility of the CFMS scale measures among Asians and Pacific Islanders, although problems such as high person scale measure standard errors, misfit among Samoans, and differences in item calibration of specific items indicated that the CFMS was not a perfect fit. Further studies indicated that the national categorical algorithm, particularly for reasons of low face validity and poor sensitivity over time was not ideal, and that an alternative measure entitled the “face valid” categorical algorithm may be an improvement (Chapter 8).

Objectives. The primary objective of this study was to document the concurrent validity of the face valid food security categorical algorithm with residents of Hawai`i. We hypothesized that findings would be consistent with the literature and that there would be differences in the prevalence of food insecurity between ethnic groups in Hawai`i, specifically that Hawaiians and Part-Hawaiians would be the most hungry. [Although analysis was also completed with the national food security algorithm (Appendix 12), these findings will not be discussed in this chapter].

### **Methods**

Samples. The samples and data collection methods have been described previously (Chapter 7).

To summarize two samples surveyed between June and November 1998 included (n=1603):

- 1) A statewide sample of 1469 respondents gathered through the Hawai`i Health Survey (HHS);  
and
- 2) A convenience sample of 144 food pantry recipients gathered to increase the likelihood of data collection from “hungry” respondents.

Survey Instrument. The survey instrument and data collection methods have been described elsewhere (Chapters 4-8). The instrument used is included in Appendix 8.

Basic demographic questions (age, household composition, and ethnic composition) were asked prior to the food security questions. The question "With what ethnic group do you identify with most?" was used to assess ethnicity. A total of 19 ethnic response categories were collected, including one for no response and another for mixed ethnicity. The food security questions included the 18 CFSM questions outlined in Appendix 3 preceded by the four-part food insufficiency question (Rose *et al.*, 1995).

Questions pertaining to the use of various resource augmentation behaviors (Hamilton *et al.*, 1999), income-related indices, and dietary indices were completed after the food security questions. Questions were limited to:

- a) Did anyone in your household receive food stamps; welfare; social security income; disability benefits; housing assistance (like Section 8); free or reduced-price school lunch, preschool, or adult meals; Head Start; the Special Supplemental Nutrition Program for Women, Infants and Children (WIC); or unemployment benefits? Responses were coded yes, no, don't know or refused.
- b) Four resource augmentation questions (Hamilton *et al.*, 1997b) were used to assess behaviors related to expanding household food money or food supply. Questions included: 1) use of charitable food pantry assistance, 2) delayed bill paying, 3) borrowing money for food, and/or 4) sending children over to someone else's house because of not enough money for food. In addition, follow-up frequency questions were asked to determine how reliant a household was on each particular augmentation tactic. Possible responses to the four primary resource augmentation questions were: yes; no; don't know; or refused. Possible responses to the follow-up questions were: almost every month; some months but not every month; only one or two months; don't know; or refused.

c) Categorical questions about finances included:

- ◆ Reported household income earned in the last year ( $\leq$  \$5,000, in 5,000 intervals until \$59,999; \$60,000-\$74,999; \$75,000-\$99,999; \$100,000-\$149,999; \$150,000 and above);
- ◆ the number of household members contributing to earned income;
- ◆ whether or not any one in the household had lost a job in the last three years and had not been able to find a new job with a comparable salary; and
- ◆ estimated household savings (<\$250; \$250-500; \$501-\$1,000; \$1,000-\$5,000;\$5,001 to \$10,000; and, more than \$10,000).

d. Dietary questions included a question about the maximum monthly frequency of consumption of an inexpensive fried noodle product locally called Saimin, and two questions about vegetable consumption. These questions were developed from our initial qualitative work that indicated vegetable intake was low, particularly at the end of the month and that many families relied on Saimin at the end of the month (Chapter 3). The question "Not counting salad or potatoes, on average, how many servings of vegetables do you eat a day. Count  $\frac{1}{2}$  cup, the size of a pudding cup, as one serving?" was used to estimate the respondent's average daily vegetable intake. Validity and stability testing (Chapter 5) of this single estimate of vegetable intake indicated that responses were highly correlated to ( $r=.81$ ) and not statistically different from the mean of a 24-hour vegetable recall. In addition, reported mean vegetable frequency intake did not vary significantly over time ( $t = -.67, p =.51$ ). Respondents were then asked, "Does your vegetable intake vary throughout the month because of inadequate money for food? Does it increase, decrease or stay the same?"

Data analysis. A description of how food security responses were coded and the creation of respondent food security scale measures have been described elsewhere (Chapter 7). Scale measures could only be completed for the 304 respondents with one or more affirmative responses. A respondent food security sum was created from the total number of affirmative responses. Based on this sum and whether or not a household had children, the previously

described “face valid categorical algorithm” was applied (Chapter 8). In this algorithm, respondents with one affirmative response were classified as “at risk of hunger”. Affirmative responses to questions pertaining to respondent experience of hunger Question (Q) 10, or any adults not eating for a whole day were required for classification of adult hunger (Q12). Similar responses to Q14 or Q16 were required for classification of hunger among children.

After a preliminary data inspection the following reclassifications were completed:

- ◆ Income was re-categorized into five categories: <\$5,000; \$5000-\$14,999; \$15,000-\$34,999; \$35,000-\$54,999;  $\geq$ \$55,000.
- ◆ Savings was re-categorized into four categories: <\$250; \$250-\$1000; \$1,001-\$10,000, >\$10,000.
- ◆ The 19 ethnic categories were combined into eight groups: Hawaiian or part-Hawaiian, Caucasian, Filipino, Japanese, other Asian (primarily Chinese and Mixed Asians), Pacific Islanders who were primarily Samoan, mixed or unidentified, and a combined single category for African Americans, Hispanics and Native Americans.
- ◆ the number of children was re-categorized into four groups as: one child; two children; three children; or  $\geq$  four children.
- ◆ For households without children, household size was recategorized into four groups: one, two, three, or four or more household members.

Statistical Analysis. Statistical analysis was completed with SPSS (Version 6.2, SPSS Inc., Chicago IL). Pearson’s *Chi*-square analysis was used to assess the relationship between various indices and food security status (Tables 9.1-9.7). Risk ratios were calculated to illustrate differences between households categorized as food secure vs. households categorized as experiencing hunger among children. One way ANOVA and Tukey’s post-hoc test were used to assess differences in selected numerical variables by food security category (Tables 9.8) and in mean values of the respondent’s food scale measure by selected categorical variables (Table 9.9). Scheffe’s post-hoc test was used because it is a conservative method when multiple a

*posterior* contrasts (not *apriori* contrasts) are completed (Ott, 1983, p. 832). Bivariate correlation analysis was employed to document the direct relationship between the food security scale measure and numerical variables (Table 9.10). The alpha value for all significance tests was set at  $p=0.05$ .

## Results

Food security status comparisons of selected demographic, income indices, government assistance programs and resource augmentation behaviors are depicted in Tables 9.1-9.7. The mean, standard deviation and range for household size was  $3.04 \pm 1.8$ , range of 1-14; for the number of seniors in each household was  $1.17 \pm 0.76$ , range of 0-7; and for the number of children was  $0.85 \pm 1.3$ , range of 0-12. All variables were significantly associated with food security status ( $p \leq 0.05$ ) except for social security income, WIC program benefits, unemployment benefits and frequent use of a food pantry. As indicated in Table 9.7, the four-part food insecurity question was significantly related to food security status ( $\chi^2=595$ ,  $df=12$ ,  $p=0.00$ ). However, only 79% were correctly identified by the food insufficiency question, and only 35% were accurately identified in the three food insecurity categories.

The difference between the samples used must be kept in mind when comparing findings: Tables 9.1-9.8 include ( $n=1603$ ) all households versus Table 9.9 and 9.10, where as only those with one or more affirmative food security responses could be include ( $n=304$  maximum). Table 9.8 indicates that the food security scale measure, resource augmentation index, respondent daily vegetable intake and maximum Saimin intake per month all varied significantly with food security status. Table 9.9 depicts the differences in food security scale values by ethnicity, household income, household savings and vegetable intake at the end of the month for only those who responded affirmatively to one or more food security indicators ( $n=304$ ). All F values were significant. Only the difference in household savings between the lowest category ( $< \$250$ ) and other categories, and between those who indicated their vegetable intake stays the same versus

increase or decreases at the end of the month, were significantly different in Scheffe's post-hoc tests. Table 9.10 which depicts the correlation coefficients over various numerical variables with the food security scale measure, provides a starting point to compare the concurrent validity of various indicators.

Resource Augmentation Behaviors. Correlation analysis confirms Chi-square and ANOVA findings that the most highly associated and consistently related variable with deteriorating food security status was the summed resource augmentation index ( $r=0.58$ ). Of the individual coping behaviors, use of a pantry and delayed bill payment were the most highly associated ( $r=0.37$ ,  $r=0.30$ , respectively) with the food security scale measures. Table 9.4 indicates that those classified as experiencing hunger among children were 14.3 times (73% vs. 5%) more likely than those classified as food secure to report delayed bill payments. Similarly, those classified as experiencing child hunger were 40.8 times more likely (65% vs. 1.6%) than those classified as food secure to use a food pantry more than once or twice in the last year. However, frequent use of a food pantry was not statistically different between food security categories ( $X^2=2$ ,  $p=0.56$ ) nor associated with the food security scale measure ( $r=.10$ ) for all respondents, or for respondents who only reported using a food pantry ( $r=0.06$ ).

Government assistance programs. The relationship of use of government assistance programs and food security status are outlined in Tables 9.3 and 9.10. Findings indicate the hungry were more likely than the food secure to be beneficiaries of all programs except social security income, unemployment benefits and WIC. Of households experiencing hunger among children 46% were on welfare, 58% on food stamps and 65% beneficiaries of free or reduced school meals. Comparably, for food secure households, 4% were on welfare, 6% on food stamps, and 5% beneficiaries of free or reduced school meals. Reception of disability income was more prevalent among those classified as at risk of hunger (13.6%) or experiencing adult hunger (14.8%), but was lower for households experiencing hunger among children (3.8%) when compared to food secure households (5.9%). The inverse relationship between WIC and deteriorating food security

status was confirmed through correlation analysis with the respondent food security scale measure ( $r=-.19$ ,  $p=0.026$ ).

Financial indicators. Tables 9.2, 9.9 and 9.10 indicate that while low income was a factor contributing to food insecurity in many households, recent loss of a job and the amount of household savings were more important determinants of food security status.

- ◆ The mean food security scale measure ( $F = 2.2$ ,  $p = 0.07$ ) did not vary with household income categories. However, the mean item scale value ( $-1.33$ ) of those with household income between \$5,000 and \$20,000 was most equivalent to the item scale value of Q9, "respondent ate less than they should". Also, 89% of those classified as food secure had household incomes greater than \$20,000 and 78% of those who experienced hunger among children reported household incomes less than \$20,000.
- ◆ Those classified as experiencing hunger among children were four times more likely (52% vs. 12%) than those classified as experiencing food security to report that someone in the household had lost a job in the last three years and had not been able to find a new job with a comparable salary.
- ◆ The mean respondent scale measure ( $-1.16$ ) of those reporting household savings less than \$250, was significantly different than the mean scale measures of all other savings categories, and indicates an item scale value that closest to the item scale value Q9, "Respondent ate less than should". Ninety-one percent of those experiencing child hunger reported household savings of less than \$250. No families who reported either adult or child hunger had savings greater than \$1,000

Demographic indices. Table 9.1 indicates that although food insecurity and hunger were more likely among households with children than those without children (30% vs. 11%), only 82% of single households were food secure versus 93% of childless households with two or more adults. In addition, hungry households without children had significantly lower mean household size (1.31

vs. 2.04) and fewer number of seniors (0.2 versus 1.4) than adults-only households that were classified as food secure.

Table 9.1 also suggests that single-parent families were the most food insecure type of household: only 34 (47%) single-parent households were food secure, 19 (27%) at risk of hunger, nine (13%) experienced hunger among adults, and nine (13%) experienced hunger among children. Table 9.8 confirms that households experiencing hunger among children had a higher mean number of children (3.0 versus 1.0) than their food secure counterparts. The risk ratio of hunger (either adult or child) was 4.36 for families with four or more children compared to families with only one child. Table 9.8 also indicates that regardless of whether a household had children, having one or more adults over the age of 60 (a senior) increased the likelihood of food security: those classified as experiencing hunger among children averaged only 0.23 seniors versus 1.09 seniors for households who were food secure.

Fifty-four percent of the sample were either Asians or Pacific Islanders. Results of the relationship between ethnic variation with food security status depend on the sample used. Table 9.9 indicates that differences in the food security scale measures, which are only calculated for those who responded to one or more question affirmatively, were not statistically significantly different in a Scheffe's post-hoc test. The mean food security scale values of the Caucasians (-1.58), Hawaiians (-1.51), and Samoans (-1.45) were lowest, and the mean scale value of the Japanese was not different than that of the Filipinos (-2.77 versus -2.79). However, one must keep in mind that this sample does not include those who did not respond affirmatively to any food security item, and thus were food secure.

Table 9.1, which includes all participants evaluated, presents percentages of food security status by ethnicity for all respondents and reveals a remarkable discrepancy in food security status between ethnic groups in Hawai'i ( $\chi^2=160$ ,  $p=0.00$ ). Ninety-six percent of Japanese respondents, 86% of other Asians, 85% of Caucasians, 81% of others, 75% of Filipinos, 67% of

Hispanics, African Americans and Native Americans, 65% of Hawaiians and Part-Hawaiians and 17% of the Samoans surveyed were food secure. Hawaiians or part-Hawaiians were more likely to be hungry, particularly experiencing child hunger, than were the Japanese and Other Asian groups. Of the 263 Hawaiians or Part-Hawaiians sampled only 173 (66%) were food secure, 62 (24%) were food insecure, 17 (6%) experienced hunger among adults, and 11 (4%) experienced hunger among children. Forty-two percent of the households classified as experiencing hunger among children were Hawaiians or part-Hawaiians. Although the number of Samoan households in the sample is small (n=18) this ethnic group was the most food insecure: only three households (17%) were food secure, nine (50%) were at risk of hunger, four (22%) were classified as experiencing hunger among adults, and two (11%) classified as experiencing hunger among children.

Dietary Indices. Analyses of dietary intake are reported on Tables 9.2 and 9.8. Results from One way ANOVA and correlation analysis indicate an inverse relationship of deteriorating food security status with both average vegetable intake ( $r = -0.24$ ) and an increased reliance on Saimin ( $r = 0.11$ ). Although, Table 9.8 indicates increased reliance on Saimin occurs more readily in households with children versus those without children. The mean vegetable intake (2.00 servings) and the mean monthly frequency of consumption of Saimin (3.7 times) of those classified as food secure, were significantly different from all other food security categories. Those who were classified as experiencing hunger among children reported an average of 1.0 serving of vegetables a day, or half the number of servings reported by those classified as experiencing food security (mean of 2.02). Those classified as experiencing child hunger reported eating Saimin more than three times as frequently as those who were classified as food secure.

Of those who reported food security, 92% indicated their vegetable intake did not change at the end of the month. Forty-six percent of those classified as experiencing hunger among children indicated their vegetable intake decreased at the end of the month. However, both the mean

scale measures of those who reported either increased or decreased vegetable intake at the end of the month (-1.08, -.84) were significantly higher (indicating greater food insecurity) than the mean food security scale measure of those who reported their vegetable intake does not change at the end of the month (-2.52).

### Discussion

The CFSM is designed to measure food deprivation stemming from inadequate resources for food (Hamilton *et al.*, 1997). It captures the dimension of food security related to food insufficiency, and to some extent the nutritional adequacy: i.e. quality and number of foods consumed. Resource augmentation (putting off bill paying, using food pantries) were not included with the basic dimension of quantitative food insufficiency because “they did not meet the statistical criteria for inclusion in the scale” (Hamilton *et al.*, 1997b). Resource augmentation questions may not scale because of differences in availability of non-profit resources, friends and family, and differences in how willing people are to use these alternative resources. If the use of food assistance programs or other coping behaviors were included in the CFSM their presence may confound the measure when it is used to assess the effectiveness of assistance programs.

The 18-item CFSM is used to create at least two useful measures for assessing concurrent validity of the instrument among respondents: the respondent food security scale measure (Chapters 7: Wright & Stone, 1980), and a categorical algorithm (Hamilton *et al.*, 1997b; Price *et al.*, 1997). Based on previous findings this researcher has chosen to use a categorical algorithm based on the face validity of the responses rather than the national algorithm (Chapter 8). Despite the utility of food security categorical algorithms for comparing prevalence rates, the food security scale measure is currently the gold standard of food security measurement. However, scale measures cannot be created for households who do not respond affirmatively to one or more indicators. Neither is it useful for those who respond affirmatively to all questions asked (Wright & Stone, 1980). In our study, scale measures were only possible for 304 of 1603, 19 of

respondents. Due to the large number of food secure respondents who don't have scale measures, concurrent validity assessment must depend heavily on the categorical algorithm. Research verifying the strong relationship between the scale measures and the algorithm was produced in Chapter 8, and was a major reason why concurrent validity assessment was only presented for the face valid categorical algorithm.

Concurrent Validity. A summary of concurrent validity findings is listed in Table 9.11. In general, findings link worsening financial insecurity to deteriorating food security status. This is very important as resource constraints--“ because of not having enough money for food ” is a fundamental construct of the CFSM (Hamilton *et al.*, 1997). In general, the use of assistance programs and coping behaviors directly correlated with both the food security scale measure and the categorical algorithm. This finding confirms national research (Hamilton *et al.*, 1997), other literature (Scott *et al.*, 1994), and our qualitative findings (Chapter 3) indicating the extent to which food insecurity is a “managed process” (Radimer *et al.*, 1992). Likewise, both measures were associated with reductions in vegetable intake and increased dependence on Saimin. This finding confirms conceptual understanding that reductions in diet quality and reliance on low cost foods are hallmarks of food insecurity (Bickel *et al.*, 1996). More households with children reported hunger among adults (n=43) than hunger among children (n=25) suggesting many parents or care-givers protect children from hunger at their own expense. Combined with our qualitative findings (Chapter 3) the evidence herein supports the concurrent validity of face valid categorical algorithm among at least Asians and Pacific Islanders in Hawai`i.

The four-part food insufficiency question had a strong, but far from perfect positive relationship with the face valid categorical algorithm. McGuiness (1997) also found that responses to the food insufficiency questions were not consistent and recommended that it not be used. His rationale was that it is a complex, confusing question. Our subjects and interviewers reported similar findings. Many times the interviewer reporting having to read the question two or three times before a response was given, thus the question is also time-intensive. Use of this food

insufficiency question is not recommended for use in monitoring, nor as a screening question prior to use of the CFSM. If comparisons with previous studies that used this question are needed, the question should be asked after the CFSM questions.

Financial indicators. Unlike the rest of the nation, Hawaii's economy is still weak with relatively high rates of unemployment (DBEDT, March 1998). Although the median income for a four-person household in Hawai'i in 1999 was projected to be \$57,909: 6<sup>th</sup> among all the States (DBEDT, 1997, Table 13.16), approximately 10.7% of the population in Hawai'i were estimated to live at the Hawai'i poverty threshold of \$18,920 for four-person household (Federal Register, February 24, 1998). Honolulu was the second most expensive city to live in during 1996: 121% of the national average (DBEDT, 1997; Table 14.08). Costs of food eaten at home are 142% of U.S. urban prices (DBEDT, 1997; Table 14.07). Relatively little of food consumed in Hawai'i is locally grown.

Despite distinctly different samples, results regarding the relationship of income-related variables and food security status are consistent with the findings of the Cornell research team (Frongillo *et al.*, 1997). Our findings support Gunderson and Gruber's (1999) premise that inadequate savings and recent loss of a job are "income shocks" which destabilize a household's financial status regardless of income. While not studied herein, we believe, as Gunderson and Gruber suggest, that loss of food stamp benefits and lack of health insurance are also related to food insecurity in Hawai'i.

Resource augmentation behaviors. Tables 9.4 and 9.9 indicate that the hungrier a household is, the more coping behaviors they use, and the more often they use them. Some choose to use government assistance programs, others rely on themselves, others on their friends or family: some utilize all available resources, others resort to stealing and begging. Findings confirm the concurrent relationship between food security status and resource augmentation (Hamilton *et al.*, 1997b) Comparison between Tables 9.3 and 9.4 indicate that use of a food

pantry may be more “socially acceptable” or more common among the very needy than use of the Food Stamp Program. Of the 132 households categorized at risk of hunger 76 (34.5%) received food stamps, 85 (38.6%) used a food pantry; of the 61 households classified as adult hungry 33 (54%) used food stamps, 37 (61%) used food pantries: of the 26 households classified as child hungry, only 15 (58%) received food stamps, but 24 (92%) used a food pantry. Of those who experienced hunger among children and used a food pantry (n=24), 17 (71%) did so often.

Foodbanks and food pantries have reported increased demand for food in Hawai'i (Second Harvest, 1998). It is the author's experience that food pantry programs in Hawai'i are not only available in most geographical locations but because of their cultural diversity, meet the needs of many ethnic group to the extent possible with salvaged foods. However, the extent to which charitable organizations can fill the holes in the increasing large “nutrition safety” net is questioned, particularly when the cap on welfare benefits affects many needy households over the next few years (Willis *et al.*, 1997)

Government programs. The relationship between the use of government programs and food security status (Tables 9.3 and 9.11) can be liken to classic “chicken and an egg argument”-- it is difficult to tease out the causality between the two. Government assistance programs are designed to enhance food and nutrition security (FNS, 1997). We generally found participation rates to be higher among those who were hungry. However, the food stamp program served only 55% of those who admitted to experiencing either hunger among adults or children. Our results are similar to Tarasuk and colleagues (1999) and suggest for various reasons, people are reluctant to use government programs. As one telephone respondent put it “*We were trapped by food stamps, in bondage, that's why we don't use food stamps*”. Our qualitative findings suggest shame or ignorance may be a factor for some, the paperwork, hassles and investigation into one's financial affairs are barriers for others (Chapter 3).

Chi-square analysis indicated no differences in food security status with SSI, unemployment and WIC benefits. While this in itself does not suggest a protective effect of these programs, the negative correlation between WIC and deteriorating food security status ( $r=-0.19$ ,  $p=0.26$ ) does suggest that WIC program participation may enhance food security status. This raises the next question of whether or not income transfer assistance programs, i.e. food stamps, as well as food distribution programs, i.e. WIC, food pantries, and commodity programs are truly enhancing food security of the most needy. Questions related to program effectiveness can not be answered by this study.

Dietary indices. Findings of reported decreases in vegetable intake with deteriorating food security status is also consistent with other studies (Kendall *et al.*, 1996; Tarasuk *et al.*, 1999) and consistent with dietary studies in Hawai'i (DOH, 1994; Derrickson & Gans, 1996) which indicate poor intake of vegetables among those with less income. Findings do confirm the conceptual linkages between financial insecurity, food insecurity and dietary consequences. The finding that intake of vegetables both increased and decreased at the end of the month among the food insecure is interesting. It could suggest that some households forego vegetables for perceived less expensive foods, while others may increase vegetable intake, and possibly reduce intake of other more relatively expensive foods like meat and processed foods. Clearly, both decreased and increased vegetable intake at the end of the month due to financial pressures are coping tactics used to stretch food resources. Yet, their divergent effects on diet quality and health substantially points to the need for increased nutrition education among the food insecure. Ironically, the high fat content of Saimin (14 grams per package) may be offsetting reduced energy intake of other foods, as many of the food insecure and lower income people in Hawai'i are not underweight (DOH, 1994).

Demographic indices. Although the sample composition is not similar to households across the United States, it is similar to the composition of households in Hawai'i (DBEDT, 1997). It is well-known that the size of many Hawaiian, Part-Hawaiian and Samoan families in Hawai'i are large,

and that grandparents sometimes live with or nearby the family (OHA,1998). Many families live together to decrease housing related costs (Chapter 3). On the other hand, except on Military bases, in general Caucasian and Japanese households are less likely to be large. Older relatives of these ethnic groups are likely to be in better health, more financially well-off, and more able to live on their own longer. Findings strongly suggest that the increased burden of the cost of raising a child reduces the financial security of a family, which combined with an income shock like illness or a lost job can create food insecurity. At the other extreme, living alone, bearing the costs of transportation, food and housing-related costs by oneself, this also can be quite difficult for many that subsist on minimum wage jobs or minimal assistance. Living with others who can earn income, or with a senior who can provide child care and perhaps contribute social security benefits to the household financial pool, clearly are first line resources to enhance financial security.

Factors such as increased rates of poverty, increased family size and fewer college graduates play a role in the limited financial security of Pacific Islanders. It is not surprising that these ethnic groups are generally most at risk of poor diet quality, excess intake and increased morbidity and early mortality (DOH, 1994: OHA, 1998). They are also disproportionately likely to be beneficiaries of government assistance (DHS, 1998). Given that traditionally, Pacific Islanders were thought quite healthy and food secure (Cook, 1778), increased Westernization and its appealing high salt, high sugar, high sodium diet resulting in decreased food and nutrition security, is one of the more ironic detriments afflicted upon native peoples (Kent, 1993).

Limitations. Various factors limit the analysis and comparisons conducted. The small size of the Samoan sample limits any generalizability of these conclusions about this ethnic group. Sample size various distinct ethnic groups also prevents further analysis of the relationship between family size, ethnicity and food security status. Asking household income and savings is a difficult task because of the relative invasion of privacy, recall bias and shame involved in reporting low income. Use of categorical choices can increase the likelihood of response, but limits the

analysis that can be conducted with the data. The lack of a measure of dietary energy limits conclusions about the relationship of food security status and decreased intake, although findings suggest that quality continues to deteriorate as food insecurity worsens. Cost constraints and use of a telephone survey limited use of more detailed dietary assessments and measures of psychological health.

### **Implications**

Findings support the concurrent validity of the CFSSM food security scale measure and the face valid algorithm among residents in Hawai'i, of which more than 50% of our sample was of Asian and Pacific Islander origin. Results confirm our hypothesis that Asians, except for Filipinos appeared to be less likely to be food insecure. Hawaiians and Part-Hawaiians and Samoans, who comprised the majority of Pacific Islanders sampled, were more likely to be hungry. In general, progressively deteriorating food security status as experienced among Hawai'i residents, resulted in concurrent decreased vegetable intake, and increased reliance on a cheap, high fat, high sodium noodle product. Increase reliance on resource augmentation behaviors. Factors such as a greater number of children, limited savings and recent loss of a job were found to compromise food security status. Factors such as WIC benefits and possibly frequent use of a food pantry, as well as presence of a senior in the household were likely to be protective factors.

Future work. Education directed at more sustainable and financially viable careers is a fundamental part of what is needed. Further funding is also needed for nutrition education program designed to assist the food insecure in maximizing the health value of their food choices. This work, and many studies of its kind (Radimer *et al.*, 1992) raise many questions which merit further investigation. While many of these questions are outlined in Table 9.12, the most important issue is continual monitoring of food security status across various population groups along with indices of health, demographics, use of assistance programs and economic indices.

Increased confidence in the food security measure can help guide policy decision making to minimize the disparity in food security status between ethnic groups.

**Table 9.1**  
**Food Security Status by Selected Demographic Characteristics**

Indicator	Overall No. (%)	Face Valid Categorical Algorithm				$\chi^2$ (p value)
		No hunger	At risk of hunger	Adult Hunger	Child Hunger	
		No. (%)	No. (%)	No. (%)	No. (%)	
N	1603	1296 (80.8)	220 (13.7)	61 (3.9)	26 (1.6)	553 (0.00)
<b>Site</b>						
HHS	1453 (92.1)	1278 (88.0)	147 (10.1)	29 (2.0)	5 (0.1)	
Pantry	144 (9.0)	18 (12.5)	73 (50.6)	32 (22.2)	21 (14.5)	
<b>Ethnicity</b>						
Caucasian	614 (38.3)	523 (85.2)	59 (9.6)	25 (4.1)	7 (1.1)	160 (0.0)
Hawaiian	263 (16.4)	173 (65.3)	62 (23.6)	17 (6.5)	11 (4.2)	
Samoan	18 (1.1)	3 (16.7)	9 (50.0)	4 (22.2)	2 (11.1)	
Filipino	198 (12.4)	149 (75.3)	40 (20.2)	5 (2.5)	4 (2.0)	
Japanese	294 (18.3)	278 (94.6)	15 (5.1)	1 (1.3)	---	
Other Asian	91 (5.7)	78 (85.7)	11 (12.1)	2 (2.2)	---	
Other/Mix	65 (4.1)	52 (80.0)	10 (15.4)	3 (4.6)	---	
His/AA/A <sup>a</sup>	60 (3.7)	40 (66.7)	14 (23.3)	4 (6.7)	2 (3.3)	
<b>Family status</b>						
No Children	941 (58.7)	840 (89.3)	82 (8.7)	12 (2.0)		117(0.00)
Children	662 (41.3)	456 (68.9)	138 (20.8)	42 (6.3)	26 (3.9)	
<b>Household status</b>						
Singles	296 (18.5)	243 (82.1)	28 (12.8)	15 (5.1)		-- 191 (0.00)
Adults only	644 (40.2)	596 (92.5)	44 ( 6.8)	4 (0.6)		
Family	409 (25.5)	296 (72.4)	82 (20.0)	19 (4.6)		
Sing.Parent	71 ( 4.4)	34 (47.9)	19 (26.8)	19 (26.8)	9 (12.7)	
Mul. Family	183 (11.4)	127 (69.4)	37 (20.2)	14 (7.7)	5 ( 2.7)	

**Notes:** a. Row percentages

b. Hispanics, African Americans and Native Americans.

**Table 9.2**

**Food Security Status by Selected Income and Dietary Characteristics**

Indicator	Overall No. (%) <sup>a</sup>	Face valid categorical algorithm				
		Food Secure No. (%)	At risk of hunger No. (%)	Adult Hunger No. (%)	Child Hunger No. (%)	X2 (p value)
<b>Lost Job<sup>b</sup></b>	188 (16.8)	109 (12.4)	45 (26.8)	21 (43.8)	13 (52.0)	70.8 (0.00)
Did not lose job	<u>929 (83.2)</u>	<u>767 (87.6)</u>	<u>123 (73.2)</u>	<u>27 (56.3)</u>	<u>12 (48.0)</u>	
	1117	876	168	48	25	
<b>Income</b>						
<\$5K	71 (6.9)	21 (2.6)	34 (22.5)	12 (27.3)	4 (25.0)	251 (0.00)
\$5-19.9K	138 (13.5)	70 (8.6)	45 (29.8)	16 (36.1)	7 (43.8)	
\$20-34.9K	258 (25.2)	201 (24.8)	43 (28.5)	10 (22.7)	4 (25.0)	
\$35-54.9K	260 (25.4)	238 (29.3)	18 (11.9)	3 (6.8)	<u>1 (6.3)</u>	
\$>54.9K	<u>296 (28.9)</u>	<u>282 (34.7)</u>	<u>11 (3.7)</u>	<u>3 (6.8)</u>		
	1023	812	151	44	16	
<b>Savings</b>						
< \$250	251 (27.3)	107 (15.5)	86 (53.4)	37 (78.7)	21 (91.3)	242 (0.00)
\$250-1000	189 (20.5)	139 (20.2)	42 (26.1)	6 (12.8)	<u>2 (8.7)</u>	
\$1001-10K	221 (24.0)	198 (28.7)	21 (13.0)	2 (4.3)	---	
> \$10K	<u>259 (28.2)</u>	<u>245 (35.6)</u>	<u>12 (7.5)</u>	<u>2 (4.3)</u>	---	
	920	689	161	47	23	
<b>Vegetable Intake at end of month</b>						
Increases	103 (6.6)	60 (4.7)	24 (11.4)	12 (20.7)	7 (26.9)	304 (0.00)
Decreases	112 (7.2)	36 (2.8)	41 (10.4)	23 (39.7)	12 (46.2)	
Stays Same	<u>1350 (86.3)</u>	<u>1174 (92.4)</u>	<u>146 (69.2)</u>	<u>22 (39.7)</u>	<u>7 (26.9)</u>	
	1565	1270	211	58	26	

Notes.

a. All percentages are column percentages.

b. Indicates that someone in the household lost their job in the last three years and was unable to find another job with comparable salary.

**Table 9.3**  
**Food Security Status by Use of Various Government Assistance Programs<sup>a</sup>**

Indicator	Overall No. (%) <sup>a</sup>	Face Valid Categorical Algorithm					
		Food Secure No. (%)	At risk of hunger No. (%)	Adult Hunger No. (%)	Child Hunger No. (%)	X2 (p value)	Risk Ratio <sup>e</sup>
TANF <sup>b</sup>	141 (8.9)	51 (4.0)	55 (25.1)	23 (37.7)	12 (46.0)	218 (0.00)	11.5
Disability	115 (7.2)	76 (5.9)	30 (13.6)	9 (14.8)	1 (3.8)	22 (0.00)	0.6
Food Stamps	205 (12.8)	82 (6.3)	76 (34.5)	33 (54.1)	15 (57.7)	280 (0.00)	9.2
Housing Asst.	76 (4.8)	25 (1.9)	31 (14.2)	15 (24.6)	5 (19.2)	130 (0.00)	10.1
Head Start	25 (1.6)	6 (0.5)	10 (4.5)	7 (11.7)	2 (7.7)	69 (0.00)	15.4
Reduced or Free meals <sup>c</sup>	164 (10.3)	61 (4.7)	62 (28.2)	24 (40.0)	17 (65.4)	263 (0.00)	13.9
Social Security Income	324 (20.6)	15 (25.4)	50 (23.0)	15 (25.4)	5 (19.2)	2 (0.58)	0.8
WIC <sup>d</sup>	79 (35.4)	30 (37.0)	30 (34.5)	11 (32.4)	8 (38.1)	<1 (0.95)	1.0

**Notes:**

- a. All percentages are column percentages.
- b. TANF = Temporary Assistance for Needy Families
- c. Received free or reduced price school lunch, preschool or adult meals.
- d. WIC = Special Supplemental Nutrition Program For Women, Infants and Children.
- e. Risk Ratios indicate the percent experiencing hunger among children divided by percent experiencing food security for the row variable.

**Table 9.4**  
**Food Security Status by Selected Resource Augmentation Behaviors.<sup>a</sup>**

Indicator	Overall No. (%) <sup>a</sup>	Face Valid Categorical Algorithm					
		Food Secure No. (%)	At risk of hunger No. (%)	Adult Hunger No. (%)	Child Hunger No. (%)	X2 (p value)	Risk Ratio
Delays bill payments	204 (12.8)	66 (5.1)	75 (34.2)	44 (72.1)	19 (73.1)	436 (0.00)	14.3
Delays bill often	142 (8.8)	32 (2.5)	56 (25.5)	37 (60.7)	17 (65.4)	15 (0.002)	26.2
Borrows food or money	183 (11.5)	53 (4.1)	66 (30.0)	44 (73.3)	21 (80.8)	490 (0.00)	19.7
Borrows often	125 (7.8)	32 (2.5)	42 (20.5)	33 (54.1)	18 (69.2)	13.2 (0.01)	27.7
Uses pantry	181 (11.5)	37 (2.9)	85 (38.6)	37 (60.7)	24 (92.3)	569 (0.00)	31.2
Uses pantry often	121 (7.5)	21 (1.6)	58 (26.4)	25 (40.0)	17 (65.3)	2 (NS)	40.8
Children sent to friends	18 (1.1)	---	4 (1.8)	7 (12.1)	7 (26.9)	231 (0.00)	
Children sent often	14 (0.9)	---	4 (1.8)	4 (6.6)	6 (23.0)	9.3 (0.03)	

**Notes:**

- a. All percentages are column percentages.
- b. Risk Ratios indicate the percent experiencing hunger among children divided by percent experiencing food security for the row variable.

**Table 9.5**  
**Household Size Versus Food Security Status for Households Without Children: Number (Percent)<sup>ab</sup>**

Household size	Face Valid Food Security Algorithm			
	Food Secure	At risk of Hunger	Adult hunger	Total
One	242 (82.3%)	37 (12.6%)	15 (5.1%)	292 (31.2%)
Two	417 (93.9%)	25 (5.6%)	2 (0.5%)	444 (47.2%)
Three	113 (89.0%)	12 (9.4%)	2 (1.6%)	127 (13.5%)
Four	67 (89.3%)	8 (10.7%)		75 (8.0%)
Total	840 (89.3%)	82 (8.7%)	19 (2.0%)	938

Note:

- a. All percentages are row percentages except for the total column which includes column percentages.
- b. Pearson's Chi-Square Value  $\chi^2=34.7$ ,  $df=6$ ,  $p=0.00$ .

**Table 9.6**  
**Number of Children Versus Food Security Status: Number (Percent) <sup>abc</sup>**

Number of children	Face Valid Categorical Algorithm				
	Food Secure	At risk of hunger	Adult hunger	Child Hunger	Total
<b>1 child</b>	209 (74.4%)	52 (18.5%)	14 (5.0%)	6 (2.1%)	281 (42.5%)
<b>2 children</b>	152 (78.8%)	28 (14.5%)	11 (5.7%)	2 (1.0%)	193 (29.2%)
<b>3 children</b>	68 (58.6%)	35 (30.2%)	5 (4.3%)	8 (6.9%)	116 (17.5%)
<b>4+ children</b>	27 (38.0%)	22 (30.9%)	12 (16.9%)	10 (14.1%)	71 (10.7%)
<b>Total</b>	456 (68.9%)	137 (20.7%)	42 (6.4%)	26 (3.9%)	661

Notes:

- a. All percentages are row percentages except for the total column which includes column percentages.
- b. Pearson's Chi-Square Statistics:  $X^2=73$ ,  $df=12$ ,  $0=0.00$ .
- c. The risk ratio of hunger (adult and child) for a family with 4+ child compared to a family with one child is 4.36:  $[12+10]/71 / [14+6]/281$ .

**Table 9.7**  
**Four-part Food Insufficiency Question Versus Food Security Status: Number (Percent)<sup>ab</sup>**

Four-part Food Insufficiency	Face Valid Categorical Algorithm				
	Food Secure	At risk of hunger	Adult hunger	Child Hunger	Total
Enough food & kinds wanted	1148 (90.0%)	104 (8.1%)	16 (1.3%)	7 (0.5%)	1275 (79.6%)
Enough food/not always kind wanted	140 (52.0%)	96 (35.7%)	28 (10.4%)	5 (1.9%)	269 (16.8%)
Sometimes Not enough	6 (1.2%)	19 (38.7%)	12 (24.5%)	12 (24.5%)	49 (3.1%)
Often not enough		1 (12.5%)	5 (62.5%)	2 (25.0%)	8 (0.5%)
Total	1294 (80.8%)	220 (13.7%)	61 (3.8%)	16 (1.6%)	1601

Notes.

- a. All percentages are row percentages except for the total column which includes column percentages.
- b. Pearson's Chi-Square Statistics:  $\chi^2=595$ ,  $df=12$ ,  $O=0.00$ ,  $r=.534$ .

**Table 9.8**

**One Way ANOVA of Selected Variables by Food Security Status (Mean and Standard Error of the Mean)**

Variable	Food Secure (mean±sem)	At risk of hunger (mean± sem)	Adult Hunger (mean± sem)	Child Hunger (mean± sem)	F (p value)
<b>All households (n=603)</b>					
◆ Food security scale measure (n=302)	None	-2.84 ±0.09 <sup>a</sup>	0.10±0.19 <sup>b</sup>	1.61±0.31 <sup>c</sup>	188 (0.00)
◆ Resource Augmentation Index	0.2±0.0 <sup>a</sup>	1.8 ±0.1 <sup>b</sup>	3.8 ±0.2 <sup>c</sup>	5.0 ±0.3 <sup>d</sup>	582 (0.00)
◆ Respondent daily vegetable Intake	2.02±0.04 <sup>a</sup>	1.67±0.08 <sup>b</sup>	1.45 ±0.16 <sup>b</sup>	1.0 ±0.12 <sup>b</sup>	9.8 (0.00)
◆ Maximum Saimin intake per month	3.7±0.2 <sup>a</sup>	8.4 ±0.9 <sup>b</sup>	7.9 ±1.2 <sup>b</sup>	13.5±2.3 <sup>b</sup>	28 (0.00)
<b>Households without children</b>					
◆ Total household size	2.04±.03 <sup>a</sup>	1.94±.12 <sup>a</sup>	1.31±.15 <sup>b</sup>		5.3 (0.001)
◆ Total number of seniors	1.4±.03 <sup>a</sup>	1.0±.13 <sup>b</sup>	0.2±.13 <sup>c</sup>		26 (0.00)
◆ Saimin	2.3±.22 <sup>a</sup>	4.5±.99 <sup>b</sup>	4.3±.1.2 <sup>b</sup>		3.5 (0.03)
<b>Households with children</b>					
◆ Total number of children	1.0±.05 <sup>a</sup>	2.3±.12 <sup>b</sup>	2.8±.34 <sup>b</sup>	3.0±.28 <sup>b</sup>	16 (0.00)
◆ Total number of seniors	1.09±.63 <sup>a</sup>	.049±.08 <sup>b</sup>	0.60±.22 <sup>b</sup>	.23±.11 <sup>b</sup>	12 (0.00)
◆ Saimin	5.0±0.4 <sup>a</sup>	10.7±1.3 <sup>b</sup>	9.8±.1.7 <sup>a</sup>	13.5±.2.3 <sup>b</sup>	10 (0.00)

Notes: All tests were conducted with Tukey's post-hoc test after significant F tests. Superscripts indicate that mean values across a row were not statistically significantly different from mean values marked with the same letter.

**Table 9.9**  
**One Way ANOVA of Respondent Food Security Scale Values<sup>a</sup> by Selected Variables**  
**(n=304)**

Variable	Mean ± Standard Error	N	Tukey Post Hoc Test <sup>b</sup>	F(pvalue)
<b>Ethnicity</b>				
Caucasian	-1.58±.22	91	> 0.05	2.69 (0.01)
Hawaiian	-1.51±.23	90		
Samoan	-1.45±.51	15		
Filipino	-2.79±.26	48		
Japanese	-2.77±.40	16		
Other Asians	-1.99±.55	13		
Other/Mix/Unidentified	-2.52±.66	12		
Hispanic/African	-1.97±.50	20		
American/Native American <sup>a</sup>				
<b>Household Income</b>				
<\$5K	-1.49±.30	50	> 0.05	2.2 (0.07)
\$5-19.9K	-1.33±.28	68		
\$20-34.9K	-2.16±.25	56		
\$35-54.9K	-2.44±.40	22		
\$>54.9K	-2.30±.57	13		
<b>Household Savings</b>				
< \$250	-1.16±.19	143	a	8.45 (0.00)
\$250-1000	-2.31±.24	50		
\$1001-10K	-2.91±.32	23		
> \$10K	-2.71±.30	13		
<b>Vegetable intake at end of the month</b>				
Increases	-1.08±.34	42	a	22.6 (0.00)
Decreases	-.84±.24	76		
Stays the same	-2.52±.14	175		

**Notes:**

- a. Respondent scale measures were calculated using the Rasch model in Chapter 7. Larger food security values (less negative) indicate more severe food insecurity.
- b. All tests were conducted with Tukey's post-hoc test after significant F tests. a = mean value significantly different than all those unmarked.

**Table 9.10**  
**Correlation Between Food Security Scale Measures and Selected Indices (n=304)**

Selected variables	Correlation Coefficient	p value
<b>Factors with direct relationship with deteriorating food security status</b>		
Resource Augmentation Index	0.58	0.00
Use of a food pantry	0.37	0.00
Delaying bill payment to have money for food	0.30	0.00
Child sent to friend or family members house often	0.25	0.01
Someone in the household lost their job in the last three years and couldn't find another with a comparable salary	0.24	0.00
Child sent to friend or family members house	0.23	0.00
Delays bill payment to have money for food often	0.22	0.00
Household member receives food stamps	0.21	0.00
Household receives housing assistance	0.17	0.00
Household receives welfare assistance	0.15	0.01
Total number of children in household	0.14	0.00
Use of the Head Start Program	0.12	0.04
<b>Not Significant/No relationship with deteriorating food security status</b>		
Number of times saimin eaten per month	0.11	0.07
Frequent food pantry use	0.10	0.14
Household size	0.07	0.23
Presence of one or more child in household	0.06	0.27
Someone in household receives unemployment benefits	0.06	0.31
Someone receives social security income	0.02	0.76
<b>Inverse relationship with deteriorating food security status</b>		
Mean daily vegetable intake	-0.14	0.014
WIC program participation	-0.19	0.026
Number of seniors in household	-0.21	0.000

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**Table 9.11**  
**Summary of Concurrent Validity Findings**

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**Factors concurrently related to increased hunger**

- ◆ Resource Augmentation behaviors (delayed bill payments use of a food pantry, etc).
- ◆ Someone in the household lost a job in the last three years
- ◆ Inadequate savings
- ◆ Use of food stamps, housing assistance, welfare assistance
- ◆ Single parent household
- ◆ Single adult household
- ◆ Increased number of children
- ◆ Decreased or no seniors
- ◆ Inadequate savings
- ◆ Overall decreased vegetable intake
- ◆ Decreased or increased vegetable intake at the end of the month
- ◆ Hawaiian, Caucasian or Samoan ethnicity

**Factors concurrently related to decreased hunger**

- ◆ Two or more adults in household
- ◆ One or more seniors in household
- ◆ WIC program participation
- ◆ Adequate savings
- ◆ Japanese ancestry

**Factor unclear without further analysis**

- ◆ Frequent use of a food pantry
  - ◆ Social security income
  - ◆ Unemployment benefits
-

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**Table 9.12**  
**Research Questions Raised From Concurrent Validity Study**

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- ◆ Can nutrition security be measured?
  - ◆ Can food and nutrition education, in itself, without food or financial support increase food and/or insecurity?
  - ◆ Which government and non-profit programs are most effective and cost-effective in enhancing food and/or nutrition security?
  - ◆ What is the health consequence between those who increase and decrease their vegetable intake at the end of the month?
  - ◆ What causes or supports those who do increase or maintain adequate intake of vegetables despite periodic food insecurity?
  - ◆ What is the true financial cost of increasing fruits and vegetables? Does it vary with convenient access to lower cost produce?
  - ◆ What is the impact of frequently eating a high sodium, high saturated fat staple like Saimin noodles?
  - ◆ What is it that seniors provide that increases likelihood of food security?
  - ◆ Is the CFSM and face valid algorithm reliable and valid with Samoans?
  - ◆ What impact will increasing community food security have on those experiencing food insecurity?
  - ◆ What is the best ways to increase and maintain food security over time?
  - ◆ What is the true impact of welfare reform on food security status?
-

## CHAPTER 10

### Overall Conclusions and Recommendations

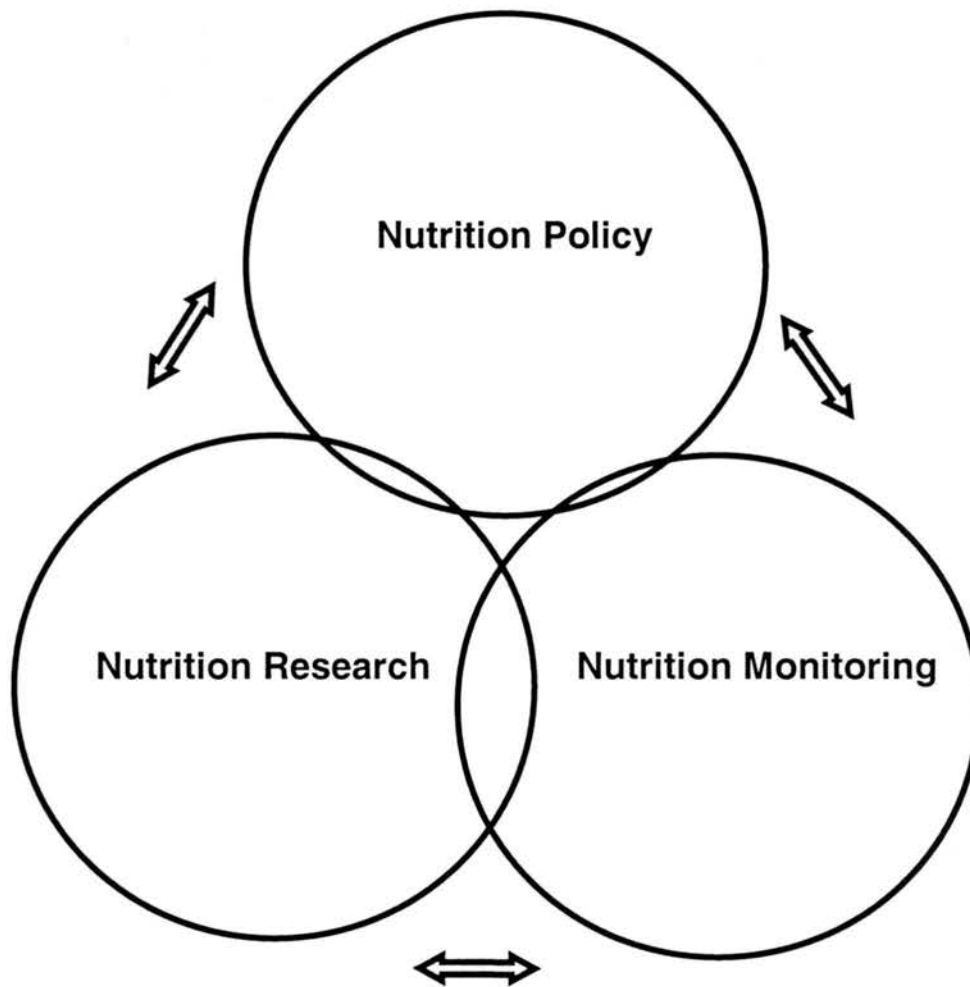
#### Introductory Framework

The primary objective of this project was to conduct an independent validation of the 18-question Core Food Security Module (CFSM) used nationally to measure the extent and severity of food security status with Asians and Pacific Islanders residing in Hawai'i. This included an estimate of the reliability and validity of the CFSM. If the CFSM was not found to be reliable and valid, an alternate module would have been developed. This is the first study to comprehensively assess the CFSM scale of indicators and the national food security categorical algorithm with an ethnically diverse population and a sample of charitable food assistance recipients.

Tied to this objective, the overall research question was:

*Does the 18 question CFSM and the conceptual framework it is based on, accurately and reliably describe food insecurity and hunger in Hawai'i, a state where 50% of the population is of Asian or Pacific Islander ancestry?*

Additional questions and hypotheses pursued to support the primary objective and research question are discussed in the context of the summary of findings.



**Figure 10.1**  
**Relationship Between Nutrition Policy, Nutrition Research and Nutrition Monitoring.**

Adapted from Department of Health and Human Services, Department of Agriculture. (1993) Ten-year Comprehensive Plan for the National Nutrition Monitoring and Related Research Program; Federal Register. Friday June 11, 1993. 58:32 753-806.

Figure 10.1 depicts the interdependent relationship between nutrition research, nutrition policy making and nutrition monitoring (USDHHS, USDA, Federal Register, 1993). The CFSM was developed by researchers to provide the public, program managers and policy makers with valid and reliable information about the extent and severity of food insecurity (Hamilton *et al.*, 1997a). Surveillance experts have considered research findings on the CFSM and are working to determine how to monitor food security status in a cost-effective, accurate, reliable and useful manner (Blumberg *et al.*, 1998). Based on information generated from food security monitoring, policy makers should create appropriate agricultural and economic policies, then decide how much funding to appropriate toward food assistance and for related research programs. In a similar fashion, the ultimate aim of this validation project was to create a valid and reliable food security monitoring instrument, which would assist policy makers in crafting legislation to cost-effectively ameliorate food insecurity and hunger. Therefore, this final chapter attempts, after encapsulating findings and limitations, to draw implications for future food security research, monitoring and policy.

### **Reliability and Validity of the CFSM**

“Reliability refers to the consistency or stability of an operational definition: validity to the goodness of fit between an operational definition and the concept it is purported to measure” (Singleton *et al.*, 1993, p. 131). In order to be valid a measure must be reliable. However, a reliable measure is not necessarily valid. Research described in Chapters 3, 7, 8 and 9 respectively discuss the face and scale validity of the CFSM, validity of various categorical algorithms and concurrent validity of the scale measure and the “face valid” categorical algorithms with Hawai`i residents. Reliability and stability of the CFSM scale measure and the categorical algorithm were discussed in Chapters 4, 7 and 8.

## **Validity of the CFMS Scale Measure and the National Food Security Categorical Algorithm**

Face Validity. Face validity assessment seeks to answer the question of whether or not the items in a measurement tool are appropriate and make sense to people who work in the field and develop policy, given their understanding of the problem. It is not a statistical evaluation, but an interactive process through which direct feedback from the intended target audience, key informants and policy makers is used to evaluate the degree to which the measure appears to measure the item(s) of interest. Technically, it involves a comparison of the conceptual definition (as known by experts or the target audience) and the operationalized measurement definition of a concept (Hessler, 1992).

Findings outlined in Chapter 2 confirmed that in a sample of 9 focus groups (n=61), lower income families in Hawai'i generally experienced food insecurity and hunger, then managed their situation in ways that were consistent with food security literature (Radimer *et al.*, 1992). Qualitative findings also confirmed the face validity of the operationalized framework for food security measurement used by the federal government (Appendix 2: Bickel *et al.*, 1996). Thus, the face validity of the CFMS was confirmed with Asians and Pacific Islanders in Hawai'i. It did not appear that an alternative set of questions would better measure food security status among Asians and Pacific Islanders in Hawai'i. Preliminary cognitive testing indicated that, except for question (Q) Q4. "(un)able to eat balanced meals," respondents generally interpreted questions and responses as expected. Although Q4 was generally understood as meaning a "meal containing a starch, meat and vegetable" many respondents had other perceptions, and some had no ideas what it meant. Thus, the validity and reliability of the Q4 is questioned.

As reported in Chapter 4 to the nature of the questions asked, the CFMS is difficult to administer in person or over the phone. It is an invasion of privacy and all questions pertaining to children are particularly difficult for parents struggling with hard times. Care was taken to keep a non-

judgmental, empathetic phone atmosphere, to use standard protocols, and to minimize bias (Lavarkas, 1988).

Scale validity. Using methods which to the extent possible replicated methods used to originally create the 18 question CFSM, overall findings outlined in Chapter 6 indicated that the 18 question CFSM fit as well with Hawai'i residents (n=1664) as it did in a national sample (Hamilton *et al.*, 1997b). There were no statistically significant differences in rates of respondent misfit among the ethnic groups studied, except possibly among the Samoans, although small sample size (n=23) and a higher rate of hunger among the Samoans limits any confidence of this conclusion. Item fit statistics did not vary with the household status, food security status, or with the source of sample (population or charitable food assistance recipients). Problems with large gaps between the item calibration values of items (item placement on the scale), poor fit of Q4, Q8 and Q8a, suggest room for improvement in the 18-question CFSM scale. A more precise and colloquial wording of Q4 (Chapter 5), combined with further research on food insecurity questions which target gaps in the scale were recommended.

Categorical algorithm validity. The national food security categorical algorithm classifies households with either 1 or 2 affirmative responses as food secure (Hamilton *et al.*, 1997b). This means that households who respond affirmatively to any two items, most likely Q2 "worried food would run out" and Q3 "that food didn't last" are classified as food secure despite affirming one or more indicators of food insecurity. The algorithm relies on a response pattern that is consistent with the national modal response pattern to categorize hungry respondents.

The validity of the national food security algorithm was first questioned in the pilot test of the CFSM (Chapter 4):

*" . . . national food security categorical algorithm runs counter to an intuitive understanding of food insecurity and is intrinsically conservative. It is difficult for many respondents to admit their food*

*insecurity to a phone interviewer . . . the probability of a false positive seems low, while the probability of a false negative seems higher.”*

Findings outlined previously regarding scale validity assessment in addition to the further investigation of response patterns also questioned the face validity and credibility of the national food security categorical algorithm (Chapter 8):

- ◆ Thirty (27%) of the 111 households identified as food secure with one or more affirmative responses responded affirmatively to Q4 “unable to eat balanced meals, and seven (6.3%) to Q9 indicating perceptions of eating less than they should.
- ◆ Seventeen (10.9%) of the 158 households classified as food insecure responded affirmatively to Q10, “respondent hungry.”
- ◆ Only 32 (50%) of 64 households classified as experiencing moderate hunger responded affirmatively to Q10, “respondent hungry”;
- ◆ Only 21 (67%) of 31 households classified as experiencing severe hunger responded affirmatively to either Q12 “adults did not eat for a whole day” or to Q14 “children hungry” .

Although alternative algorithms based on methods used by other food security researcher teams (Radimer *et al.*, 1992, Wehler *et al.*, 1992) had merit, a new algorithm based on the face validity of responses was thought best. In the face valid food security categorical algorithm those with one affirmative response were classified as “at risk of hunger”; those who responded affirmatively to the respondent hunger question (Q10) or child hunger question (Q14) were classified as such, regardless of other responses. Compared to the national algorithm, the face valid algorithm resulted in a lower proportion classified as food secure (85% vs. 78%), a greater percentage who were consistently classified as food insecure over time (57% vs. 80%), while a similar percentage were classified as experiencing adult hunger (3.8 vs.4.3%), and very similar percentage experiencing severe or child hunger (1.9% vs. 2.0%). The criteria for developing an alternative national food security algorithm were suggested in Chapter 8.

Concurrent validity. Concurrent validity assesses “the ability of a measure to indicate an individual's present standing on the criterion variable” (Singleton, 1993: p. 124), and was presented in Chapter 9. Given that findings indicated the face valid algorithm was deemed a more valid measure of food security than the national food security categorical algorithm, concurrent validity assessment was described and discussed only with the face valid algorithm. Findings on the concurrent validity of the national food security algorithm are presented in Appendix 12, but are not discussed because of face validity concerns although the algorithm appeared to have concurrent validity with the measures studied.

Qualitative findings outlined in Table 3.3 indicated which questions in a predominately Asian and Pacific Islander low income population were likely to be useful predictors of food security status. However, only factors which could be measured within the cost and time constraints of this study were utilized for concurrent validity assessment. In general, progressively deteriorating food security status as experienced among Hawai'i residents resulted in: concurrent decreases in vegetable intake, increased reliance on a cheap, high fat, high sodium noodle product, and increased reliance on resource augmentation behaviors. Factors such as a greater number of children, limited savings, and recent loss of a job were found to compromise food security status. Factors such as WIC benefits and frequent use of a food pantry, as well as the presence of a senior in the household were likely protective factors.

The second research question queried whether or not there were differences in food security status between ethnic groups in Hawai'i. Due to limitations in the sample, which are discussed in the next section, this question could not be conclusively answered at this time. However, results indicate that differences in food security status among ethnic groups in Hawai'i are quite likely. In this sample Asians, except for Filipinos, were more food secure. Whereas Hawaiians and part-Hawaiians, and Samoans, who comprised the majority of other Pacific Islanders studied, were more likely to be at risk of hunger and more likely than other Asian groups to report hunger among children.

### **Reliability of the 18 question CFSM scale measure and the categorical algorithm**

Pilot findings outlined in Chapter 4 indicated that the CFSM scale of 18 items was internally consistent in a sample of food pantry recipients in Hawai'i (n=77). However, when reliability was assessed using Rasch methods in Chapter 7 (n=1664), although the rate of misfitting response was acceptable, standard errors in respondent food security measures were moderately high. An investigation of the modal pattern completed in Chapter 8 confirmed that response variability was great enough to affect the application of the categorical algorithm. Q4. "unable to eat balanced meals" had an unacceptably high rate of misfit that was likely related to an inconsistent perception of the meaning of the term "balance meals" (Chapters 3 and 5).

Stability assessments (n=61) were completed for the individual items (Chapter 4), for the respondent food security measures (Chapter 7), and for the national and face valid algorithms (Chapters 4 and 8). Data was collected a mean of 11 days apart using similar data collection methods and the exact same instrument. Although, in general, correlation coefficients of item responses over time were not above 0.70, they were either statistically significant or approached significance. Because food security scale measures at time 1 and 2 were highly correlated (r=.75), with mean values that were not statistically significant, it can be concluded that the respondent food security scale measure was stable over time with a sample of ethnically diverse charitable food recipients.

Stability of CFSM and face valid categorical algorithms. Even though classification of affirmative responses with the CFSM food security categorical algorithm were dependent over time ( $\chi^2 = 68.6, 3 \text{ df}, p = 0.00$ ), only 57% were classified consistently as food insecure without hunger over time. Therefore, if the criteria of having 70% of respondents be consistently classified over time as food insecure was applied, one would conclude that the CFSM categorical algorithm was not

stable with the sample of charitable food recipients from Hawai'i over time. Various algorithms were assessed in an attempt to improve the validity and stability of the CFMS categorical algorithm developed from the 18 CFMS indicators. Thirty-one of 39 (80%) of those classified as "at risk of hunger" by the face valid algorithm were consistently classified over time. Using the same standard as above, one would conclude that the face valid categorical algorithm was stable with the sample of charitable food recipients from Hawai'i.

Variance in interviewers, timing, and the conditions of interview are all known to affect the stability of an instrument (McGuinness, 1996). Due to the nature of the questions asked, the CFMS is difficult to administer in person or over the phone. It can appear to respondents as an invasion of privacy and is particularly difficult for parents struggling with hard times. The circumstances in timing, the interviewers, and the condition of the respondent all varied and could have affected the stability and validity of responses. This concern was discussed by researchers at the Second National Food Security Monitoring and Research conference (Tables 2.7 and 2.8) and may warrant a large scale, multi-context investigation to clarify ramifications of distinct data collection methods. In addition, the respondent burden of multiple questions on the extent of hunger, particularly of households with children should be considered. Use of a shorter instrument may minimize respondent burden.

Factors enhancing validity and generalizability. Generally, in an experimental study, internal validation is enhanced by strong experimental design. A quality design includes: a control group, random assignment to rule out possible effects of extraneous variables, a probability sample, and consistent data collection protocols. If the same results are found in different setting by different researchers who use the same method then replication has occurred and external validity is enhanced. When there are multiple replications using the same methods and with the same findings, external validity or generalizability is confirmed and an instrument may be called robust.

Various efforts were employed to enhance the generalizability of this study's findings and conclusions. In this study, Caucasians who were the primary participants in most of the food security measurement research conducted in the U.S. thus far, could be construed as the control group. Except for the scale validity of the Samoans, there were no noticeable or statistically significant differences in validity findings between Caucasians and the other ethnic groups studied. Sampling of the general population via the Hawai'i Health Survey which comprised 88% of the sample used for scale, categorical and concurrent validity assessments, was a random probability sample.

### **Limitations Related to the Primary Objective**

The experimental design, data collection methods, and combined qualitative and quantitative aspects of this project were designed to minimize bias and objectively document outcomes. Yet, Asians and Pacific Islanders are a conglomerate of diverse ethnic entities, each with their own unique culture and food habits (Palafox & Warren, 1980; Corum, 1983). In an ideal situation where funding and time are unlimited:

- each ethnic group would have been studied separately with samples that represent a cross section of U.S. residents;
- the detail of information on demographic, dietary and income-related variables would have been enhanced; and
- qualitative research would have included households without children.

The population in Hawai'i--consisting predominately of Caucasians, Japanese, Hawaiians and Part-Hawaiians, and Filipinos--is a unique and ever-changing blend of cultures. Given this ethnic diversity, the primary question regarding generalization of these findings is whether or not the samples used were valid representations of the Asian and Pacific Islander residents of Hawai'i.

In this study, ethnicity was self-reported based on the respondent's perception. For households with members of various ethnic backgrounds, the ethnicity declared by the respondent may be different than the ethnic disposition of other members of the household. Yet, self-report is how ethnicity is reported on vital statistics, census surveys, and in similar research efforts conducted in Hawai'i (DBEDT, 1997; Derrickson & Gans, 1996). There is no gold standard or definitive criterion of ethnicity. Instead, how one responds to the question "With which ethnic group do you identify with most?" is based on one's cultural sense and pride more than on one's blood quantum or lineage. For example, part-Hawaiians, who look Caucasian and are over 75% Caucasian, commonly refer to themselves as part-Hawaiian if they regularly eat traditional foods, participate in cultural activities, and share traditional Hawaiian values.

As documented in Chapters 3, 4 and 9, the samples gathered in the qualitative study and the food pantry samples were generally reflective of limited resource residents of Hawai'i, (DBEDT, 1997; DHS, 1998). However, the small size in the populations of other ethnic minorities in Hawai'i known to experience food insecurity, i.e., Micronesians, Vietnamese, and even Samoans made these groups too small to study without specifically targeting these groups. Each group comprises less than 2% of the general population, but Samoans make up an estimated 6% of the population receiving food stamps (DHS, 1998). Therefore, only the Asian and Pacific Islander groups residing in Hawai'i with more than 8-10% of the general population—Hawaiians and Part-Hawaiians, Filipinos and Japanese (DBEDT, 1997)— were adequately assessed in this study. Additional work, ideally with Asians and Pacific Islanders of varying degrees of Westernization acculturation, such as Samoans from Western Samoan, American Samoa and American Samoans residing in the U.S, with native researchers or research collaborators is needed to confirm the validity of utilizing of the CFMS among Asians and Pacific Islanders representing a smaller proportions of the overall population.

Along these same lines, although unknown prior to the study, the statewide population survey, although random, was not a representative cross-sectional sample of all residents. Residents in

two counties were over sampled and weights were not available to adjust for this sampling affect on food security measurement. Thus, although estimates of ethnicities are similar to other estimates of ethnic distribution (DBEDT, 1997), they are not true cross-section estimates of food security status among ethnic groups in Hawai'i. In addition, due to the nature of a telephone interview, language proficiency could also have been a barrier. As described in Chapter 4, those who could not speak English well, i.e., first generation immigrants or recent immigrants from the Philippines, Vietnam, Micronesia and American Samoa, were likely underrepresented in the population survey. However, underrepresentation of non-English speakers is common to all telephone surveys of this nature. In addition, access to a telephone itself is a barrier that should not be discounted in surveillance efforts, as food insecurity is likely to be higher among those who do not have phones. Additional discussion on potential survey limitations is provided in Chapters 4 through 9.

### **Summary and Conclusions**

The key findings of this project are summarized in Table 10.1. In comparison to the "five judgements of internal validity" outlined in Table 2.1, findings support:

- a. Explanation credibility (Chapter 4 and 9);
- b. Translation feasibility (Chapter 8 and 9);
- c. Demonstration relationship (Chapter 4 and 9);
- d. Credible results which are generally in comparable to others findings (most notably: face validity: Radimer *et al.*, 1992; scale validity: Hamilton *et al.*, 1997b.: categorical and concurrent validity: Hamilton *et al.*, 1999b, Frongillo *et al.*, 1997, Kendall *et al.*, 1996).

However, the fifth judgement, "rival explanations eliminated," could not be fully addressed. Food insecurity is a multi-causal experience closely tied to poverty, and the availability of food, and one's willingness to depend on resource augmentation behaviors. In order to completely

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**Table 10.1**  
**Summary of Key Findings**

- ◆ The face validity of the CFMS with Hawaiians, Filipinos, Caucasians and Samoans residing in Hawai'i was confirmed (Chapter 3).
- ◆ Due to the nature of questions asked use of multiple questions, particularly extensive questions pertaining to hunger among children may be justified, and may place insensitive respondent burden on food insecure households with children. Consideration of this issue warrants further investigation of shorter food security measures. (Chapter 4)
- ◆ "Balanced meals" was most often perceived as a meal with "meat, starch and vegetable". Misunderstanding of Q4 "(un)able to eat balanced meals" is likely affecting the validity and reliability of responses. (Chapter 5).
- ◆ The question "Not counting salads or potatoes, how many servings of vegetables do YOU usually eat each day? Count ½ cup, the size of a pudding cup, as one serving" yields a reasonably reliable and valid measure of average daily vegetable intake (Chapter 6)
- ◆ The CFMS yields valid and reliable scale measures among Asian and Pacific Islanders in Hawai'i, except possibly with American Samoans, with whom additional research is needed. Q4, Q8 and Q8a fit poorly compared to established criteria of goodness-of-fit. (Chapter 7)
- ◆ Rasch measurement is limited when measuring a phenomenon such as food security status in which a large proportion of respondents do not respond affirmatively to any of the questions asked. This questions whether or not the food security scale can be considered the gold standard for measuring food security status (Chapter 7)
- ◆ Based on the qualitative perceptions of hunger, weak credibility and stability of categorization; the national food security categorical algorithm may not be a valid or stable measure of food security status nor may it be the best algorithm to use nationally. The proposed "face valid" algorithm—in which one affirmative response is classified as "at risk of hunger" and those who responded affirmatively to the respondent hunger question (Q10) or child hunger question (Q14) were classified as such, regardless of other responses—may be preferable. Compared to the national algorithm, the face valid algorithm resulted in a lower proportion classified as food secure (85% vs. 78%), a greater percentage who were consistently classified as food insecure over time (57% vs. 80%), while similar proportions classified as experiencing adult (3.8 vs.4.3%) and very similar percentages experiencing severe or child hunger (1.9% vs. 2.0%). (Chapter 8)
- ◆ In general, progressively deteriorating food security status as experienced among Hawai'i residents, resulted in concurrent decreases in vegetable intake, increased reliance on a cheap, high fat, high sodium noodle product, and increased reliance on resource augmentation behaviors. Factors such as a greater number of children, limited savings and recent loss of a job were found to compromise food security status. Factors such as WIC benefits and frequent use of a food pantry, as well as presence of a senior in the household were likely to be protective factors. (Chapter 9)
- ◆ Hawaiians and Part-Hawaiians, and Samoans are likely to be disproportionately food insecure in Hawai'i. (Chapter 9).

eliminate rival explanations adequate controls over and measurement of financial indices over time would be needed (Gunderson & Guber, 1999).

Prior to a discussion on generalizability, two fundamental and related issues arise. First, is the CFMS really applicable among the Asians and Pacific Islanders studied? Second, do findings support a general application of the CFMS to Asians and Pacific Islanders across the U.S. and in a larger context across the world? While the previous caveats with respect to limitations of the sample have been discussed, findings suggest that the CFMS scale measure, categorical algorithm and face valid categorical algorithm were as valid among the Hawaiians and Part-Hawaiians, Japanese and Filipino residents in Hawai'i as they were among the Caucasians in Hawai'i. In terms of the external validity or the generalizability of these findings, the results are likely to be translatable and replicable; and the methods applicable to studies with other ethnic groups. However, the generalizability of these findings is truly limited to the ethnic groups studied. Since there is no known basis or research on food security measurement among other Asian and Pacific Islander groups residing in the United States, and there is a wealth of literature documenting the differences in food and cultural habits, one should cautiously assume that the CFMS doesn't fit until one can prove that it does. Therefore, prudence should be utilized when extending findings to ethnic groups not studied adequately in Hawai'i, and to other Asians and Pacific Islander groups who reside in the United States but who were not studied.

Yet, the fit of the CFMS among the ethnic groups studied in Hawai'i was better than expected and yielded goodness of fit statistics remarkably similar to the original sample from which the CFMS was developed (Hamilton *et al.*, 1997). Furthermore, across the nation, relatively few Chinese, Japanese, and Korean Americans are food insecure (Hamilton *et al.*, 1997a). Thus, it seems appropriate based on these findings to suggest that the CFMS is a valid instrument to use when a) the proportion of Asians and Pacific Islanders is relatively small, such as less than 2% of the population under study, and not expected to be excessively food insecure, or in Hawai'i; and

b) in other places where the population of Asians and Pacific Islanders is similar to the composition in Hawai'i. However, when the population includes an ethnic group not studied adequately herein, such as Vietnamese or Hmong in various counties across the nation, additional validation work is warranted prior to using the CFSM.

This three-part validation effort utilized may be a model for future researchers attempting validation of the CFSM with other ethnic groups. Regardless, the robustness or external validity of the CFSM across various minorities in the United States can not be fully determined until there are multiple replications of similar studies with various ethnic groups.

### **Implications and Recommendations**

As in any research effort of this nature additional research questions abound. Most questions have been addressed in detail in the preceding chapters. Tables 10.2 and 10.3 list all major questions related to food security research and monitoring identified and supported by this research. Not surprisingly, many recommendations concur with those of the Federal Interagency Working groups on Food Security Measurement outlined in Tables 2.6 and 2.7; preliminary findings were reported at the Second Food Security Measurement and Research conference in February, 1999. Table 10.4 outlines policy related issues.

This discussion of implications is limited to the linkages between the objectives of this project and the interdependent relationships between nutrition research, monitoring, and policy. At the outset of this project, the following outcomes were expected:

1. An independent assessment of the robustness of the CFSM in a state population and among charitable food recipients consisting of a majority of Asians and Pacific Islanders;

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**Table 10.2**

**Food Security Measurement Research Questions For Future Research**

- ◆ Should food insufficiency or a more tightly defined aspect of food security status be measured rather than “availability of nutritionally adequate food” which is the focus of the 18 question CFMS?
- ◆ Are the CFMS and categorical measure robust across ethnic groups in the United States?
- ◆ Which food insecurity indicators should be added to fill gaps in the item calibration of scale, and to more accurately and consistently classify the food secure from the food insecure?
- ◆ Can Q4. “(un)able to eat balanced meals” be revised to enhance the reliability, validity and cultural sensitivity of this indicator of dietary quality?
- ◆ What is it that seniors provide that increases the likelihood of food security? Does lower prevalence of food insecurity among seniors represent a measurement bias?
- ◆ How can nutrition security be measured?
- ◆ Do food security responses vary depending on the data collection method utilized, i.e., one on one interview vs. phone interview?
- ◆ How can the amount of time a household spends at a certain food security category be most accurately and reliably measured?
- ◆ Is the CFMS the gold standard of food security measurement?

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**Table 10.3**

**Food Security Monitoring Questions For Future Research**

- ◆ What are the publics' and policy makers' perceptions of food insecurity and understanding of the national presentation of CFSM measurement? Would a categorical algorithm based on the face validity of responses be better understood and more consistently understood by the public and policy makers?
  
  - ◆ Should a smaller subscale, like the six-question food security measure be used for monitoring or should the entire 18-question instrument be used?
  
  - ◆ How often and how fully should the extent and severity of food security be monitored?
  
  - ◆ What surveys should be used to monitor food security status? Should the 18 question CFSM be part of the census, other surveillance systems, or a shorter food security monitoring tool be used?
  
  - ◆ Should the four-part food insufficiency question be discontinued as a food security measure? Should it be used as a screening tool prior to the 18 CFSM questions?
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**Table 10.4**

**Food and Nutrition Security Policy Questions**

- ◆ What are the most effective ways to improve and maintain food security status over time?
- ◆ What is the true impact of welfare reform on food security status?
- ◆ What impact will increasing community food security have on those experiencing food insecurity?
- ◆ Should funding for WIC and other food assistance programs be enhanced?
- ◆ What can be done to permanently and most cost-effectively minimize ethnic disparity in food security status?
- ◆ Should food security status be monitored as an outcome or prerequisite to federal food assistance?
- ◆ How much should the government depend on non-profit assistance to provide a food and nutrition safety net?
- ◆ Should the government protect a right to adequate intake of food?
- ◆ What can be done to minimize the stigma and other barriers to participation in public and private food assistance programs?

2. Enhanced knowledge and measurement of predictor variables (causes, health, and experiential outcomes, and the various coping behaviors people utilize to ameliorate their situation) that can assist policy makers and educators in designing more effective programs and improving the measurement of program outcomes;
3. Construction and validation of a food security instrument, which would be used for food security surveillance efforts in Hawai'i; and
4. Development of a model that other researchers could use to validate the CFSM with other population groups.

Findings suggest that the first, second and fourth outcomes were achieved. However, the third outcome, was the ultimate purpose of this research has not yet been achieved. While the CFSM is an acceptable instrument to use among the major ethnic groups residing in Hawai'i, its length is a deterrent to use in food security monitoring. While monitoring experts have suggested the national use of a six-question instrument (Blumberg *et al.*, 1998) findings do not support this particular six-question instrument or the national food security categorical algorithm, but do suggest a shorter scale is worthy of consideration. However, developing a consensus on whether measurement of food (in)security or food insufficiency should be measured should occur first. Next a careful examination of various food security categorical algorithms (Chapter 9: Tables 10.2 and 10.3 is recommended. However, research assessing the public's and policy makers' understanding of food insecurity and what they want reported will be greatly aid this discussion. While our research supports a categorical algorithm based on the face validity of responses, this is only one approach. Other approaches to categorization of food security status and a consensus on the best way to monitor food insecurity is needed relatively soon so that research and monitoring will not just be and end to themselves, but will assist in driving policy-related decisions.

Policy implications of this and other related work abound. Many policy issues and questions are outlined in Table 10.4. Most, inevitably, require further research and monitoring. The most important policy implication appears to be how to most cost-effectively, and with ethnic equity, improve and maintain food security status over time. The overall goal of our food assistance programs is “to enhance food and nutrition security, to improve nutritional health and well-being, and to promote active lives” (FCS, 1996). Although the success of these programs is not contested herein, the reality is that billions of dollars are spent on federal assistance programs, yet non-profit or charitable food pantries have become increasingly more depended upon, and people still report inadequate food intake (Van Amburg, 1998; Hamilton *et al.*, 1997a). Obviously, government policy is not completely successful and additional changes are needed.

Various suggestions and remedies are in progress. Community food security efforts, which aim to enhance the food supply at the local level, have become popular and undoubtedly are a step in the right direction. Yet, in remote areas such as Hawai‘i, natural resources are expensive, while economic and political pressure make wide-scale community food security difficult to achieve. Greater dependence on the private sector and non-profit agencies to “pick up the slack” in necessary food assistance has occurred. However, in times of recession or economic downturn, funding to support these humanitarian efforts may dwindle, and the assurance of the safety net may unravel further. Welfare reform--a controversial effort to assist welfare recipients in becoming employed and less dependent on government assistance--can only be effective with programs that continue to provide adequate education, health care, child care and food for families whose breadwinners seek work, but can't find adequate paying jobs that match their skills.

The fundamental remaining question is what is the appropriate role of the government in ensuring food and nutrition security? Should there be a right to adequate food and nutrition? Widespread grass-roots and non-profit efforts can enhance food insecurity in the short run. However, as Poppendiek (1998) has documented (paraphrased):

“We hear from clients who endure endless humiliation as they receive meals too small to feed their families . . . which can not overcome the underlying causes of all the misery experienced, and from the directors of charitable programs who wonder if the success of their programs is actually contributing to the very problem they are working so hard to solve”.

Changes in food and economic policies that ameliorate poverty and improve food access are needed in the long run. What needs to be done? Eisenger has thoughtfully addressed this complex issue with the following suggestions: (1999: p. 127-130)

- ◆ Increasing funding for food assistance programs;
- ◆ Strengthening the partnership between public and private food assistance efforts including:
  - Using charitable feeding programs as vehicles for enrolling clients in public assistance programs;
  - Using government resources to make private food assistance more effective in providing nutritious foods;
- ◆ Establishing stores in inner cities through public and private grocery partnerships; and
- ◆ Subsidizing transportation of poor consumers to and from the stores.

However, he agrees that the ultimate remedy to hunger in America is to cure poverty. Therefore, efforts are needed to assist in microenterprise efforts, training programs that lead to adequate, long-term employment, and instituting agricultural and food industry practices that enhance community food security. Others, such as Hamelin and colleagues (1999), who have studied the broader social implications of food insecurity, suggest that important aspects of human development hinge on food security; and because of this realization of the “right to food” is critical to long term household and community food security. While research and monitoring can provide policy guidance, history suggests that persistent and effective collaborative advocacy in the political arena will be the key to ending hunger in the United States.

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## APPENDICES

1. Definitions of food and nutrition security used by the U.S. Government.
2. Operationalized Framework of the CFMS
3. The Core Food Security Module
4. Rasch Item Fit of the CFMS
5. Scale Values and the CFMS Categorical Algorithm
6. Part I. Consent Form
7. Part I. Additional Tables
8. Part II. Survey
9. Part III. Survey
10. Hawai'i Health Survey
11. Table of Item Fit Without Retest Data
12. Tables of the CFMS Categorical Algorithm with Selected Variables

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## Appendix 1

### Definitions of Food and Nutrition Security Used by the U.S. Government

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- ◆ **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 (LSRO, 1990)
  
  - ◆ **Food insufficiency:** is defined as inadequate amount of food intake due to lack of money or resources (Briefel & Woteki, 1992).
  
  - ◆ **Food security** is access by all people at all times to enough food for an active, healthy life and includes at a minimum: a) the ready availability of nutritionally adequate and safe foods, and b) the assured ability to acquire acceptable foods in socially acceptable ways (without resorting to emergency food supplies, scavenging or other coping strategies) (LSRO, 1990).
  
  - ◆ **Hunger** is ... (an) uneasy or painful sensation caused by a lack of food. Hunger and malnutrition are potential and although not necessary, consequences of food insecurity (LSRO/AIN, 1990)
  
  - ◆ **Nutrition Security** is, in addition to food security, the provision of an environment that encourages and motivates society to make food choices consistent with short – and long– term good health (CNPP, USDA 1997. p3)
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## Appendix 2

### Operationalized Framework of the Core Food Security Module

Food Security Status	Sequence of 18 questions answered Affirmatively by modal households <sup>1</sup>	Indicators of operationalized framework
<b>Food secure</b>  Score: <3	2. Worried food would run out  3. Food bought didn't last	<b>Diminished Household food resources force economizing in food spending:</b> running short of money, substituting cheaper, dietary monotony.
<b>Food insecure level I</b>  Score: 3-7	4. <i>Family couldn't afford balanced meals</i> <sup>2</sup> 5. Relied on a few low cost foods  8. Cut size of meals/ skip meals - adults 6. Could not afford balanced meal - child 9. Adult ate less than felt they should	<b>Food insecurity short of actual hunger:</b> extreme food acquisition and management coping strategies; use of socially non-normative food resources; Nutritional quality of diets and health impacted.
<b>Food insecure level II</b>  Score: 8-12	8a. <i>Adult cut size or skip meals for three or months in the last year</i> 7. Child not eating enough 10. Adult hungry but didn't eat  11. Adult lost weight 13. Cut size of child's meals	<b>Managing insufficient resources.</b> Adult hunger in household, for at least some members, some times. Indicators: cutting or skipping meals, being hungry, not eating because one couldn't afford to buy food.
<b>Food Insecure III</b>  Score: 13-18	12. <i>Adult didn't eat for whole day</i> 14. Child hungry 12a. <i>Adult didn't eat for whole day -3+ / 12 months</i> 15. Child skip meals - short term 15b. Child skip meals - 3+ / 12 months  16. Child didn't eat for a whole day	<b>Severe hunger in household and hunger among children.</b> Indicators: cutting or skipping child's meals, child going all day without eating.

#### Notes.

1. "Modal" households are those whose responses to the 18 indicator questions exactly fit the common pattern determined by the Rasch measurement model to the 1995 national survey data. (Hamilton *et al.*, 1997b).
2. Indicators in italics represent threshold scale items.

Source. Adapted from Bickel *et al.*, 1996.

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**Appendix 3**  
**The Core Food Security Module**

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**Question. Question. In the last 12 months. . . because there wasn't enough money for food?**

**Food Insecurity Indicators**

- Q2 Worried about whether food would run out before we got money to buy more.
- Q3 The food we bought just didn't last and we didn't have money to get more.
- Q4 We couldn't afford to eat balanced meals.
- Q5 We relied on only a few kinds of low cost foods to feed our children because we were running out of money to buy food.
- Q6 We couldn't feed our children a balanced meal because we couldn't afford that.

*Skip: Stop if no affirmative response or food sufficiency response is 1 or 2*

**Moderate Hunger Indicators**

- Q7 Children were not eating enough because just couldn't afford enough food.
- Q8 Any adult in household ever cut the size of meal or skip meals.
- Q8a How often? Three or more months.
- Q9 Did you ever eat less than you felt you should.
- Q10 Were you ever hungry but didn't eat.
- Q11 Did you lose weight?

*Skip: Stop if all questions 7H-11H are negative.*

**Severe Hunger Indicators**

- Q12 Any adult ever not eat for a whole day?
  - Q12a How often? Three or more months
  - Q13 Did you ever cut the size of any of your children's meals?
  - Q14 Were the children ever hungry, but you could not afford more food?
  - Q15 Did your children ever skip meals?
  - Q15a How often? Three or more months.
  - Q16 Did any child ever not eat for a whole day?
-

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## Appendix 4

### CFSM Scale Measure Item Calibration and Fit Statistics

Item no USDA	Study item	USDA raw score	Item Calibration	Transformed Calibration	Infit Statistics	Outfit Statistics
Q53	Q2	6312	-4.99	0.9	1.16	3.04
Q54	Q3	4973	-3.73	2.0	0.92	1.06
Q55	Q4	4627	-3.42	2.2	1.03	1.61
Q58*	Q5*	2295*	-3.10	2.5	1.14	1.29
Q24	Q8	2824	-1.72	3.6	0.88	0.87
Q56*	Q6*	1453*	-1.64	3.7	1.08	0.94
Q32	Q9	2661	-1.56	3.8	0.94	0.94
Q25	Q8a	1919	-.70	4.5	0.93	0.76
Q57*	Q7*	779*	-.15	5.0	1.07	0.86
Q35	Q10	1249	.27	5.3	0.91	0.77
Q38	Q11	625	1.54	6.4	1.10	1.31
Q40*	Q13*	290*	1.69	6.5	1.01	1.28
Q28	Q12	537	1.82	6.6	0.97	1.16
Q47*	Q14*	257*	1.88	6.6	0.93	0.97
Q29	Q12a	332	2.55	7.2	0.89	0.55
Q43*	Q15	135*	2.86	7.5	0.88	0.78
Q44*	Q15a	87*	3.48	8.0	0.84	0.28
Q50*	Q16*	29*	4.82	9.2	1.09	6.02

Notes. \* indicates that the item is for households with children only and that the number of respondents was less (n=4324-4333) than the number of respondents for the items (no \*) asked of all respondents (n=7870-7889).

Source. (Hamilton et al., 1997b, p. 25).

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Appendix 5.

CSFM Scale values and food security categorical algorithm for households with and without children

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Households with Children			Households without Children		
No. of affirmative responses (out of 18)	Scale Value	Food security Category	No. of affirmative responses (out of 18)	Scale Value	Food security Category
0	0.0	0	0	0.0	0
1	0.7	0	1	0.9	0
2	1.6	0	2	1.9	0
3	2.2	1	3	2.7	1
4	2.8	1	4	3.5	1
5	3.3	1	5	4.2	1
6	3.7	1	6	4.9	2
7	4.2	1	7	5.7	2
8	4.6	2	8	6.5	2
9	5.1	2	9	7.4	3
10	5.5	2	10	8.1	3
11	5.9	2			
12	6.4	2			
13	6.8	3			
14	7.2	3			
15	7.7	3			
16	8.3	3			
17	9.2	3			
18	10.0	3			

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Notes on labels for food security status categorization.

- 0 = Food secure
- 1 = Food insecure without hunger
- 2 = Food insecure with moderate hunger
- 3 = Food insecure with severe hunger

Source. Price et al., 1997, p. 21.

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**Appendix 6**  
**Part I. Consent Form**

**COLORADO STATE UNIVERSITY**  
**INFORMED CONSENT TO PARTICIPATE IN A RESEARCH PROJECT**

**TITLE OF PROJECT** A three part validation of a national food security measure with Asians and Pacific Islanders

**RESEARCHERS** Jennifer Anderson, Ph.D., R.D. Professor, and Joda P. Derrickson, M.S., R.D. Doctoral Candidate, Dept. of Food Science and Human Nutrition, Colorado State University

**CONTACT NAME/NUMBER:** Joda P. Derrickson: 808-956-3840

**PURPOSE OF THE RESEARCH:** The purpose of this project is to find out if a survey that is used to measure food insecurity and hunger is the right one to use in Hawai'i or if a different survey would be better.

**METHODS TO BE USED:** You have been asked to join in this study because you have a family and use at least one assistance program. You will receive food and a drink during the focus group and will be given \$25 at the end of the focus group for your help. You will be one of a group of up to twelve participants in a focus group. The focus group interview will last one and a half to two hours. You will be asked to describe what happens when you do not have enough food and how you keep from running out of food You will also be asked to complete a survey and to share your thoughts about the questions on the survey. After the focus group you may be asked questions in a follow-up phone interview to confirm your thoughts and responses.

The focus group interview will be taped to make sure we correctly capture what you said. Tapes will be typed into written pages exactly as they were recorded. All information will be kept confidential (a secret) and will not affect your benefits in other programs. You will have access to the typed pages of the interview to check if they are correct.

**RISKS INHERENT IN THE PROJECT:** There are no known risks to this study. It is not possible to identify all potential risks in project, but the researcher(s) have taken reasonable safeguards to minimize any known and potential, but unknown, risks.

Page 1 of 2 Subject initials \_\_\_\_\_ Date \_\_\_\_\_

**BENEFITS:** You will receive food and a drink during the focus group and will be given \$25 at the end of the focus group.

**CONFIDENTIALITY:** Any personal information gathered will be kept confidential. Each participant will have a code in a file which will identify them to the researchers. This file will only be accessible to the researchers. You may have a copy of the written part of what you have said in the focus group, but not what others have said. Your quotes or what you say may be used in various reports of this project. However, your name (or other ways to identify you exclusively) will not be attached to the quote. Once the project is over, all tapes, typed pages and coded data analysis will be destroyed.

Focus group participants are asked to respect others privacy during the focus group by not discussing other participant's comments after the focus group. Although no reference to the individuals will be used in the final reports, confidentiality can only be guaranteed if each participant does not discuss what others said in the focus group.

**LIABILITY:** The Colorado Governmental Immunity Act determines and may limit Colorado State University's legal responsibility if an injury happens because of this study. Claims against the University must be filed within 180 days of the injury. Questions about subjects' rights may be directed to Celia S. Walker at (970) 491-1563.

**PARTICIPATION:** Your participation in this research is voluntary. If you decide to participate in the study, you may withdraw your consent and stop participating at any time without penalty or loss of benefits to which you are otherwise entitled. Your signature acknowledges that you have read the information stated and willingly sign this consent form. Your signature also acknowledges that you have received, on the date signed, a copy of this document containing 2 pages.

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Participant name (printed)

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Participant signature \_\_\_\_\_ Date \_\_\_\_\_

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Co-investigator signature \_\_\_\_\_ Date \_\_\_\_\_

Page 2 of 2 Subject initials \_\_\_\_\_ Date \_\_\_\_\_

**Appendix 7a: Part I. Additional Tables**  
**Causes of Food Insecurity in Hawaii From Nine Focus Groups**

	Hawn	Cauc	Filip	Samn
<b>Number of focus groups</b>	2	2	2	3
<b>1. Un and underemployment/poor economy</b> • Cutbacks in hiring and low salaries leave	✓✓	✓✓	✓✓	✓✓
<b>2. High costs of:</b> • Food                      • Housing • Insurance                • Child-care	✓✓	✓✓	✓✓	✓✓✓
<b>3. Problems with Assistance:</b> • Programs don't cover "gap groups" • Insufficient benefits -Section 8 • Welfare is self-defeating • Inadequate knowledge of programs	✓✓	✓✓	✓✓	✓✓
<b>4. Cultural factors:</b> • Shame in using assistance programs • Large families • Obligation to share food and resources	✓✓	✓✓	✓	✓✓✓
<b>5. Difficulty in purchasing food</b> • transportation to/from store • food availability limited in rural areas	✓✓	✓✓		✓
<b>6. Inadequate education:</b> • on cooking, food, health • on parenting: poor role models	✓✓	✓✓	✓	✓✓
<b>7. Hopelessness? Low-self esteem:</b> • Self-defeating welfare/economic system • "Keeping up with the Jones" • Hopelessness in getting ahead	✓✓	✓✓	✓✓	✓✓✓
<b>8. Abuse of assistance programs</b> • selling food stamps particularly for drugs	✓	✓✓	✓✓	✓✓✓
<b>9. Mismanagement</b> • Foolish, irresponsible practices • Irresponsible behavior • Poor food choices	✓✓	✓✓	✓	✓✓

**Notes:** ✓ indicate the number of focus groups with evidence of selected causes of food insecurity

**Appendix 7b.**  
**Perceived Consequences of Food Insecurity and Hunger**

Consequences	Adults	Child -ren	Hawaiian	Caucasian	Filipino	Samoaan
1. No difference	✓			✓	✓	✓✓
2. Psychological stress: fear of not feeding family and wondering where next meal is coming from, preoccupation with food, financial stress	✓		✓✓	✓	✓	✓✓
3. Poor diet: no or little vegetables for part of the month, only eating Saimin, eating undesirable food or food from rubbish	✓	✓	✓	✓✓	✓	✓✓✓
4. Tired: fatigue	✓	✓	✓✓	✓✓	✓✓	✓✓
5. "Can't think" - Dysfunctional	✓	✓	✓✓	✓✓	✓	✓
6. Shame leading to depression	✓	✓	✓✓	✓✓	✓✓	✓✓
7. Aggression: loud voice, impatience, frustration and abuse	✓		✓✓	✓✓	✓✓	✓
8. Neglect of children leading to having grandparents and siblings take care of children, and preference for being at school rather than at home	✓	✓	✓	✓	✓	✓
9. Begging and stealing for foods	✓	✓	✓✓	✓✓	✓	✓
10. Physical complains: hunger, sickly, smaller		✓	✓	✓	✓	

Notes: ✓ indicate that qualitative findings from one focus group provided evidence of the indicated consequence of food insecurity.

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**Appendix 7c.**  
**Coping Behaviors Utilized by Ethnic Group**

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<b>Coping Behaviors</b>	<b>Hawaiian</b>	<b>Caucasian</b>	<b>Filipino</b>	<b>Samoaan</b>
1. Sharing: Getting help from family or friends	✓✓	✓✓	✓✓	✓✓✓
2. Managing				
• by budgeting, planning, prioritizing	✓✓	✓✓	✓✓	✓✓
• living together with another household(s) to minimize rent costs	*	✓	✓	✓
• by "eating the same thing" relying on low cost foods decreased quality	✓✓	✓✓	✓	✓✓
• Specifically eating less vegetables	✓	✓	✓	✓
• stretching meals/decreasing amount; cutting out snacks	✓✓	✓	✓✓	✓✓✓
• gleanng from neighborhood fruit and vegetable trees, fishing	✓✓	✓	✓	
• feeding kids first	✓✓	✓	✓	✓
3. Using alternative food resources				
• using assistance government programs if eligible		✓	✓	✓✓
• using non-profit resources	✓	✓	✓	✓
• eating from garbage, begging, stealing	✓	✓		✓
4. Praying	✓	✓		

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**Notes:**

✓ indicates that qualitative findings in one focus group provided evidence of the indicated coping behavior.

\* indicates that evidence was provided by demographic data

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Appendix 7d  
Comparison of food security responses: CFSM and Qualitative study

Food Security	Core Food Security Measure <sup>1</sup>		Chapter 3 responses				
	CFSM Questions		Frequency of responses				
	Because of not having enough money for food . . In the last 12 months	Modal Order	Modal Order	No	Most of the time	Some-times	Yes
<b>Food Security</b> (0-2)	2. Worried that food would run out	1	1	13	16	32	
	3. Food bought didn't last	2	2	14	8	39	
<b>Mild food insecurity</b> (Score:3-7)	4. Couldn't afford balanced meals for adults	3	3	17	7	37	
	5. Relied on a few low cost foods	4	4	18	16	27	
	6. Could not afford balanced meal for child	6	5	24	4	33	
	7. Child not eating enough -couldn't afford it	9 <sup>1</sup>	6	30	4	27	
<b>Moderate food Insecurity</b> (8-12)	8. Adult cut size or skip meal for adults	5	8	38	≥ 3 mo.	≥ 3 mo.	23
	8a. Adult cut size of meals more ≥ 3 mo.	8	9	43	18	5	23
	9. Adult ate less than they felt they should	7	7	36			25
	10. Adult hungry but didn't eat	10	10	47			14
<b>Severe food insecurity</b>	11. Adult lose weight	11	15	55			6
	12 Adult did not eat for a whole day	13	16	58			3
	12a Adult not eat for a whole day ≥ 3 mo.	15	17	59	2	1	3
	13. Cut size of children's meals	12	12	53			8
	14. Children ever skipped a meal	16	15	55			6
	14a. Children skip meals ≥ 3 mo.	17	15	55	6		6
	15. Children hungry	14	12	53			8
	16. Children not eat for a whole day	18	18	60			1

Notes:

1. Hamilton et al., 1997b, pp. 47, 48 and 52.
2. Shaded areas responses are not consistent with the CFSM.

**Appendix 8  
Part II. Survey**

Name \_\_\_\_\_ Phone: \_\_\_\_\_ Surv # \_\_\_\_\_

CallerID: \_\_\_\_\_ 10 days later; \_\_\_\_\_

Date	Time	Code	Comments
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Hi my name is \_\_\_\_\_. You have been selected as a participant in a study about food habits in Hawai'i. If you complete our survey and the follow up in 10 days you will receive a 10-dollar supermarket gift certificate. The information will be kept confidential, and you may withdraw at any time. Your participation is voluntary and we won't record your name in our data files. Would you like to complete this survey over the phone? It will take between 8-15 minutes. [If yes] Is now a good time or would you prefer a different time?

**Variable Name and Questions**

HH. <b>How many people live in your household?</b> (even if multiple families living together)
Kid. <b>How many children age 18 or under live in your household?</b>
Sen. <b>How many adults age 60 or older live in your household?</b>
HHD. [If not obvious] <b>Which household type best fits your household description?</b> S) single adult TA) Two or more adults T) Two parent family SP) Single parent family MF) Multiple family
Eth. <b>Which ethnic group do you identify with most?</b> [one only] H)Hawaiian or Part Hawn F) Filipino S)Samoan C)Caucasian J)Japanese CH)Chinese K)Korean SE)South East Asian HS)Hispanic B)Black AI) Am Indian OP) Other Pacific Other)
Twn. <b>What town do you live in?</b> (Input city name)
Zip. <b>What is your five digit zip code?</b>

[Based on household description now decide which Part II survey to use]

Single Adult = Blue	2+ Adults only (no children) = Green
Single adult with 1+ children = Yellow	2+ adults with 1+ children = Pink

Now I want to ask you some questions about the food used in your household and the ways you are managing to meet your food needs?

- 1S. Which of these statements best describes the food eaten in your household in the last 12 months, that is, since July 1997?
- 1) We always have enough and the kinds of foods we wanted
  - 2) We have enough to eat but NOT always the KINDS of foods wanted
  - 3) Sometimes we don't have ENOUGH to eat, or
  - 4) Often we don't have enough
- DK) Don't Know R) Refused

Now, I'm going to read you several statements that people have made about their food situation. For these statements, please tell me whether the statement was **OFTEN** true, **SOMETIMES** true, or **NEVER** true for your household in the last 12 months, since July 1997. The first statement is:

2S. "We worried about whether or not our food would run out before we got money to buy more?" Was that **O**ften true, **S**ometimes true, or **N**ever true for your household in the last 12 months?

3S. "The food we bought just didn't last and we didn't have money to get more. Was that **O**ften true, **S**ometimes true, or **N**ever true for your household in the last 12 months?

4S. "We couldn't afford to eat balanced meals." Was that **O**ften true, **S**ometimes true, or **N**ever true for your household in the last 12 months?

*What does the word balance, as in "eating balanced meals" mean to you?*

5S. "We relied on only a few kinds of low-cost food to feed our child/children because we were running out of money to buy food?" Was that **O**ften true, **S**ometimes true, or **N**ever true for your household in the last 12 months?

6S. "We couldn't feed our children balanced meals, because we couldn't afford that" Was that **O**ften true, **S**ometimes true, or **N**ever true for your household in the last 12 months?

**1<sup>ST</sup> Screen for Food Insecurity.** If respondents answered either a 3 or 4 to question 1S or gives any positive response to questions 2S to 6S (i.e. often true or sometimes true ) than continue; otherwise skip to end.

*Moderate Hunger Indicators*

**7H. Our child/children were not eating enough because we just couldn't afford enough food. Was that 0)ften, S)ometimes or N)ever true for you and your household in the last 12 months?**

**8H. In the last 12 months, since July 1997 did you or another adult in your household ever cut the size of your meals or skip meals because there wasn't enough money for food? Y)es or N)o (Skip to 9H)**

**8HA [IF Yes, ask] How often did this happen? A)lmost every month, S)Some months not other months or in only 1) or 2 months**

**Note: Use 9 or more months as "Almost every month ; 3-8 months as "Some Months"**

**8HI. How about you personally? In the last 12 months did you ever cut the size of YOUR meals or skip meals because there wasn't enough money for food? Y)es or N)o [skip to 9H]**

**8HIA. [If Yes] How often did this happen— A)lmost every month, S)ome months but not other months or in only 1) or 2 months?**

**9H. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food? Y)es or N)o (Skip to 10)**

**9HA. How often did this happen—A)lmost every month, S)ome months but not other months or in only 1) or 2 months?**

**10H. In the last 12 months, were you ever hungry but didn't eat because you couldn't afford enough food? Y)es or N)o (Skip to 11)**

**10HA. [If yes above ask]. How often did this happen? A)lmost every month, S)ome months but not every month or in only 1) or 2 months?**

**11H. In the last 12 months did you lose weight because you didn't have enough money for food? Yes or No?**

**11X. If no. Did you stay the same or gain weight because you didn't have enough money for food? NS) No, I stayed the same, NG) No, I gained weight.**

*2nd screen for hunger. If respondent said yes, sometimes or often true to any of questions 7-11 than continue otherwise go to Part III. However, if respondent has one or more children and responded negatively to all questions about hunger only ask question 12 and then proceed to end.*

**Stage 3: Severe Hunger (SH) indicators**

12SH. 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? Y)es or N)o (Skip to 13)

12SHA. [If YES above ask] How often did this happen? A)lmost every month, S)ome months but not every month or in only 1) or 2 months?

12SHI [If YES to 12SH ask] How about you personally-in the last 12 moths did you ever not eat for a whole day because there wasn't enough money for food? Y)es, N)o (Skip to 13)

12SHIA [If YES to 12SHI ASK] How often did this happen? A)lmost every month, S)ome months but not every month or in only 1) or 2 months?

[If children in household ask 13-16 otherwise Go to Part III]

13SH. The next questions are about the children living in your household who are under 18 years old. In the last 12 months since July 1997 of last year, did you ever cut the size of any of your children's meals because there wasn't enough money for food? Y)es or N)o [If only one child under 18 then skip to 14SH]

13SHI. Now I want to ask about one particular child living in your household – the child that most recently had a birthday before today's date.

When was this child's birthday? \_\_\_\_\_

In the last 12 months, did you ever have to cut the size of this child's meals because there wasn't enough money for food? Y)es N)o

14SH. In the last 12 months were the children every hungry but you just couldn't afford more food? Y)es or N)o?

14SHA. [If YES above ASK] How often did this happen – A)Almost every month, S)Some months but not every month, or in only 1) or 2 months?  
[If only one child under 18 skip to 15SH.]

14SHI. What about your child who most recently had a birthday was he or she ever hungry but you just couldn't afford more food? Y)es or N)o

14SH1A. [If YES above ASK] How often did this happen – A)lmost every month, S)ome months but not every month, or in only 1) or 2 months?

15SH. In the last 12 months did your children ever skip meals because there wasn't enough money for food, Y)es or N)o?

15SHA. [If YES above ASK]. How often did this happen – A)lmost every month, S)ome months but not every month, or in only 1) or 2 months?

[If only one child in household skip to 16)

15SHI. What about your child who most recently had a birthday, did he or she ever skip meals because there wasn't enough money for food? Y)es or N)o

15SH1a. [If YES above ASK]. How often did this happen – A)most every month, S)Some months but not every month, or in only 1 or 2 months?

16SH. In the last 12 months, did any of your children ever not eat for a whole day because there wasn't enough money for food? Y)es or N)o

16SHI. [If YES ASK] What about your child who most recently had a birthday, did he or she ever not eat for a whole day?

Part III.  
"Just a few more" questions

17. Has anyone in your household received food or financial assistance in the last 12 months, since July of 1997? Yes or No?

[If Yes] What, did you receive?

a. Food Stamps? Y)es or N)o?

b. AFDC/Welfare? Y)es or N)o?

c. SSI? Y)es or N)o?

d. Disability Y)es or No?

e. Housing Assistance? Y)es or N)o?

f. Free or Reduce price school lunch, Preschool or adult meals?

g. WIC? Y)es or N)o?

h. Head Start? Y)es or N)o?

18a Did you get food from a church, food pantry or foodbank? Y)es or N)o *If no skip to 19*

18b. *If yes*, How often in the last year? A)most every month, S)ome months not every month, or only 1) or 2 months?

18c. *If yes*, Which months?

Ja F Mr Ap My Jn Jl Ag S O N D

19a. In the last 12 months did you put off paying bills to have money to buy food? Y)es or N)o *[If No go to 20a]*

19b. *[If yes]* How often? A)most every month, S)ome months not every month, or in only 1) or 2 months?

20a In the last 12 months did you get food or borrow money from friends or relatives? Y)es or N)o *[If No go to 21a]*

20b. *[If yes]* How often? A)most every month, S)ome months not every month, or only 1) or 2 months?

*[If no children skip to 22]*

21a. In the last 12 months did you every send or take your children to friends or relatives from a meal because of not having enough food or money for food? Y)es or N)o? *[If No go to 22]*

21b. [If yes] How often? A)Most every month, S)ome months not every month, or only 1 or 2 months?

22. Please estimate your earned household income per month or year (gross)?  
M= \_\_\_\_\_ x 12 = \_\_\_\_\_

23. [If any income, otherwise go to 24] How many people in your household contributed to that earned income/worked??

24. Has anyone in your house hold lost their job in the last three years and has not been able to find a new job with a comparable salary (not less than \$5000 for the same hours worked)? Y)es or N)o

25. How much savings do you estimate your household has ?

<\$500, \$500-1000, \$1001-\$5000, \$5001-\$10,000, \$15000 or more

Now a few questions about the vegetables YOU eat:

26. Not counting salads or potatoes, how many servings of vegetables do YOU usually eat each day. Count ½ cup, the size of a pudding cup, as one serving.

27. [Questions 27 and 28 will not be asked in final survey just for Part II test.]

Think about what you ate in the last 24 hours (from \_\_\_ o'clock yesterday). What vegetables did you eat? How much of each?

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

28. Is this typical of what you usually eat? If Not why?

29. Does your vegetable intake vary at times during the month because of inadequate food or money for food? Yes or No?

30. Does it increase, decrease or stay the same when you have less money or food?

31. How many times last month did you or your children, which ever is more, eat dried Saimin or Ramen?

First survey: If you would like, I can send you a letter discussing this project and your consent to participate. Would you like to receive a letter?

If so, May I please have your address: \_\_\_\_\_

I will need to call you again in 10-14 days. What day would be best for you?  
Date: \_\_\_\_\_ [Write on front]

Thank you for your help today.

2<sup>nd</sup> survey: You are eligible to receive a \$10 gift certificate for a local supermarket chain.

From which store would you like to receive a certificate? [circle one]

Longs   Safeway   Times   Star   Foodland   Daiei   \_\_\_\_\_

And where should we send the gift certificate?

Name: \_\_\_\_\_

Address \_\_\_\_\_

City and Zip: \_\_\_\_\_

Mahalo nui loa for you kokua. Your gift certificate should arrive within a week or two.

[PAU]

Interviewer comments:

**Appendix 9**  
**Part III. Survey**

Q.1 (PRESS [1] TO START SURVEY).

1 ENTER [1] TO CONTINUE

[IF THE ANSWER TO QUESTION 1 IS 0-9, THEN SKIP TO QUESTION 9999]

Q.2 (DUMMY) Name of Target Respondent

(6-55) \_\_\_\_\_

Q.3 Hello, I'm \_\_ calling from SMS Research. We're working for a research study about food habits in Oahu. The purpose of the study is to find out if a survey that is used in the mainland is the right one to use in Hawai'i, or if a different survey would be better. We need to represent households like yours. The information will be kept confidential. Your participation is voluntary and you may withdraw at any time. However, when you complete this study, your name will be entered in a sweepstakes for ten \$50 worth of groceries.

We called you because a member of your household, &&, gave us this number.

(FIRST TIME) Can we speak with Mr./Ms. &&, please.

(REPEAT INTRODUCTION)

(NEXT TIME) Are you Mr./Ms. &&?

(IF NO) Can we speak with Mr./Ms. &&, please.

(REPEAT INTRODUCTION)

(7)

1 ENTER [1] IF YOU ARE ALREADY TALKING TO TARGET RESPONDENT

2 ENTER [2] IF TARGET RESPONDENT IS NOT AVAILABLE

[IF THE ANSWER IS 1, THEN SKIP TO QUESTION 8]

Q.4 Well, we can do this survey with any adult who lives in the household.

Are you 18 years of age or older?

(IF NO) May I speak to someone who is?

(8)

1 ENTER [1] IF RESPONDENT IS AN ADULT

2 ENTER [2] IF RESPONDENT IS NOT ADULT, BUT THERE IS SOMEONE

3 ENTER [3] IF NO ADULT IS AVAILABLE NOW

[IF THE ANSWER IS 1, THEN SKIP TO QUESTION 7]

[IF THE ANSWER IS 3, THEN SKIP TO QUESTION 6]

Q.5 Hello, I'm \_\_ calling from SMS Research. We're working for a research study about food habits in Oahu. The purpose of the study is to find out if a survey that is used in the mainland is the right one to use in Hawai'i, or if a different survey would be better. We need to represent households like yours. The information will be kept confidential. Your participation is voluntary and you may withdraw at any time. However, when you complete this study, your name will be entered in a sweepstakes for ten \$50 worth of groceries.

We called you because a member of your household, &&, gave us this number. If she is not around, may I speak with you then?

- (9)  
 1 YES  
 2 NO

[IF THE ANSWER TO QUESTION 5 IS 1, THEN SKIP TO QUESTION 9999]

Q.6 What is a good time to call back to reach Mr./Ms. &&? \_\_\_\_\_ (56-65)

[IF THE ANSWER TO QUESTION 4 IS 3, THEN SKIP TO QUESTION 100]  
[IF THE ANSWER TO QUESTION 5 IS 2, THEN SKIP TO QUESTION 100]

Q.7 And what is your name? \_\_\_\_\_ (66-80)

Q.8 (ENTER SEX OF RESPONDENT.)  
(10)  
 1 MALE  
 2 FEMALE

Q.9 (Including yourself) What is the total number of people in your household?

ENTER TOTAL NO. OF PEOPLE IN HOUSEHOLD ..... \_\_\_\_\_ (11-12)

[IF THE ANSWER IS 0, THEN SKIP TO QUESTION 9]

Q.10 (Including yourself) How many of the people in your household are male?

ENTER NO. OF MALES IN HOUSEHOLD ..... \_\_\_\_\_ (13-14)

Q.11 (DUMMY) PRESS [ENTER] TO CONTINUE.  
NO. OF FEMALES IN HOUSEHOLD ..... \_\_\_\_\_ (15-16)

Q.12 So there are && females in your household, right?

- (17)  
 1 Yes  
 2 No

[IF THE ANSWER TO QUESTION 12 IS 1, THEN SKIP TO QUESTION 9999]

Q.13 Let us go back to the previous question.

- (18)  
 1 ENTER (1) TO CONTINUE

[IF THE ANSWER IS 1, THEN SKIP TO QUESTION 9]

Q.14 How many children under age 18 live in your household?  
No. of children under 18 yrs. .... \_\_\_\_\_ (19)

Q.15 How many adults age 60 or older live in your household?  
No. of adults 60 yrs or older ..... \_\_\_\_\_ (20)

[IF THE ANSWER TO QUESTION 9 IS 1, THEN SKIP TO QUESTION 9999]  
[IF THE ANSWER TO QUESTION 9 IS 2-20, AND...]  
[IF THE ANSWER TO QUESTION 14 IS 0, THEN SKIP TO QUESTION 9999]

Q.16 [IF NOT OBVIOUS]

Which household type best fits your household description ?

(21)

- 1 SINGLE ADULT
- 2 TWO OR MORE ADULTS
- 3 Two adults with children
- 4 Single Parent family
- 5 2 or more family units (3 OR MORE ADULTS + 1 OR MORE KIDS)

Q.17 When you think of yourself, what is your ancestry or ethnic background? (ACCEPT ONLY ONE ANSWER. DO NOT READ LIST) (RESPONDENT)

(22-23)

- 01 White/Caucasian
- 02 Hawaiian
- 03 Chinese
- 04 Filipino
- 05 Japanese
- 06 Korean
- 07 Samoan/Tongan
- 08 Black/African American
- 09 Native American/Aleut/Eskimo/Inuit
- 10 Vietnamese
- 11 Asian Indian
- 12 Portuguese
- 13 Guamanian/Chamorro
- 14 Mixed/Non-Hawaiian
- 15 Other (Specify)
- 16 Don't know/not sure
- 17 REFUSED
- 18 Part Hawaiian
- 19 Hispanics

[IF THE ANSWER TO QUESTION 17 IS NOT 15, THEN SKIP TO QUESTION 9999]

Q.18 (OTHER - SPECIFY HERE)

(81-120)

---

Q.19 Now I want to ask you some questions about the food used in your household and the ways you are managing to meet your food needs.

Which of these statements best describes the food eaten in your household in the last 12 months?

(READ THE FOLLOWING STATEMENTS COMPLETELY INCLUDING NUMBER)

1. I/We always have enough to eat, and the kinds of food I/we want.
2. I/We have enough to eat but not always the kinds of food we want to eat
3. I/We sometimes don't have enough to eat, or

4. I/We often don't have enough

(ACCEPT ONLY ONE ANSWER.)

(24)

- 1 ALWAYS ENOUGH AND FOOD WE WANT
- 2 ENOUGH BUT NOT ALWAYS FOOD WE WANT
- 3 SOMETIMES DON'T HAVE ENOUGH
- 4 OFTEN DON'T HAVE ENOUGH
- 5 DON'T KNOW / NOT SURE
- 6 REFUSED

Q.20 Now I'm going to read you statements that people have made about their food situation. Please tell me whether the statement was often, sometimes or never true for your household in the last 12 months. The first statement is:

"I/we worried about whether our food would run out before I/we got money to buy more." In the last 12 months, was that:

(READ FIRST 3 CHOICES IN THE LIST)

(25)

- 1 Often true
- 2 Sometimes true
- 3 Never true
- 4 DON'T KNOW / NOT SURE
- 5 REFUSED

[IF THE ANSWER TO QUESTION 19 IS 6, AND...]

[IF THE ANSWER IS 5, THEN SKIP TO QUESTION 52]

Q.21 "The food I/we bought just didn't last and I/we didn't have enough to get more." In the last 12 months, was that:

(READ FIRST 3 CHOICES IN THE LIST)

(26)

- 1 Often true
- 2 Sometimes true
- 3 Never true
- 4 DON'T KNOW / NOT SURE
- 5 REFUSED

[IF THE ANSWER TO QUESTION 20 IS 5, AND...]

[IF THE ANSWER IS 5, THEN SKIP TO QUESTION 52]

Q.22 "I/We couldn't afford to eat balanced meals." In the last 12 months, was that: (READ FIRST 3 CHOICES IN THE LIST)

(27)

- 1 Often true
- 2 Sometimes true
- 3 Never True
- 4 DON'T KNOW / NOT SURE
- 5 REFUSED

[IF THE ANSWER TO QUESTION 21 IS 5, AND...]

[IF THE ANSWER IS 5, THEN SKIP TO QUESTION 52]

[IF THE ANSWER TO QUESTION 14 IS 0, THEN SKIP TO QUESTION 25]

Q.23 "I/We relied on only a few kinds of low-cost food to feed the child/ children because I/we was/were running out of money for food." In the last 12 months, was that: (READ FIRST 3 CHOICES IN THE LIST)

(28)

- 1 Often true
- 2 Sometimes true
- 3 Never true
- 4 DON'T KNOW / NOT SURE
- 5 REFUSED

[IF THE ANSWER TO QUESTION 22 IS 5, AND...]

[IF THE ANSWER IS 5, THEN SKIP TO QUESTION 52]

Q.24 "I/We couldn't feed the child/children a balanced meal, because I/we couldn't afford it." In the last 12 months, was that:

(READ FIRST 3 CHOICES IN THE LIST)

(29)

- 1 Often true
- 2 Sometimes true
- 3 Never true
- 4 DON'T KNOW / NOT SURE
- 5 REFUSED

[IF THE ANSWER TO QUESTION 23 IS 5, AND...]

[IF THE ANSWER IS 5, THEN SKIP TO QUESTION 52]

[IF THE ANSWER TO QUESTION 14 IS 0, AND...]

[IF THE ANSWER TO QUESTION 19 IS 1 OR 2, AND...]

[IF THE ANSWER TO QUESTION 20 IS 3, AND...]

[IF THE ANSWER TO QUESTION 21 IS 3, AND...]

[IF THE ANSWER TO QUESTION 22 IS 3, THEN SKIP TO QUESTION 52]

[IF THE ANSWER TO QUESTION 14 IS NOT 0, AND...]

[IF THE ANSWER TO QUESTION 19 IS 1 OR 2, AND...]

[IF THE ANSWER TO QUESTION 20 IS 3, AND...]

[IF THE ANSWER TO QUESTION 21 IS 3, AND...]

[IF THE ANSWER TO QUESTION 22 IS 3, AND...]

[IF THE ANSWER TO QUESTION 23 IS 3, AND...]

[IF THE ANSWER TO QUESTION 24 IS 3, THEN SKIP TO QUESTION 52]

[IF THE ANSWER TO QUESTION 14 IS 0, THEN SKIP TO QUESTION 9999]

Q.25 "The child/children was/were not eating enough because I/we just couldn't afford enough food." In the last 12 months, was that:

(READ FIRST 3 CHOICES IN THE LIST)

(30)

- 1 Often true
- 2 Sometimes true
- 3 Never true
- 4 DON'T KNOW / NOT SURE
- 5 REFUSED

[IF THE ANSWER TO QUESTION 24 IS 5, AND...]

[IF THE ANSWER IS 5, THEN SKIP TO QUESTION 52]

Q.26 In the last 12 months, did you or another adult in your household ever

cut the size of your meals or skip meals because there wasn't enough money for food?

(31)

- 1 Yes
- 2 No
- 3 DON'T KNOW / NOT SURE
- 4 REFUSED

[IF THE ANSWER TO QUESTION 25 IS 5, AND...]

[IF THE ANSWER IS 4, THEN SKIP TO QUESTION 52]

[IF THE ANSWER TO QUESTION 22 IS 5, AND...]

[IF THE ANSWER IS 4, THEN SKIP TO QUESTION 52]

[IF THE ANSWER TO QUESTION 26 IS NOT 1, THEN SKIP TO QUESTION 9999]

Q.27 How often did this happen?

(32)

- 1 Almost every month
- 2 Some months but not every month
- 3 Only 1 or 2 months
- 4 DON'T KNOW / NOT SURE
- 5 REFUSED

[IF THE ANSWER TO QUESTION 9 IS 1, THEN SKIP TO QUESTION 30]

[IF THE ANSWER TO QUESTION 26 IS 2, THEN SKIP TO QUESTION 30]

Q.28 How about you personally? In the last 12 months, did you ever cut the size of your meals or skip meals because there wasn't enough money for food?

(33)

- 1 Yes
- 2 No
- 3 DON'T KNOW / NOT SURE
- 4 REFUSED

[IF THE ANSWER TO QUESTION 26 IS 4, AND...]

[IF THE ANSWER IS 4, THEN SKIP TO QUESTION 52]

[IF THE ANSWER TO QUESTION 28 IS NOT 1, THEN SKIP TO QUESTION 9999]

Q.29 How often did this happen?

(34)

- 1 Almost every month
- 2 Some months but not every month
- 3 Only 1 or 2 months
- 4 DON'T KNOW / NOT SURE
- 5 REFUSED

Q.30 In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money?

(35)

- 1 Yes
- 2 No
- 3 DON'T KNOW / NOT SURE
- 4 REFUSED

[IF THE ANSWER TO QUESTION 28 IS 4, AND...]  
[IF THE ANSWER IS 4, THEN SKIP TO QUESTION 52]

[IF THE ANSWER TO QUESTION 30 IS NOT 1, THEN SKIP TO QUESTION 9999]

Q.31 How often did this happen?

(36)

- 1 Almost every month
- 2 Some months but not every month
- 3 Only 1 or 2 months
- 4 DON'T KNOW / NOT SURE
- 5 REFUSED

Q.32 In the last 12 months, were you ever hungry but didn't eat because you couldn't afford enough food?

(37)

- 1 Yes
- 2 No
- 3 DON'T KNOW / NOT SURE
- 4 REFUSED

[IF THE ANSWER TO QUESTION 30 IS 4, AND...]  
[IF THE ANSWER IS 4, THEN SKIP TO QUESTION 52]

[IF THE ANSWER TO QUESTION 32 IS NOT 1, THEN SKIP TO QUESTION 9999]

Q.33 How often did this happen?

(38)

- 1 Almost every month
- 2 Some months but not every month
- 3 Only 1 or 2 months
- 4 DON'T KNOW / NOT SURE
- 5 REFUSED

Q.34 In the last 12 months, did you lose weight because you didn't have enough money for food?

(39)

- 1 Yes
- 2 No
- 3 DON'T KNOW / NOT SURE
- 4 REFUSED

[IF THE ANSWER TO QUESTION 32 IS 4, AND...]  
[IF THE ANSWER IS 4, THEN SKIP TO QUESTION 52]

[IF THE ANSWER TO QUESTION 25 IS 3, AND...]  
[IF THE ANSWER TO QUESTION 26 IS 2, AND...]  
[IF THE ANSWER TO QUESTION 28 IS 2, AND...]  
[IF THE ANSWER TO QUESTION 30 IS 2, AND...]  
[IF THE ANSWER TO QUESTION 32 IS 2, AND...]  
[IF THE ANSWER TO QUESTION 34 IS 2, THEN SKIP TO QUESTION 52]

Q.35 In the last 12 months, did you or another adult in your household ever not eat for a whole day because there wasn't enough money for food?

(40)

- 1 Yes

- 2 No
- 3 DON'T KNOW / NOT SURE
- 4 REFUSED

[IF THE ANSWER TO QUESTION 34 IS 4, AND...]  
[IF THE ANSWER IS 4, THEN SKIP TO QUESTION 52]  
[IF THE ANSWER IS 2, THEN SKIP TO QUESTION 39]

[IF THE ANSWER TO QUESTION 35 IS NOT 1, THEN SKIP TO QUESTION 9999]

Q.36 How often did this happen?

- (41)
- 1 Almost every month
  - 2 Some months but not every month
  - 3 Only 1 or 2 months
  - 4 DON'T KNOW / NOT SURE
  - 5 REFUSED

[IF THE ANSWER TO QUESTION 9 IS 1, THEN SKIP TO QUESTION 39]

Q.37 How about you personally - In the last 12 months, did you ever not eat for a whole day because there wasn't enough money for food?

- (42)
- 1 Yes
  - 2 No
  - 3 DON'T KNOW / NOT SURE
  - 4 REFUSED

[IF THE ANSWER TO QUESTION 35 IS 4, AND...]  
[IF THE ANSWER IS 4, THEN SKIP TO QUESTION 52]

[IF THE ANSWER TO QUESTION 37 IS NOT 1, THEN SKIP TO QUESTION 9999]

Q.38 How often did this happen?

- (43)
- 1 Almost every month
  - 2 Some months but not every month
  - 3 Only 1 or 2 months
  - 4 DON'T KNOW / NOT SURE
  - 5 REFUSED

[IF THE ANSWER TO QUESTION 14 IS 0, THEN SKIP TO QUESTION 52]

Q.39 The next questions are about the child/children less than 18 years old living in your household.

In the last 12 months, did you ever cut the size of the child's/ children's meals because there wasn't enough money for food?

- (44)
- 1 Yes
  - 2 No
  - 3 DON'T KNOW / NOT SURE
  - 4 REFUSED

[IF THE ANSWER TO QUESTION 37 IS 4, AND...]  
[IF THE ANSWER IS 4, THEN SKIP TO QUESTION 52]

[IF THE ANSWER TO QUESTION 14 IS 1, THEN SKIP TO QUESTION 42]

Q.40 Now I want to ask about one particular child living in your household  
- the child that most recently had a birthday. How old is that child?

130)

(121-

Q.41 In the last 12 months, did you ever have to cut the size of this  
child's meal because there wasn't enough money for food?

(45)

- 1 Yes
- 2 No
- 3 DON'T KNOW / NOT SURE
- 4 REFUSED

[IF THE ANSWER TO QUESTION 39 IS 4, AND...]  
[IF THE ANSWER IS 4, THEN SKIP TO QUESTION 52]

Q.42 In the last 12 months, was/were the child/children ever hungry but you  
just couldn't afford more food?

(46)

- 1 Yes
- 2 No
- 3 DON'T KNOW / NOT SURE
- 4 REFUSED

[IF THE ANSWER TO QUESTION 14 IS 1, AND...]  
[IF THE ANSWER TO QUESTION 39 IS 4, AND...]  
[IF THE ANSWER IS 4, THEN SKIP TO QUESTION 52]  
[IF THE ANSWER TO QUESTION 41 IS 4, AND...]  
[IF THE ANSWER IS 4, THEN SKIP TO QUESTION 52]

[IF THE ANSWER TO QUESTION 42 IS NOT 1, THEN SKIP TO QUESTION 9999]

Q.43 How often did this happen?

(47)

- 1 Almost every month
- 2 Some months but not every month
- 3 Only 1 or 2 months
- 4 DON'T KNOW / NOT SURE
- 5 REFUSED

[IF THE ANSWER TO QUESTION 14 IS 1, THEN SKIP TO QUESTION 46]

Q.44 What about the child who most recently had a birthday, was this child  
ever hungry but you just couldn't afford more food?

(48)

- 1 Yes
- 2 No
- 3 DON'T KNOW / NOT SURE
- 4 REFUSED

[IF THE ANSWER TO QUESTION 42 IS 4, AND...]  
[IF THE ANSWER IS 4, THEN SKIP TO QUESTION 52]

[IF THE ANSWER TO QUESTION 44 IS NOT 1, THEN SKIP TO QUESTION 9999]

Q.45 How often did this happen?

(49)

- 1 Almost every month
- 2 Some months but not every month
- 3 Only 1 or 2 months
- 4 DON'T KNOW / NOT SURE
- 5 REFUSED

Q.46 In the last 12 months, did the child/children ever skip meals because there wasn't enough money for food?

(50)

- 1 Yes
- 2 No
- 3 DON'T KNOW / NOT SURE
- 4 REFUSED

[IF THE ANSWER TO QUESTION 14 IS 1, AND...]

[IF THE ANSWER TO QUESTION 42 IS 4, AND...]

[IF THE ANSWER IS 4, THEN SKIP TO QUESTION 52]

[IF THE ANSWER TO QUESTION 44 IS 4, AND...]

[IF THE ANSWER IS 4, THEN SKIP TO QUESTION 52]

[IF THE ANSWER TO QUESTION 46 IS NOT 1, THEN SKIP TO QUESTION 9999]

Q.47 How often did this happen?

(51)

- 1 Almost every month
- 2 Some months but not every month
- 3 Only 1 or 2 months
- 4 DON'T KNOW / NOT SURE
- 5 REFUSED

[IF THE ANSWER TO QUESTION 14 IS 1, THEN SKIP TO QUESTION 50]

Q.48 What about the child who most recently had a birthday, did he or she ever skip meals because there wasn't enough money for food?

(52)

- 1 Yes
- 2 No
- 3 DON'T KNOW / NOT SURE
- 4 REFUSED

[IF THE ANSWER TO QUESTION 46 IS 4, AND...]

[IF THE ANSWER IS 4, THEN SKIP TO QUESTION 52]

[IF THE ANSWER TO QUESTION 48 IS NOT 1, THEN SKIP TO QUESTION 9999]

Q.49 How often did this happen?

(53)

- 1 Almost every month
- 2 Some months but not every month
- 3 Only 1 or 2 months
- 4 DON'T KNOW / NOT SURE
- 5 REFUSED

Q.50 In the last 12 months, did the child/any of the children ever not eat for a whole day because there wasn't enough money for food?

(54)

- 1 Yes
- 2 No
- 3 DON'T KNOW / NOT SURE
- 4 REFUSED

[IF THE ANSWER IS NOT 1, THEN SKIP TO QUESTION 52]

[IF THE ANSWER TO QUESTION 14 IS 1, THEN SKIP TO QUESTION 9999]

Q.51 What about the child who most recently had a birthday, did he or she ever not eat for a whole day?

(55)

- 1 Yes
- 2 No
- 3 DON'T KNOW / NOT SURE
- 4 REFUSED

Q.52 Now some questions on food or financial assistance in the last 12 months.

(56)

- 1 PRESS [1] TO CONTINUE

Q.53 Did anyone in your household receive . . . (READ LIST)  
(CODE AS: 1 - YES ; 2 - NO ; 3 - DK/NOT SURE ; 4 - REFUSED)

Food Stamps ? .....	___ (57)
AFDC/Welfare (DHS) ? .....	___ (58)
SSI (Social Security Income)? .....	___ (59)
Disability ? .....	___ (60)
Housing assistance (like Section 8) ? .....	___ (61)
Free or reduced price school lunch, preschool, adult meals .....	___ (62)
Head Start ? .....	___ (63)
WIC ? .....	___ (64)
Unemployment benefits ? .....	___ (65)

Q.54 Did you or any other adult get food from a foodbank, food pantry or church?

(66)

- 1 Yes
- 2 No
- 3 DON'T KNOW / NOT SURE
- 4 REFUSED

[IF THE ANSWER TO QUESTION 54 IS NOT 1, THEN SKIP TO QUESTION 9999]

Q.55 How often in the last year?

(67)

- 1 Weekly
- 2 2 to 3 times a month
- 3 Almost every month
- 4 Some months but not every month
- 5 Only 1 or 2 months
- 6 DON'T KNOW / NOT SURE
- 7 REFUSED

Q.56 In the last 12 months, did you or any other adult ever put off paying bills to have money to buy food?

(68)

- 1 Yes

- 2 No
- 3 DON'T KNOW / NOT SURE
- 4 REFUSED

[IF THE ANSWER TO QUESTION 54 IS 4, AND...]  
[IF THE ANSWER IS 4, THEN SKIP TO QUESTION 65]

[IF THE ANSWER TO QUESTION 56 IS NOT 1, THEN SKIP TO QUESTION 9999]

Q.57 How often did this happen?

(69)

- 1 Almost every month
- 2 Some months but not every month
- 3 Only 1 or 2 months
- 4 DON'T KNOW / NOT SURE
- 5 REFUSED

Q.58 In the last 12 months, did you or any other adult get food or borrow money from friends or relatives?

(70)

- 1 Yes
- 2 No
- 3 DON'T KNOW / NOT SURE
- 4 REFUSED

[IF THE ANSWER TO QUESTION 56 IS 4, AND...]  
[IF THE ANSWER IS 4, THEN SKIP TO QUESTION 65]

[IF THE ANSWER TO QUESTION 58 IS NOT 1, THEN SKIP TO QUESTION 9999]

Q.59 How often did this happen?

(71)

- 1 Almost every month
- 2 Some months but not every month
- 3 Only 1 or 2 months
- 4 DON'T KNOW / NOT SURE
- 5 REFUSED

[IF THE ANSWER TO QUESTION 14 IS 0, THEN SKIP TO QUESTION 9999]

Q.60 In the last 12 months, did you or any other adult ever send the child/ children to friends or relatives for a meal because of not having enough food or money for food?

(72)

- 1 Yes
- 2 No
- 3 DON'T KNOW / NOT SURE
- 4 REFUSED

[IF THE ANSWER TO QUESTION 58 IS 4, AND...]  
[IF THE ANSWER IS 4, THEN SKIP TO QUESTION 65]

[IF THE ANSWER TO QUESTION 60 IS NOT 1, THEN SKIP TO QUESTION 9999]

Q.61 How often did this happen?

(73)

- 1 Almost every month
- 2 Some months but not every month
- 3 Only 1 or 2 months
- 4 DON'T KNOW / NOT SURE
- 5 REFUSED

Q.62 Now some questions about the vegetables you eat:

Not counting salad or potatoes, how many servings of vegetables do you usually eat a day? Count 1/2 cup, like the size of a pudding cup, as one serving.

[ENTER '99' FOR DON'T KNOW/REFUSED.]

No. of servings ..... \_\_\_\_\_ (74-77)

Q.63 Does your vegetable intake increase or decrease throughout the month because of inadequate food or money for food, or does your intake stay the same? For example, does it change around the end of the month?

(78)

- 1 Increase
- 2 Decrease
- 3 Stay the same
- 4 DON'T KNOW / NOT SURE
- 5 REFUSED

Q.64 How many times last month did you or the child/children (whoever ate more) eat Saimin that was purchased dried not frozen?

(IF NO. GIVEN IS PER WEEK, MULTIPLY BY 4 TO GET MONTHLY)

(ENTER '99' FOR DON'T KNOW/REFUSED)

(IF RESPONDENT WANT TO KNOW WHY WE ASK THIS, SAY 'BECAUSE THIS IS A FOOD THAT IS BIG IN HAWAII, NOT IN THE MAINLAND'.)

No. of times PER MONTH ..... \_\_\_\_\_ (79-80)

Q.65 Now, I would like to ask you some general questions about your household for statistical purposes. What was the total income of all members of the household before taxes, in the calendar year 1997?

(81-82)

- 01 Under \$5,000
- 02 \$5,000 to \$9,999
- 03 \$10,000 to \$14,999
- 04 \$15,000 to \$19,999
- 05 \$20,000 to \$24,999
- 06 \$25,000 to \$29,999
- 07 \$30,000 to \$34,999
- 08 \$35,000 to \$39,999
- 09 \$40,000 to \$44,999
- 10 \$45,000 to \$49,999
- 11 \$50,000 to \$54,999
- 12 \$55,000 to \$59,999
- 13 \$60,000 to \$74,999
- 14 \$75,000 to \$99,999
- 15 \$100,000 to \$149,999
- 16 \$150,000 and over
- 17 DON'T KNOW (DO NOT READ)
- 18 REFUSED (DO NOT READ)

Q.66 How much savings do you estimate your household has?

(83)

- 1 less than \$250
- 2 \$250 - 500
- 3 \$501 - 1,000

- 4 \$1,001 - 5,000
- 5 \$5,001 - 10,000
- 6 more than \$10,000
- 7 DON'T KNOW / NOT SURE
- 8 REFUSED

Q.67 Of the household members 16 years old and older, how many are employed in any way?  
 ENTER NUMBER OF EMPLOYED (16 YRS OR OLDER) ..... \_\_\_\_\_ (84-85)

Q.68 Has anyone in your household lost their job in the last three years, and wasn't able to get a new job with a comparable salary?  
 [NOTE: 'COMPARABLE' IS WITHIN \$5,000 PER YEAR]

- (86)
- 1 YES
  - 2 NO
  - 3 DON'T KNOW / NOT SURE
  - 4 REFUSED

[IF THE ANSWER TO QUESTION 8 IS 1 OR 2, THEN SKIP TO QUESTION 9999]

Q.69 PHONE NUMBER

\_\_\_\_\_ (131-145)

Q.70 What is your zipcode?  
 (DON'T KNOW=999)

ENTER LAST 3 DIGITS OF ZIPCODE: 96 ..... \_\_\_\_\_ (87-89)

Q.71 Thank you very much for your time and cooperation. All your answers will be combined to give us information about the food insecurity of the people in the state.

- (90)
- 1 ENETER [1] - SURVEY COMPLETED

Q.72 (COMMENT ABOUT THIS INTERVIEW.)  
 \_\_\_\_\_ (146-345)

**Appendix 10.**  
**Hawai'i Health Survey - Version 4.0 (November 1998)**

- Q.1 Hello, I'm \_\_\_ calling from SMS Research on behalf of the Department of Health. We're doing a study on the health of Hawaii's residents, and we'd like to ask some questions about your health and the health of members of your household. It is a very important study, and we need to represent households like yours.  
(IF THEY ASK WHAT THE STUDY IS FOR:) The department uses this study to measure the health of the state and to plan so the right amount & types of health care are available in your area.  
Is this a private residence? (IF NO:) Is this a business as well as a residence? (IF BUSINESS:) Thank you very much but we are only interviewing private residence.  
(TERMINATE & CODE AS "16")  
Our study requires that I interview an adult who lives in this household. Are you 18 years of age or older?  
(IF NO:) May I speak to someone who is? (REPEAT INTRODUCTION).  
(IF ADULT 18+ NOT AVAILABLE, TERMINATE & CODE AS "8")
- Q.2 With your permission, we'd like to use our computer to digitally record your answers to certain questions -- just to make sure we get down exactly what you have to say. Is that okay with you?
- Q.3 Please be advised that my supervisor may be taping this interview for our internal quality control.
- Q.4 (Including yourself) What is the total number of people in your household?
- Q.5 (Including yourself) How many of the people in your household are male?
- Q.6 (DUMMY) PRESS [ENTER] TO CONTINUE.
- Q.7 So there are && females in your household, right?
- Q.8 Let us go back to the previous question.
- Q.9 In order for me to ask you questions about the health of each of the && members of your household, I would like you to tell me the first name of each of the persons living in your household.  
-  
If you are uncomfortable with giving out their first names you can tell me their initials.  
-  
(ENTER SEX OF RESPONDENT)
- Q.10 Let's begin with you. What is your name (or initials)?
- Q.11 What is the name (or initials) of the OLDEST MALE living in the household? (IF RESPONDENT IS MALE:) .... Excluding yourself.  
(MALE#1)

- Q.12 What is the name (or initials) of the NEXT OLDEST MALE living in the household?  
(MALE #2)
- Q.13 What is the name (or initials) of the NEXT OLDEST MALE living in the household?  
(MALE #3)
- Q.14 What is the name (or initials) of the NEXT OLDEST MALE living in the household?  
(MALE #4)
- Q.15 What is the name (or initials) of the NEXT OLDEST MALE living in the household?  
(MALE #5)
- Q.16 What is the name (or initials) of the NEXT OLDEST MALE living in the household?  
(MALE #6)
- Q.17 What is the name (or initials) of the NEXT OLDEST MALE living in the household?  
(MALE #7)
- Q.18 What is the name (or initials) of the NEXT OLDEST MALE living in the household?  
(MALE #8)
- Q.19 What is the name (or initials) of the NEXT OLDEST MALE living in the household?  
(MALE #9)
- Q.20 What is the name (or initials) of the OLDEST FEMALE living in the household? (IF RESPONDENT IS FEMALE) ... Excluding yourself.  
(FEMALE#1)
- Q.21 What is the name (or initials) of the NEXT OLDEST FEMALE living in the household?  
(FEMALE #2)
- Q.22 What is the name (or initials) of the NEXT OLDEST FEMALE living in the household?  
(FEMALE #3)
- Q.23 What is the name (or initials) of the NEXT OLDEST FEMALE living in the household?  
(FEMALE #4)
- Q.24 What is the name (or initials) of the NEXT OLDEST FEMALE living in the household?  
(FEMALE #5)
- Q.25 What is the name (or initials) of the NEXT OLDEST FEMALE living in the household?  
(FEMALE #6)

- Q.26 What is the name (or initials) of the NEXT OLDEST FEMALE living in the household?  
(FEMALE #7)
- Q.27 What is the name (or initials) of the NEXT OLDEST FEMALE living in the household?  
(FEMALE #8)
- Q.28 What is the name (or initials) of the NEXT OLDEST FEMALE living in the household?  
(FEMALE #9)
- Q.29 Let me repeat the names (initials) of all the household members?  
(READ ALL THE NAMES MENTIONED)  
(HOUSEHOLD ROSTER)  
-  
Did we get them all?
- Q.30 Let us go back to the question earlier.
- Q.31 Now, I would like to ask you some questions about each of these persons. Let's begin with you.
- Q.32 What is your age in years, on your last birthday?  
[ENTER 99 FOR DON'T KNOW/REFUSED]
- Q.33 What is your marital status? Is it... (READ LIST)
- Q.34 When you think of yourself, what is your ancestry or ethnic background? (ACCEPT ONLY ONE ANSWER. DO NOT READ LIST)  
(RESPONDENT)
- Q.35 (OTHER - SPECIFY HERE)
- Q.36 Of what ethnic background is your mother?  
READ LIST FOR 01-13. Question accepts 4 answers)  
(RESPONDENT)
- Q.37 (OTHER - SPECIFY HERE)
- Q.38 Of what ethnic background is your father?  
(READ LIST 01-13. QUESTION ACCEPTS 4 ANSWERS)  
(RESPONDENT)
- Q.39 (OTHER - SPECIFY HERE)
- Q.40 About how much do you weigh without your shoes?  
(PROBE FOR APPROXIMATE IF NECESSARY. ENTER '999' FOR 'REFUSED')
- Q.41 About how tall are you without shoes?  
(PROBE FOR APPROXIMATE, IF NECESSARY. ENTER '9999' FOR 'REFUSED')
- Q.42 What is the highest grade or year of school you completed?  
(READ ONLY IF NECESSARY)
- Q.43 What was &&'s age in years on his last birthday?

(MALE #1)  
(ENTER '97' FOR LESS THAN 1 YRS OF AGE)  
(PROBE FOR APPROXIMATE AGE IF "DON'T KNOW", ENTER '99' IF STILL DON'T KNOW)

Q.44 What is &&'s relationship to you?

Q.45 Is && ... (READ LIST 1-5)

Q.46 Of what ethnic background is &&'s mother?  
READ LIST FOR 01-13. Question accepts 4 answers)  
(MALE#1)

Q.47 (OTHER - SPECIFY HERE)

Q.48 Of what ethnic background is &&'s father?  
(READ LIST 01-13. QUESTION ACCEPTS 4 ANSWERS)  
(MALE #1)

Q.49 (OTHER - SPECIFY HERE)

Q.50 What is the highest grade or year of school && completed?  
(READ ONLY IF NECESSARY)

Q.51 What was &&'s age in years on his last birthday?  
(MALE #2)  
(ENTER '97' FOR LESS THAN 1 YRS OF AGE)  
(PROBE FOR APPROXIMATE AGE IF "DON'T KNOW", ENTER '99' IF STILL DON'T KNOW)

Q.52 What is &&'s relationship to you?

Q.53 Is && ... (READ LIST 1-5) Married .....

Q.54 Of what ethnic background is &&'s mother?  
(READ LIST FOR 01-13. Question accepts 4 answers)  
(MALE #2)

Q.55 (OTHER - SPECIFY HERE)

Q.56 Of what ethnic background is &&'s father?  
(READ LIST 01-13. QUESTION ACCEPTS 4 ANSWERS)  
(MALE #2)

Q.57 (OTHER - SPECIFY HERE)

Q.58 What is the highest grade or year of school && completed?  
(READ ONLY IF NECESSARY)

Q.59 What was &&'s age in years on his last birthday?  
(MALE #3)  
(ENTER '97' FOR LESS THAN 1 YRS OF AGE)  
(PROBE FOR APPROXIMATE AGE IF "DON'T KNOW", ENTER '99' IF STILL DON'T KNOW)

Q.60 What is &&'s relationship to you?

- Q.61 Is && ... (READ LIST 1-5) Married .....
- Q.62 Of what ethnic background is &&'s mother?  
(READ LIST FOR 01-13. Question accepts 4 answers)  
(MALE #3)
- Q.63 (OTHER - SPECIFY HERE)
- Q.64 Of what ethnic background is &&'s father?  
(READ LIST 01-13. QUESTION ACCEPTS 4 ANSWERS)  
(MALE #3)
- Q.65 (OTHER - SPECIFY HERE)
- Q.66 What is the highest grade or year of school && completed?  
(READ ONLY IF NECESSARY)
- Q.67 What was &&'s age in years on his last birthday?  
(MALE #4)  
(ENTER '97' FOR LESS THAN 1 YRS OF AGE)  
(PROBE FOR APPROXIMATE AGE IF "DON'T KNOW", ENTER '99' IF STILL DON'T KNOW)
- Q.68 What is &&'s relationship to you?
- Q.69 Is && ... (READ LIST 1-5) Married .....
- Q.70 Of what ethnic background is &&'s mother?  
(READ LIST FOR 01-13. Question accepts 4 answers)  
(MALE #4)
- Q.71 (OTHER - SPECIFY HERE)
- Q.72 Of what ethnic background is &&'s father?  
(READ LIST 01-13. QUESTION ACCEPTS 4 ANSWERS)  
(MALE #4)
- Q.73 (OTHER - SPECIFY HERE)
- Q.74 What is the highest grade or year of school && completed?  
(READ ONLY IF NECESSARY)
- Q.75 What was &&'s age in years on his last birthday?  
(MALE #5)  
(ENTER '97' FOR LESS THAN 1 YRS OF AGE)  
(PROBE FOR APPROXIMATE AGE IF "DON'T KNOW", ENTER '99' IF STILL DON'T KNOW)
- Q.76 What is &&'s relationship to you?
- Q.77 Is && ... (READ LIST 1-5) Married .....
- Q.78 Of what ethnic background is &&'s mother?  
(READ LIST FOR 01-13. Question accepts 4 answers)  
(MALE #5)

- Q.79 (OTHER - SPECIFY HERE)
- Q.80 Of what ethnic background is &&'s father?  
(READ LIST 01-13. QUESTION ACCEPTS 4 ANSWERS)  
(MALE #5)
- Q.81 (OTHER - SPECIFY HERE)
- Q.82 What is the highest grade or year of school && completed?  
(READ ONLY IF NECESSARY)
- Q.83 What was &&'s age in years on his last birthday?  
(MALE #6)  
(ENTER '97' FOR LESS THAN 1 YRS OF AGE)  
(PROBE FOR APPROXIMATE AGE IF "DON'T KNOW", ENTER '99' IF STILL DON'T KNOW)
- Q.84 What is &&'s relationship to you?
- Q.85 Is && ... (READ LIST 1-5) Married .....
- Q.86 Of what ethnic background is &&'s mother?  
(READ LIST FOR 01-13. Question accepts 4 answers)  
(MALE #6)
- Q.87 (OTHER - SPECIFY HERE)
- Q.88 Of what ethnic background is &&'s father?  
(READ LIST 01-13. QUESTION ACCEPTS 4 ANSWERS)  
(MALE #6)
- Q.89 (OTHER - SPECIFY HERE)
- Q.90 What is the highest grade or year of school && completed?  
(READ ONLY IF NECESSARY)
- Q.91 What was &&'s age in years on his last birthday?  
(MALE #7)  
(ENTER '97' FOR LESS THAN 1 YRS OF AGE)  
(PROBE FOR APPROXIMATE AGE IF "DON'T KNOW", ENTER '99' IF STILL DON'T KNOW)
- Q.92 What is &&'s relationship to you?
- Q.93 Is && ... (READ LIST 1-5) Married .....
- Q.94 Of what ethnic background is &&'s mother?  
(READ LIST FOR 01-13. Question accepts 4 answers)  
(MALE #7)
- Q.95 (OTHER - SPECIFY HERE)
- Q.96 Of what ethnic background is &&'s father?  
(READ LIST 01-13. QUESTION ACCEPTS 4 ANSWERS)  
(MALE #7)

- Q.97 (OTHER - SPECIFY HERE)
- Q.98 What is the highest grade or year of school && completed?  
(READ ONLY IF NECESSARY)
- Q.99 What was &&'s age in years on his last birthday?  
(MALE #8)  
(ENTER '97' FOR LESS THAN 1 YRS OF AGE)  
(PROBE FOR APPROXIMATE AGE IF "DON'T KNOW", ENTER '99' IF STILL DON'T KNOW)
- Q.100 What is &&'s relationship to you?
- Q.101 Is && ... (READ LIST 1-5)Married .....
- Q.102 Of what ethnic background is &&'s mother?  
(READ LIST FOR 01-13. Question accepts 4 answers)  
(MALE #8)
- Q.103 (OTHER - SPECIFY HERE)
- Q.104 Of what ethnic background is &&'s father?  
(READ LIST 01-13. QUESTION ACCEPTS 4 ANSWERS)  
(MALE #8)
- Q.105 (OTHER - SPECIFY HERE)
- Q.106 What is the highest grade or year of school && completed?  
(READ ONLY IF NECESSARY)
- Q.107 What was &&'s age in years on his last birthday?  
(MALE #9)  
(ENTER '97' FOR LESS THAN 1 YRS OF AGE)  
(PROBE FOR APPROXIMATE AGE IF "DON'T KNOW", ENTER '99' IF STILL DON'T KNOW)
- Q.108 What is &&'s relationship to you?
- Q.109 Is && ... (READ LIST 1-5)Married .....
- Q.110 Of what ethnic background is &&'s mother?  
(READ LIST FOR 01-13. Question accepts 4 answers)  
(MALE #9)
- Q.111 (OTHER - SPECIFY HERE)
- Q.112 Of what ethnic background is &&'s father?  
(READ LIST 01-13. QUESTION ACCEPTS 4 ANSWERS)  
(MALE #9)
- Q.113 (OTHER - SPECIFY HERE)
- Q.114 What is the highest grade or year of school && completed?  
(READ ONLY IF NECESSARY)

- Q.115 What was &&'s age in years on her last birthday?  
 (FEMALE #1)  
 (ENTER '97' FOR LESS THAN 1 YRS OF AGE)  
 (PROBE FOR APPROXIMATE AGE IF "DON'T KNOW", ENTER '99' IF STILL DON'T KNOW)
- Q.116 What is &&'s relationship to you?
- Q.117 Is && ... (READ LIST 1-5)Married .....
- Q.118 Of what ethnic background is &&'s mother?  
 (READ LIST FOR 01-13. Question accepts 4 answers)  
 (FEMALE #1)
- Q.119 (OTHER - SPECIFY HERE)
- Q.120 Of what ethnic background is &&'s father?  
 (READ LIST 01-13. QUESTION ACCEPTS 4 ANSWERS)  
 (FEMALE #1)
- Q.121 (OTHER - SPECIFY HERE)
- Q.122 What is the highest grade or year of school && completed?  
 (READ ONLY IF NECESSARY)
- Q.123 What was &&'s age in years on her last birthday?  
 (FEMALE #2)  
 (ENTER '97' FOR LESS THAN 1 YRS OF AGE)  
 (PROBE FOR APPROXIMATE AGE IF "DON'T KNOW", ENTER '99' IF STILL DON'T KNOW)
- Q.124 What is &&'s relationship to you?
- Q.125 Is && ... (READ LIST 1-5)Married .....
- Q.126 Of what ethnic background is &&'s mother?  
 (READ LIST FOR 01-13. Question accepts 4 answers)  
 (FEMALE #2)
- Q.127 (OTHER - SPECIFY HERE)
- Q.128 Of what ethnic background is &&'s father?  
 (READ LIST 01-13. QUESTION ACCEPTS 4 ANSWERS)  
 (FEMALE #2)
- Q.129 (OTHER - SPECIFY HERE)
- Q.130 What is the highest grade or year of school && completed?  
 (READ ONLY IF NECESSARY)
- Q.131 What was &&'s age in years on her last birthday?  
 (FEMALE #3)  
 (ENTER '97' FOR LESS THAN 1 YRS OF AGE)  
 (PROBE FOR APPROXIMATE AGE IF "DON'T KNOW", ENTER '99' IF STILL DON'T KNOW)

- Q.132 What is &&'s relationship to you?
- Q.133 Is && ... (READ LIST 1-5)Married .....
- Q.134 Of what ethnic background is &&'s mother?  
(READ LIST FOR 01-13. Question accepts 4 answers)  
(FEMALE #3)
- Q.135 (OTHER - SPECIFY HERE)
- Q.136 Of what ethnic background is &&'s father?  
(READ LIST 01-13. QUESTION ACCEPTS 4 ANSWERS)  
(FEMALE #3)
- Q.137 (OTHER - SPECIFY HERE)
- Q.138 What is the highest grade or year of school && completed?  
(READ ONLY IF NECESSARY)
- Q.139 What was &&'s age in years on her last birthday?  
(FEMALE #4)  
(ENTER '97' FOR LESS THAN 1 YRS OF AGE)  
(PROBE FOR APPROXIMATE AGE IF "DON'T KNOW", ENTER '99' IF STILL DON'T KNOW)
- Q.140 What is &&'s relationship to you?
- Q.141 Is && ... (READ LIST 1-5)Married .....
- Q.142 Of what ethnic background is &&'s mother?  
(READ LIST FOR 01-13. Question accepts 4 answers)  
(FEMALE #4)
- Q.143 (OTHER - SPECIFY HERE)
- Q.144 Of what ethnic background is &&'s father?  
(READ LIST 01-13. QUESTION ACCEPTS 4 ANSWERS)  
(FEMALE #4)
- Q.145 (OTHER - SPECIFY HERE)
- Q.146 What is the highest grade or year of school && completed?  
(READ ONLY IF NECESSARY)
- Q.147 What was &&'s age in years on her last birthday?  
(FEMALE #5)  
(ENTER '97' FOR LESS THAN 1 YRS OF AGE)  
(PROBE FOR APPROXIMATE AGE IF "DON'T KNOW", ENTER '99' IF STILL DON'T KNOW)
- Q.148 What is &&'s relationship to you?
- Q.149 Is && ... (READ LIST 1-5)Married .....
- Q.150 Of what ethnic background is &&'s mother?  
(READ LIST FOR 01-13. Question accepts 4 answers)

- (FEMALE #5)
- Q.151 (OTHER - SPECIFY HERE)
- Q.152 Of what ethnic background is &&'s father?  
(READ LIST 01-13. QUESTION ACCEPTS 4 ANSWERS)  
(FEMALE #5)
- Q.153 (OTHER - SPECIFY HERE)
- Q.154 What is the highest grade or year of school && completed?  
(READ ONLY IF NECESSARY)
- Q.155 What was &&'s age in years on her last birthday?  
(FEMALE #6)  
(ENTER '97' FOR LESS THAN 1 YRS OF AGE)  
(PROBE FOR APPROXIMATE AGE IF "DON'T KNOW", ENTER '99' IF STILL DON'T  
KNOW)
- Q.156 What is &&'s relationship to you?
- Q.157 Is && ... (READ LIST 1-5)Married .....
- Q.158 Of what ethnic background is &&'s mother?  
(READ LIST FOR 01-13. Question accepts 4 answers)  
(FEMALE #6)
- Q.159 (OTHER - SPECIFY HERE)
- Q.160 Of what ethnic background is &&'s father?  
(READ LIST 01-13. QUESTION ACCEPTS 4 ANSWERS)  
(FEMALE #6)
- Q.161 (OTHER - SPECIFY HERE)
- Q.162 What is the highest grade or year of school && completed?  
(READ ONLY IF NECESSARY)
- Q.163 What was &&'s age in years on her last birthday?  
(FEMALE #7)  
(ENTER '97' FOR LESS THAN 1 YRS OF AGE)  
(PROBE FOR APPROXIMATE AGE IF "DON'T KNOW", ENTER '99' IF STILL DON'T  
KNOW)
- Q.164 What is &&'s relationship to you?
- Q.165 Is && ... (READ LIST 1-5)Married .....
- Q.166 Of what ethnic background is &&'s mother?  
(READ LIST FOR 01-13. Question accepts 4 answers)  
(FEMALE #7)
- Q.167 (OTHER - SPECIFY HERE)
- Q.168 Of what ethnic background is &&'s father?  
(READ LIST 01-13. QUESTION ACCEPTS 4 ANSWERS)

- (FEMALE #7)
- Q.169 (OTHER - SPECIFY HERE)
- Q.170 What is the highest grade or year of school && completed?  
(READ ONLY IF NECESSARY)
- Q.171 What was &&'s age in years on her last birthday?  
(FEMALE #8)  
(ENTER '97' FOR LESS THAN 1 YRS OF AGE)  
(PROBE FOR APPROXIMATE AGE IF "DON'T KNOW", ENTER '99' IF STILL DON'T KNOW)
- Q.172 What is &&'s relationship to you?
- Q.173 Is && ... (READ LIST 1-5)Married .....
- Q.174 Of what ethnic background is &&'s mother?  
(READ LIST FOR 01-13. Question accepts 4 answers)  
(FEMALE #8)
- Q.175 (OTHER - SPECIFY HERE)
- Q.176 Of what ethnic background is &&'s father?  
(READ LIST 01-13. QUESTION ACCEPTS 4 ANSWERS)  
(FEMALE #8)
- Q.177 (OTHER - SPECIFY HERE)
- Q.178 What is the highest grade or year of school && completed?  
(READ ONLY IF NECESSARY)
- Q.179 What was &&'s age in years on her last birthday?  
(FEMALE #9)  
(ENTER '97' FOR LESS THAN 1 YRS OF AGE)  
(PROBE FOR APPROXIMATE AGE IF "DON'T KNOW", ENTER '99' IF STILL DON'T KNOW)
- Q.180 What is &&'s relationship to you?
- Q.181 Is && ... (READ LIST 1-5)Married .....
- Q.182 Of what ethnic background is &&'s mother?  
(READ LIST FOR 01-13. Question accepts 4 answers)  
(FEMALE #9)
- Q.183 (OTHER - SPECIFY HERE)
- Q.184 Of what ethnic background is &&'s father?  
(READ LIST 01-13. QUESTION ACCEPTS 4 ANSWERS)  
(FEMALE #9)
- Q.185 (OTHER - SPECIFY HERE)
- Q.186 What is the highest grade or year of school && completed?  
(READ ONLY IF NECESSARY)

- Q.187 (DUMMY) PRESS [ENTER] TO CONTINUE
- Q.188 (DUMMY) PRESS [ENTER] TO CONTINUE.
- Q.189 (DUMMY) PRESS [ENTER] TO CONTINUE.
- Q.190 Now I am going to ask you some health related questions. I will be asking you if certain health conditions affect any of the members of your household.
- Q.191 Has anyone in the household been told by a physician or medical professional that they have high cholesterol?
- Q.192 What are the names (initials) of those household members?  
(QUESTION ACCEPTS 19 ANSWERS)  
(HOUSEHOLD ROSTER)
- Q.193 Has anyone in the household been told by a physician or medical professional that they have asthma?
- Q.194 What are the names (initials) of those household members?  
(QUESTION ACCEPTS 19 ANSWERS)  
(HOUSEHOLD ROSTER)
- Q.195 Has anyone in the household been told by a physician or medical professional that they have hypertension or high blood pressure?
- Q.196 What are the names (initials) of those household members?  
(QUESTION ACCEPTS 19 ANSWERS)  
(HOUSEHOLD ROSTER)
- Q.197 Has anyone in the household been told by a physician or medical professional that they have diabetes?
- Q.198 What are the names (initials) of those household members?  
(QUESTION ACCEPTS 19 ANSWERS)  
(HOUSEHOLD ROSTER)
- Q.199 Has anyone in the household been told by a physician or medical professional that they have arthritis?
- Q.200 What are the names (initials) of those household members?  
(QUESTION ACCEPTS 19 ANSWERS)  
(HOUSEHOLD ROSTER)
- Q.201 Has a medical professional ever recommended that you should increase your physical activity or exercise?
- Q.202 Who gave you that advice on exercise? (READ LIST 1-4)
- Q.203 Did the advise on exercise include discussion of how often, how hard, and how long you should exercise?
- Q.204 Would you say your health in general is: (READ LIST 1-5)  
(RESPONDENT)

- Q.205 During a typical day, does your health limit you from moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?
- Q.206 During a typical day, does your health limit you from moderate activities, such as climbing several flights of stairs?
- Q.207 During the past four weeks, have you had any of the following problems with your work or other regular activities as a result of PHYSICAL HEALTH...
- Q.208 ...accomplish less than you would like?  
[DURING THE PAST 4 WEEKS]
- Q.209 ...limited in the kind of work or other activities?  
[DURING THE PAST 4 WEEKS]
- Q.210 During the past four weeks, have you had any of the following problems with your work or other regular activities as a result of EMOTIONAL PROBLEMS...
- Q.211 ...accomplish less than you would like?  
[DURING THE PAST 4 WEEKS]
- Q.212 ...didn't do work or other activities as carefully as usual?  
[DURING THE PAST 4 WEEKS]
- Q.213 During the past four weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?  
(PHYSICAL PAIN)
- Q.214 Would you say &&'s health in general is: (READ LIST 1-5)  
(MALE#1)
- Q.215 During a typical day, does &&'s health limit him from moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?
- Q.216 During a typical day, does &&'s health limit him from moderate activities, such as climbing several flights of stairs?
- Q.217 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of PHYSICAL HEALTH..
- Q.218 ...accomplish less than he would like?  
[DURING THE PAST 4 WEEKS]
- Q.219 ...limited in the kind of work or other activities?  
[DURING THE PAST 4 WEEKS]
- Q.220 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of EMOTIONAL PROBLEMS...
- Q.221 ...accomplish less than he would like?

[DURING THE PAST 4 WEEKS]

- Q.222 ...didn't do work or other activities as carefully as usual?  
[DURING THE PAST 4 WEEKS]
- Q.223 During the past four weeks, how much did pain interfere with &&'s normal work (including both work outside the home and housework)?
- Q.224 Would you say &&'s health in general is: (READ LIST 1-5)  
(MALE#2)
- Q.225 During a typical day, does &&'s health limit him from moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?
- Q.226 During a typical day, does &&'s health limit him from moderate activities, such as climbing several flights of stairs?
- Q.227 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of PHYSICAL HEALTH..
- Q.228 ...accomplish less than he would like?
- Q.229 ...limited in the kind of work or other activities?
- Q.230 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of EMOTIONAL PROBLEMS...
- Q.231 ...accomplish less than he would like?
- Q.232 ...didn't do work or other activities as carefully as usual?
- Q.233 During the past four weeks, how much did pain interfere with &&'s normal work (including both work outside the home and housework)?
- Q.234 Would you say &&'s health in general is: (READ LIST 1-5)  
(MALE#3)
- Q.235 During a typical day, does &&'s health limit him from moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?
- Q.236 During a typical day, does &&'s health limit him from moderate activities, such as climbing several flights of stairs?
- Q.237 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of PHYSICAL HEALTH..
- Q.238 ...accomplish less than he would like?
- Q.239 ...limited in the kind of work or other activities?
- Q.240 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of EMOTIONAL PROBLEMS...

- Q.241 ...accomplish less than he would like?
- Q.242 ...didn't do work or other activities as carefully as usual?
- Q.243 During the past four weeks, how much did pain interfere with &&'s normal work (including both work outside the home and housework)?
- Q.244 Would you say &&'s health in general is: (READ LIST 1-5)  
(MALE#4)
- Q.245 During a typical day, does &&'s health limit him from moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?
- Q.246 During a typical day, does &&'s health limit him from moderate activities, such as climbing several flights of stairs?
- Q.247 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of PHYSICAL HEALTH..
- Q.248 ...accomplish less than he would like?
- Q.249 ...limited in the kind of work or other activities?
- Q.250 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of EMOTIONAL PROBLEMS...
- Q.251 ...accomplish less than he would like?
- Q.252 ...didn't do work or other activities as carefully as usual?
- Q.253 During the past four weeks, how much did pain interfere with &&'s normal work (including both work outside the home and housework)?
- Q.254 Would you say &&'s health in general is: (READ LIST 1-5)  
(MALE#5)
- Q.255 During a typical day, does &&'s health limit him from moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?
- Q.256 During a typical day, does &&'s health limit him from moderate activities, such as climbing several flights of stairs?
- Q.257 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of PHYSICAL HEALTH..
- Q.258 ...accomplish less than he would like?
- Q.259 ...limited in the kind of work or other activities?
- Q.260 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of EMOTIONAL PROBLEMS...

- Q.261 ...accomplish less than he would like?
- Q.262 ...didn't do work or other activities as carefully as usual?
- Q.263 During the past four weeks, how much did pain interfere with &&'s normal work (including both work outside the home and housework)?
- Q.264 Would you say &&'s health in general is: (READ LIST 1-5)  
(MALE#6)
- Q.265 During a typical day, does &&'s health limit him from moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?
- Q.266 During a typical day, does &&'s health limit him from moderate activities, such as climbing several flights of stairs?
- Q.267 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of PHYSICAL HEALTH..
- Q.268 ...accomplish less than he would like?
- Q.269 ...limited in the kind of work or other activities?
- Q.270 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of EMOTIONAL PROBLEMS...
- Q.271 ...accomplish less than he would like?
- Q.272 ...didn't do work or other activities as carefully as usual?
- Q.273 During the past four weeks, how much did pain interfere with &&'s normal work (including both work outside the home and housework)?
- Q.274 Would you say &&'s health in general is: (READ LIST 1-5)  
(MALE#7)
- Q.275 During a typical day, does &&'s health limit him from moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?
- Q.276 During a typical day, does &&'s health limit him from moderate activities, such as climbing several flights of stairs?
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- Q.280 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of EMOTIONAL PROBLEMS...

- Q.281 ...accomplish less than he would like?
- Q.282 ...didn't do work or other activities as carefully as usual?
- Q.283 During the past four weeks, how much did pain interfere with &&'s normal work (including both work outside the home and housework)?
- Q.284 Would you say &&'s health in general is: (READ LIST 1-5)  
(MALE#8)
- Q.285 During a typical day, does &&'s health limit him from moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?
- Q.286 During a typical day, does &&'s health limit him from moderate activities, such as climbing several flights of stairs?
- Q.287 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of PHYSICAL HEALTH..
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- Q.290 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of EMOTIONAL PROBLEMS...
- Q.291 ...accomplish less than he would like?
- Q.292 ...didn't do work or other activities as carefully as usual?
- Q.293 During the past four weeks, how much did pain interfere with &&'s normal work (including both work outside the home and housework)?
- Q.294 Would you say &&'s health in general is: (READ LIST 1-5)  
(MALE#9)
- Q.295 During a typical day, does &&'s health limit him from moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?
- Q.296 During a typical day, does &&'s health limit him from moderate activities, such as climbing several flights of stairs?
- Q.297 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of PHYSICAL HEALTH..
- Q.298 ...accomplish less than he would like?
- Q.299 ...limited in the kind of work or other activities?
- Q.300 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of EMOTIONAL PROBLEMS...

- Q.301 ...accomplish less than he would like?
- Q.302 ...didn't do work or other activities as carefully as usual?
- Q.303 During the past four weeks, how much did pain interfere with &&'s normal work (including both work outside the home and housework)?
- Q.304 Would you say &&'s health in general is: (READ LIST 1-5)  
(FEMALE#1)
- Q.305 During a typical day, does &&'s health limit her from moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?
- Q.306 During a typical day, does &&'s health limit her from moderate activities, such as climbing several flights of stairs?
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- Q.309 ...limited in the kind of work or other activities?
- Q.310 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of EMOTIONAL PROBLEMS...
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- Q.312 ...didn't do work or other activities as carefully as usual?
- Q.313 During the past four weeks, how much did pain interfere with &&'s normal work (including both work outside the home and housework)?
- Q.314 Would you say &&'s health in general is: (READ LIST 1-5)  
(FEMALE#2)
- Q.315 During a typical day, does &&'s health limit her from moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?
- Q.316 During a typical day, does &&'s health limit her from moderate activities, such as climbing several flights of stairs?
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- Q.323 During the past four weeks, how much did pain interfere with &&'s normal work (including both work outside the home and housework)?
- Q.324 Would you say &&'s health in general is: (READ LIST 1-5)  
(FEMALE#3)
- Q.325 During a typical day, does &&'s health limit her from moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?
- Q.326 During a typical day, does &&'s health limit her from moderate activities, such as climbing several flights of stairs?
- Q.327 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of PHYSICAL HEALTH..
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- Q.330 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of EMOTIONAL PROBLEMS...
- Q.331 ...accomplish less than she would like?
- Q.332 ...didn't do work or other activities as carefully as usual?
- Q.333 During the past four weeks, how much did pain interfere with &&'s normal work (including both work outside the home and housework)?
- Q.334 Would you say &&'s health in general is: (READ LIST 1-5)  
(FEMALE#4)
- Q.335 During a typical day, does &&'s health limit her from moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?
- Q.336 During a typical day, does &&'s health limit her from moderate activities, such as climbing several flights of stairs?
- Q.337 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of PHYSICAL HEALTH..
- Q.338 ...accomplish less than she would like?
- Q.339 ...limited in the kind of work or other activities?
- Q.340 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of EMOTIONAL PROBLEMS...

- Q.341 ...accomplish less than she would like?
- Q.342 ...didn't do work or other activities as carefully as usual?
- Q.343 During the past four weeks, how much did pain interfere with &&'s normal work (including both work outside the home and housework)?
- Q.344 Would you say &&'s health in general is: (READ LIST 1-5)  
(FEMALE#5)
- Q.345 During a typical day, does &&'s health limit her from moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?
- Q.346 During a typical day, does &&'s health limit her from moderate activities, such as climbing several flights of stairs?
- Q.347 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of PHYSICAL HEALTH..
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- Q.350 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of EMOTIONAL PROBLEMS...
- Q.351 ...accomplish less than she would like?
- Q.352 ...didn't do work or other activities as carefully as usual?
- Q.353 During the past four weeks, how much did pain interfere with &&'s normal work (including both work outside the home and housework)?
- Q.354 Would you say &&'s health in general is: (READ LIST 1-5)  
(FEMALE#6)
- Q.355 During a typical day, does &&'s health limit her from moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?
- Q.356 During a typical day, does &&'s health limit her from moderate activities, such as climbing several flights of stairs?
- Q.357 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of PHYSICAL HEALTH..
- Q.358 ...accomplish less than she would like?
- Q.359 ...limited in the kind of work or other activities?
- Q.360 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of EMOTIONAL PROBLEMS...

- Q.361 ...accomplish less than she would like?
- Q.362 ...didn't do work or other activities as carefully as usual?
- Q.363 During the past four weeks, how much did pain interfere with &&'s normal work (including both work outside the home and housework)?
- Q.364 Would you say &&'s health in general is: (READ LIST 1-5)  
(FEMALE#7)
- Q.365 During a typical day, does &&'s health limit her from moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?
- Q.366 During a typical day, does &&'s health limit her from moderate activities, such as climbing several flights of stairs?
- Q.367 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of PHYSICAL HEALTH..
- Q.368 ...accomplish less than she would like?
- Q.369 ...limited in the kind of work or other activities?
- Q.370 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of EMOTIONAL PROBLEMS...
- Q.371 ...accomplish less than she would like?
- Q.372 ...didn't do work or other activities as carefully as usual?
- Q.373 During the past four weeks, how much did pain interfere with &&'s normal work (including both work outside the home and housework)?
- Q.374 Would you say &&'s health in general is: (READ LIST 1-5)  
(FEMALE#8)
- Q.375 During a typical day, does &&'s health limit her from moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?
- Q.376 During a typical day, does &&'s health limit her from moderate activities, such as climbing several flights of stairs?
- Q.377 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of PHYSICAL HEALTH..
- Q.378 ...accomplish less than she would like?
- Q.379 ...limited in the kind of work or other activities?
- Q.380 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of EMOTIONAL PROBLEMS...

- Q.381 ...accomplish less than she would like?
- Q.382 ...didn't do work or other activities as carefully as usual?
- Q.383 During the past four weeks, how much did pain interfere with &&'s normal work (including both work outside the home and housework)?
- Q.384 Would you say &&'s health in general is: (READ LIST 1-5)  
(FEMALE#9)
- Q.385 During a typical day, does &&'s health limit her from moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?
- Q.386 During a typical day, does &&'s health limit her from moderate activities, such as climbing several flights of stairs?
- Q.387 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of PHYSICAL HEALTH..
- Q.388 ...accomplish less than she would like?
- Q.389 ...limited in the kind of work or other activities?
- Q.390 During the past four weeks, has && had any of the following problems with work or other regular activities as a result of EMOTIONAL PROBLEMS...
- Q.391 ...accomplish less than she would like?
- Q.392 ...didn't do work or other activities as carefully as usual?
- Q.393 During the past four weeks, how much did pain interfere with &&'s normal work (including both work outside the home and housework)?
- Q.394 The following questions are about how you felt during the PAST FOUR WEEKS. How much of the time...
- Q.395 ...have you felt calm and peaceful?  
(DURING THE PAST 4 WEEKS)
- Q.396 ...did you have a lot of energy?  
(DURING THE PAST 4 WEEKS)
- Q.397 ...have you felt down-hearted and blue?  
(DURING THE PAST 4 WEEKS)
- Q.398 During the PAST 4 WEEKS, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)?
- Q.399 Now, some questions about health insurance - Do you or anyone else in your household have a health insurance plan? Include health insurance obtained through employers, insurance you purchased directly, and the purchased directly, and the government programs like Medicaid and

QUEST.

- Q.403 Are all those household members with health care insurance covered by the same plan?
- Q.404 Which health plan(s) does your household have?  
(PROBE) Any other health plan? (THIS QUESTION ACCEPTS UP TO 5 ANSWERS)  
(COVERAGE THE SAME FOR ALL HOUSEHOLD MEMBERS)
- Q.405 (OTHER - SPECIFY HERE)
- Q.406 Please tell me whether each of the following is included in your health insurance plan:... Basic Medical Care?
- Q.407 ...Prescription drugs and medicine?
- Q.408 ...Dental care?
- Q.409 Is anyone in your household NOT covered by any health insurance plan?
- Q.410 What are the names (or initials) of those household members WITHOUT health insurance plan? (QUESTION ACCEPTS 18 ANSWERS)  
(HOUSEHOLD ROSTER)
- Q.411 So everyone else has health care coverage. Right?
- Q.412 (RESPONDENT W/OUT COVERAGE)  
When was the last time you had health care coverage?
- Q.413 (RESPONDENT W/OUT COVERAGE)  
Why did you stop being covered by health insurance?
- Q.414 (OTHER - SPECIFY HERE)
- Q.415 (MALE#1 W/OUT COVERAGE)  
When was the last time && had health care coverage?
- Q.416 (MALE#1 W/OUT COVERAGE)  
Why did && stop being covered by health insurance?
- Q.417 (OTHER - SPECIFY HERE)
- Q.418 (MALE#2 W/OUT COVERAGE)  
When was the last time && had health care coverage?
- Q.419 (MALE#2 W/OUT COVERAGE)  
Why did && stop being covered by health insurance?
- Q.420 (OTHER - SPECIFY HERE)
- Q.421 (MALE#3 W/OUT COVERAGE)  
When was the last time && had health care coverage?
- Q.422 (MALE#3 W/OUT COVERAGE)  
Why did && stop being covered by health insurance?

- Q.423 (OTHER - SPECIFY HERE)
- Q.424 (MALE#4 W/OUT COVERAGE)  
When was the last time && had health care coverage?
- Q.425 (MALE#4 W/OUT COVERAGE)  
Why did && stop being covered by health insurance?
- Q.426 (OTHER - SPECIFY HERE)
- Q.427 (MALE#5 W/OUT COVERAGE)  
When was the last time && had health care coverage?
- Q.428 (MALE#5 W/OUT COVERAGE)  
Why did && stop being covered by health insurance?
- Q.429 (OTHER - SPECIFY HERE)
- Q.430 (MALE#6 W/OUT COVERAGE)  
When was the last time && had health care coverage?
- Q.431 (MALE#6 W/OUT COVERAGE)  
Why did && stop being covered by health insurance?
- Q.432 (OTHER - SPECIFY HERE)
- Q.433 (MALE#7 W/OUT COVERAGE)  
When was the last time && had health care coverage?
- Q.434 (MALE#7 W/OUT COVERAGE)  
Why did && stop being covered by health insurance?
- Q.435 (OTHER - SPECIFY HERE)
- Q.436 (MALE#8 W/OUT COVERAGE)  
When was the last time && had health care coverage?
- Q.437 (MALE#8 W/OUT COVERAGE)  
Why did && stop being covered by health insurance?
- Q.438 (OTHER - SPECIFY HERE)
- Q.439 (MALE#9 W/OUT COVERAGE)  
When was the last time && had health care coverage?
- Q.440 (MALE#9 W/OUT COVERAGE)  
Why did && stop being covered by health insurance?
- Q.441 (OTHER - SPECIFY HERE)
- Q.442 (FEMALE#1 W/OUT COVERAGE)  
When was the last time && had health care coverage?
- Q.443 (FEMALE#1 W/OUT COVERAGE)  
Why did && stop being covered by health insurance?

- Q.444 (OTHER - SPECIFY HERE)
- Q.445 (FEMALE#2 W/OUT COVERAGE)  
When was the last time && had health care coverage?
- Q.446 (FEMALE#2 W/OUT COVERAGE)  
Why did && stop being covered by health insurance?
- Q.447 (OTHER - SPECIFY HERE)
- Q.448 (FEMALE#3 W/OUT COVERAGE)  
When was the last time && had health care coverage?
- Q.449 (FEMALE#3 W/OUT COVERAGE)  
Why did && stop being covered by health insurance?
- Q.450 (OTHER - SPECIFY HERE)
- Q.451 (FEMALE#4 W/OUT COVERAGE)  
When was the last time && had health care coverage?
- Q.452 (FEMALE#4 W/OUT COVERAGE)  
Why did && stop being covered by health insurance?
- Q.453 (OTHER - SPECIFY HERE)
- Q.454 (FEMALE#5 W/OUT COVERAGE)  
When was the last time && had health care coverage?
- Q.455 (FEMALE#5 W/OUT COVERAGE)  
Why did && stop being covered by health insurance?
- Q.456 (OTHER - SPECIFY HERE)
- Q.457 (FEMALE#6 W/OUT COVERAGE)  
When was the last time && had health care coverage?
- Q.458 (FEMALE#6 W/OUT COVERAGE)  
Why did && stop being covered by health insurance?
- Q.459 (OTHER - SPECIFY HERE)
- Q.460 (FEMALE#7 W/OUT COVERAGE)  
When was the last time && had health care coverage?
- Q.461 (FEMALE#7 W/OUT COVERAGE)  
Why did && stop being covered by health insurance?
- Q.462 (OTHER - SPECIFY HERE)
- Q.463 (FEMALE#8 W/OUT COVERAGE)  
When was the last time && had health care coverage?
- Q.464 (FEMALE#8 W/OUT COVERAGE)  
Why did && stop being covered by health insurance?

Q.465 (OTHER - SPECIFY HERE)

Q.466 (FEMALE#9 W/OUT COVERAGE)

When was the last time && had health care coverage?

Q.467 (FEMALE#9 W/OUT COVERAGE)

Why did && stop being covered by health insurance?

Q.468 (OTHER - SPECIFY HERE)

Q.469 What kind of plan do you yourself have? (QUESTION ACCEPTS 3 ANSWERS)  
(RESPONDENT)

Q.470 (OTHER - SPECIFY HERE)

Q.471 Please tell me whether each of the following is included in your  
health insurance plan:... Basic Medical Care?

Q.472 ...Prescription drugs and medicine?

Q.473 ...Dental care?

Q.474 What kind of plan does && have? (QUESTION ACCEPTS 3 ANSWERS)  
(MALE#1)

Q.475 (OTHER - SPECIFY HERE)

Q.476 Please tell me whether each of the following is included in &&'s  
health insurance plan:... Basic Medical Care?

Q.477 ...Prescription drugs and medicine?

Q.478 ...Dental care?

Q.479 What kind of plan does && have? (QUESTION ACCEPTS 3 ANSWERS)  
(MALE#2)

Q.480 (OTHER - SPECIFY HERE)

Q.481 Please tell me whether each of the following is included in &&'s  
health insurance plan:... Basic Medical Care?

Q.482 ...Prescription drugs and medicine?

Q.483 ...Dental care?

Q.484 What kind of plan does && have? (QUESTION ACCEPTS 3 ANSWERS)  
(MALE#3)

Q.485 (OTHER - SPECIFY HERE)

Q.486 Please tell me whether each of the following is included in &&'s  
health insurance plan:... Basic Medical Care?

Q.487 ...Prescription drugs and medicine?

- Q.488 ...Dental care?
- Q.489 What kind of plan does && have? (QUESTION ACCEPTS 3 ANSWERS)  
(MALE#4)
- Q.490 (OTHER - SPECIFY HERE)
- Q.491 Please tell me whether each of the following is included in &&'s  
health insurance plan:... Basic Medical Care?
- Q.492 ...Prescription drugs and medicine?
- Q.493 ...Dental care?
- Q.494 What kind of plan does && have? (QUESTION ACCEPTS 3 ANSWERS)  
(MALE#5)
- Q.495 (OTHER - SPECIFY HERE)
- Q.496 Please tell me whether each of the following is included in &&'s  
health insurance plan:... Basic Medical Care?
- Q.497 ...Prescription drugs and medicine?
- Q.498 ...Dental care?
- Q.499 What kind of plan does && have? (QUESTION ACCEPTS 3 ANSWERS)  
(MALE#6)
- Q.500 (OTHER - SPECIFY HERE)
- Q.501 Please tell me whether each of the following is included in &&'s  
health insurance plan:... Basic Medical Care?
- Q.502 ...Prescription drugs and medicine?
- Q.503 ...Dental care?
- Q.504 What kind of plan does && have? (QUESTION ACCEPTS 3 ANSWERS)  
(MALE#7)
- Q.505 (OTHER - SPECIFY HERE)
- Q.506 Please tell me whether each of the following is included in &&'s  
health insurance plan:... Basic Medical Care?
- Q.507 ...Prescription drugs and medicine?
- Q.508 ...Dental care?
- Q.509 What kind of plan does && have? (QUESTION ACCEPTS 3 ANSWERS)  
(MALE#8)
- Q.510 (OTHER - SPECIFY HERE)
- Q.511 Please tell me whether each of the following is included in &&'s

health insurance plan:... Basic Medical Care?

Q.512 ...Prescription drugs and medicine?

Q.513 ...Dental care?

Q.514 What kind of plan does && have? (QUESTION ACCEPTS 3 ANSWERS)  
(MALE#9)

Q.515 (OTHER - SPECIFY HERE)

Q.516 Please tell me whether each of the following is included in &&'s  
health insurance plan:... Basic Medical Care?

Q.517 ...Prescription drugs and medicine?

Q.518 ...Dental care?

Q.519 What kind of plan does && have? (QUESTION ACCEPTS 3 ANSWERS)  
(FEMALE#1)

Q.520 (OTHER - SPECIFY HERE)

Q.521 Please tell me whether each of the following is included in &&'s  
health insurance plan:... Basic Medical Care?

Q.522 ...Prescription drugs and medicine?

Q.523 ...Dental care?

Q.524 What kind of plan does && have? (QUESTION ACCEPTS 3 ANSWERS)  
(FEMALE#2)

Q.525 (OTHER - SPECIFY HERE)

Q.526 Please tell me whether each of the following is included in &&'s  
health insurance plan:... Basic Medical Care?

Q.527 ...Prescription drugs and medicine?

Q.528 ...Dental care?

Q.529 What kind of plan does && have? (QUESTION ACCEPTS 3 ANSWERS)  
(FEMALE#3)

Q.530 (OTHER - SPECIFY HERE)

Q.531 Please tell me whether each of the following is included in &&'s  
health insurance plan:... Basic Medical Care?

Q.532 ...Prescription drugs and medicine?

Q.533 ...Dental care?

Q.534 What kind of plan does && have? (QUESTION ACCEPTS 3 ANSWERS)  
(FEMALE#4)

Q.535 (OTHER - SPECIFY HERE)

Q.536 Please tell me whether each of the following is included in &&'s health insurance plan:... Basic Medical Care?

Q.537 ...Prescription drugs and medicine?

Q.538 ...Dental care?

Q.539 What kind of plan does && have? (QUESTION ACCEPTS 3 ANSWERS)  
(FEMALE#5)

Q.540 (OTHER - SPECIFY HERE)

Q.541 Please tell me whether each of the following is included in &&'s health insurance plan:... Basic Medical Care?

Q.542 ...Prescription drugs and medicine?

Q.543 ...Dental care?

Q.544 What kind of plan does && have? (QUESTION ACCEPTS 3 ANSWERS)  
(FEMALE#6)

Q.545 (OTHER - SPECIFY HERE)

Q.546 Please tell me whether each of the following is included in &&'s health insurance plan:... Basic Medical Care?

Q.547 ...Prescription drugs and medicine?

Q.548 ...Dental care?

Q.549 What kind of plan does && have? (QUESTION ACCEPTS 3 ANSWERS)  
(FEMALE#7)

Q.550 (OTHER - SPECIFY HERE)

Q.551 Please tell me whether each of the following is included in &&'s health insurance plan:... Basic Medical Care?

Q.552 ...Prescription drugs and medicine?

Q.553 ...Dental care?

Q.554 What kind of plan does && have? (QUESTION ACCEPTS 3 ANSWERS)  
(FEMALE#8)

Q.555 (OTHER - SPECIFY HERE)

Q.556 Please tell me whether each of the following is included in &&'s health insurance plan:... Basic Medical Care?

Q.557 ...Prescription drugs and medicine?

Q.558 ...Dental care?

Q.559 What kind of plan does && have? (QUESTION ACCEPTS 3 ANSWERS)  
(FEMALE#9)

Q.560 (OTHER - SPECIFY HERE)

Q.561 Please tell me whether each of the following is included in &&'s  
health insurance plan:... Basic Medical Care?

Q.562 ...Prescription drugs and medicine?

Q.563 ...Dental care?

Q.564 Phone # & Island

Q.565 ( PLEASE ENTER LAST NUMBER - "&&" )

THIS IS THE ISLAND THE RESPONDENT RESIDES TAKEN FROM SAMPLE FILE

Q.566 Have you ever used the services of the Native Hawaiian Health Care  
Systems? (INSERT NAME ACCORDING TO ISLAND OF RESIDENCE: "&&")

Q.567 What services did you use?  
(QUESTION ACCEPTS 6 ANSWERS)

Q.568 (OTHER SPECIFY HERE)

Q.569 Have you ever used any of the following traditional Hawaiian healing  
practices...

Q.570 ...La'au Lapa'au?

Q.571 ...Ho'oponopono?

Q.572 ...Lomilomi?

Q.573 Have you ever used any other traditional Hawaiian healing practice?

Q.574 (IF YES:) What are the other traditional Hawaiian healing practices?

Q.575 (IF YES:) What are the other traditional Hawaiian healing practices?

Q.576 The next set of questions refer to child care arrangements for your  
&& child(ren) less than 6 years old.

Q.577 In a typical week, what type of child care arrangements do you have for &&? (CHILDREN  
0-5 - #1)

Q.578 (SPECIFY OTHER HERE)

Q.579 In a typical week, what type of child care arrangements do you have for &&? (CHILDREN  
0-5 - #2)

Q.580 (SPECIFY OTHER HERE)

- Q.581 In a typical week, what type of child care arrangements do you have for &&? (CHILDREN 0-5 - #3)
- Q.582 (SPECIFY OTHER HERE)
- Q.583 In a typical week, what type of child care arrangements do you have for &&? (CHILDREN 0-5 - #4)
- Q.584 (SPECIFY OTHER HERE)
- Q.585 In a typical week, what type of child care arrangements do you have for &&? (CHILDREN 0-5 - #5)
- Q.586 (SPECIFY OTHER HERE)
- Q.587 In a typical week, what type of child care arrangements do you have for &&? (CHILDREN 0-5 - #6)
- Q.588 (SPECIFY OTHER HERE)
- Q.589 In a typical week, what type of child care arrangements do you have for &&? (CHILDREN 0-5 - #7)
- Q.590 (SPECIFY OTHER HERE)
- Q.591 In a typical week, what type of child care arrangements do you have for &&? (CHILDREN 0-5 - #8)
- Q.592 (SPECIFY OTHER HERE)
- Q.593 In a typical week, what type of child care arrangements do you have for &&? (CHILDREN 0-5 - #9)
- Q.594 (SPECIFY OTHER HERE)
- Q.595 In a typical week, what type of child care arrangements do you have for &&? (CHILDREN 0-5 - #10)
- Q.596 (SPECIFY OTHER HERE)
- Q.597 In a typical week, what type of child care arrangements do you have for &&? (CHILDREN 0-5 - #11)
- Q.598 (SPECIFY OTHER HERE)
- Q.599 In a typical week, what type of child care arrangements do you have for &&? (CHILDREN 0-5 - #12)
- Q.600 (SPECIFY OTHER HERE)
- Q.601 In a typical week, what type of child care arrangements do you have for &&? (CHILDREN 0-5 - #13)
- Q.602 (SPECIFY OTHER HERE)
- Q.603 In a typical week, what type of child care arrangements do you have for &&? (CHILDREN

0-5 - #14)

Q.604 (SPECIFY OTHER HERE)

Q.605 In a typical week, what type of child care arrangements do you have for &&? (CHILDREN 0-5 - #15)

Q.606 (SPECIFY OTHER HERE)

Q.607 In a typical week, what type of child care arrangements do you have for &&? (CHILDREN 0-5 - #16)

Q.608 (SPECIFY OTHER HERE)

Q.609 In a typical week, what type of child care arrangements do you have for &&? (CHILDREN 0-5 - #17)

Q.610 (SPECIFY OTHER HERE)

Q.611 In a typical week, what type of child care arrangements do you have for &&? (CHILDREN 0-5 - #18)

Q.612 (SPECIFY OTHER HERE)

Q.613 Sometimes people have a hard time finding child care that's convenient or that they can afford. I am going to read to you three statements, and I'd like you to tell me which ONE best describes how you feel.

Q.614 (STATEMENT 1)

" I am VERY SATISFIED with my current arrangement."

Q.615 (STATEMENT 2)

" I am NOT COMPLETELY SATISFIED with my current arrangement, but it is the best choice I have right now. "

Q.616 (STATEMENT 3)

" I am UNSATISFIED with my current arrangement, but I had no choice other than what I am doing now. "

Q.617 (ENTER WHICH STATEMENT BEST DESCRIBES HOW RESPONDENT FEELS)

Q.618 I am going to read you a list of five reasons some people are not satisfied with their child care arrangements. Tell me which ONE is the MAIN reason you cannot make satisfactory child care arrangements.

Q.619 (STATEMENT 1)

" There are no GOOD child care providers or programs in my area. "

Q.620 (STATEMENT 2)

" There are no child care providers or programs with openings in my area. "

Q.621 (STATEMENT 3)

" I can't afford child care. "

Q.622 (STATEMENT 4)

" The programs in my area are not open in the hours that I need them."

Q.623 (STATEMENT 5)

" There's no way for my child to get to and from the program in my area. "

(ACCEPT ONLY ONE 'Yes' ANSWER TO THE FOLLOWING 5 STATEMENTS)

Q.624 (ENTER WHICH STATEMENT IS THE MAIN REASON CANNOT MAKE SATISFACTORY CHILD CARE ARRANGEMENTS.)

Q.625 (SPECIFY OTHER HERE)

Q.626 For all children 0-5 years old, how much are you paying IN CASH for FULL TIME child care EACH MONTH.

(ENTER ROUNDED NUMBER ONLY. FIND OUT APPROX AMOUNT IF RESPONDENT DK)

(999=DON'T KNOW/REFUSED)

(IF AMOUNT IS UNDER \$100, ASK:) Is that amount PER MONTH?

Q.627 Do you give any IN KIND goods or services in return for child care?

Q.752 (ANY FEMALES OR CHILDREN UNDER AGE OF 1 IN HOUSEHOLD)

Is anyone in your household currently pregnant or the mother of a child under 1?

Q.753 How many women in your household are pregnant or have a child under one?

Q.754 What are the names (or initials) of those women currently pregnant or have a child under one?

(HOUSEHOLD ROSTER:) (QUESTION ACCEPTS 10 ANSWERS)

Q.755 There is a program that provides nutritional counseling and nutritional supplements to pregnant women and women with children under one year of age call WIC (PRONOUNCED "WICK"), Women and Infant Children Nutrition Program. Is anyone in the household receiving WIC services?

Q.756 What are the names (or initials) of those household members who are NOT receiving WIC services?

(HOUSEHOLD ROSTER:)

Q.757 Why are you not currently enrolled in the WIC (Wick) program?  
(QUESTION ACCEPTS 3 ANSWERS)

Q.758 Why is && not currently enrolled in the WIC (Wick) program?  
(QUESTION ACCEPTS 3 ANSWERS)

Q.759 Why is && not currently enrolled in the WIC (Wick) program?  
(QUESTION ACCEPTS 3 ANSWERS)

Q.760 Why is && not currently enrolled in the WIC (Wick) program?  
(QUESTION ACCEPTS 3 ANSWERS)

- Q.761 Why is && not currently enrolled in the WIC (Wick) program?  
(QUESTION ACCEPTS 3 ANSWERS)
- Q.762 Why is && not currently enrolled in the WIC (Wick) program?  
(QUESTION ACCEPTS 3 ANSWERS)
- Q.763 Why is && not currently enrolled in the WIC (Wick) program?  
(QUESTION ACCEPTS 3 ANSWERS)
- Q.764 Why is && not currently enrolled in the WIC (Wick) program?  
(QUESTION ACCEPTS 3 ANSWERS)
- Q.765 Why is && not currently enrolled in the WIC (Wick) program?  
(QUESTION ACCEPTS 3 ANSWERS)
- Q.766 Why is && not currently enrolled in the WIC (Wick) program?  
(QUESTION ACCEPTS 3 ANSWERS)
- Q.767 Now, I would like to ask you some general questions about your household for statistical purposes. What was the total income of all members of the household before taxes, in the calendar year 1997?
- Q.768 (DUMMY) PRESS [ENTER] TO CONTINUE
- Q.769 Of the adults living in your household, how many are in the active military duty service, NOT including national guards, coast guards, reserves and ROTC?
- Q.770 How many people in this household are military dependents?
- Q.771 How long has your household lived in the State of Hawaii?  
(IF RESPONDENT GIVES MORE THAN ONE ANSWER, TAKE THE SHORTEST PERIOD.)
- (00=LESS THAN 1 YEAR ; 01 to 89 = ACTUAL NUMBER OF YEARS ;  
90=LIFETIME ; 98=REFUSED ; 99=DON'T KNOW)
- Q.772 How many members of your household moved to this island in the past 12 months?
- Q.773 What are the names (or initials) of those members of your household who moved to this island in the last 12 months?  
(HOUSEHOLD ROSTER) (QUESTION ACCEPTS 19 ANSWERS)
- Q.774 Where did you live before that?  
(RESPONDENT)
- Q.775 (SPECIFY ANOTHER STATE HERE:)
- Q.776 (SPECIFY ANOTHER COUNTRY HERE):
- Q.777 Where did && live before that?  
(MALE#1)
- Q.778 (SPECIFY ANOTHER STATE HERE:)
- Q.779 (SPECIFY ANOTHER COUNTRY HERE):

- Q.780 Where did && live before that?  
(MALE#2)
- Q.781 (SPECIFY ANOTHER STATE HERE:)
- Q.782 (SPECIFY ANOTHER COUNTRY HERE):
- Q.783 Where did && live before that?  
(MALE#3)
- Q.784 (SPECIFY ANOTHER STATE HERE:)
- Q.785 (SPECIFY ANOTHER COUNTRY HERE):
- Q.786 Where did && live before that?  
(MALE#4)
- Q.787 (SPECIFY ANOTHER STATE HERE:)
- Q.788 (SPECIFY ANOTHER COUNTRY HERE):
- Q.789 Where did && live before that?  
(MALE#5)
- Q.790 (SPECIFY ANOTHER STATE HERE:)
- Q.791 (SPECIFY ANOTHER COUNTRY HERE):
- Q.792 Where did && live before that?  
(MALE#6)
- Q.793 (SPECIFY ANOTHER STATE HERE:)
- Q.794 (SPECIFY ANOTHER COUNTRY HERE):
- Q.795 Where did && live before that?  
(MALE#7)
- Q.796 (SPECIFY ANOTHER STATE HERE:)
- Q.797 (SPECIFY ANOTHER COUNTRY HERE):
- Q.798 Where did && live before that?  
(MALE#8)
- Q.799 (SPECIFY ANOTHER STATE HERE:)
- Q.800 (SPECIFY ANOTHER COUNTRY HERE):
- Q.801 Where did && live before that?  
(MALE#9)
- Q.802 (SPECIFY ANOTHER STATE HERE:)
- Q.803 (SPECIFY ANOTHER COUNTRY HERE):

- Q.804 Where did && live before that?  
(FEMALE#1)
- Q.805 (SPECIFY ANOTHER STATE HERE:)
- Q.806 (SPECIFY ANOTHER COUNTRY HERE):
- Q.807 Where did && live before that?  
(FEMALE#2)
- Q.808 (SPECIFY ANOTHER STATE HERE:)
- Q.809 (SPECIFY ANOTHER COUNTRY HERE):
- Q.810 Where did && live before that?  
(FEMALE#3)
- Q.811 (SPECIFY ANOTHER STATE HERE:)
- Q.812 (SPECIFY ANOTHER COUNTRY HERE):
- Q.813 Where did && live before that?  
(FEMALE#4)
- Q.814 (SPECIFY ANOTHER STATE HERE:)
- Q.815 (SPECIFY ANOTHER COUNTRY HERE):
- Q.816 Where did && live before that?  
(FEMALE#5)
- Q.817 (SPECIFY ANOTHER STATE HERE:)
- Q.818 (SPECIFY ANOTHER COUNTRY HERE):
- Q.819 Where did && live before that?  
(FEMALE#6)
- Q.820 (SPECIFY ANOTHER STATE HERE:)
- Q.821 (SPECIFY ANOTHER COUNTRY HERE):
- Q.822 Where did && live before that?  
(FEMALE#7)
- Q.823 (SPECIFY ANOTHER STATE HERE:)
- Q.824 (SPECIFY ANOTHER COUNTRY HERE):
- Q.825 Where did && live before that?  
(FEMALE#8)
- Q.826 (SPECIFY ANOTHER STATE HERE:)
- Q.827 (SPECIFY ANOTHER COUNTRY HERE):

- Q.828 Where did && live before that?  
(FEMALE#9)
- Q.829 (SPECIFY ANOTHER STATE HERE:)
- Q.830 (SPECIFY ANOTHER COUNTRY HERE):
- Q.831 Of the && household members 16 years old and older, how many are employed in any way?
- Q.832 Of those && household members, how many are in the active duty military service ONLY?
- Q.833 Not counting military service, what is the total number of JOBS held by those employed persons 16 years of age or older in your household?
- Q.834 Is that job-full-time or part-time?
- Q.835 Is that job self-employment, or working for another person or company?
- Q.836 How many of those && jobs are full-time jobs?
- Q.837 [JOBS= && ][IF ZERO, ASK ...]  
So there are no part-time jobs, right?  
[IF NOT ZERO, ASK ...]  
So the (other) && Job(s) is/are part-time, right?
- Q.838 Let us go over the last 2 questions again.
- Q.839 How many of the && full-time jobs are self-employment?
- Q.840 [JOBS= && ][IF ZERO, ASK ...]  
So there are no jobs working for another person or company, right?  
[IF NOT ZERO, ASK ...]  
So the (other) && full-time job(s) is/are working for another person or company?
- Q.841 Let us go back to the previous question.
- Q.842 How many of the && part-time jobs are self-employment?
- Q.843 [JOBS= && ][IF ZERO, ASK ...]  
So there are no jobs working for another person or company, right?  
[IF NOT ZERO, ASK ...]  
So the (other) && part-time job(s) is/are working for another person or company?
- Q.844 Let us go back to the previous question.
- Q.845 How many household members 16 years and older who are unemployed are actively looking for work?
- Q.846 (DUMMY) PRESS [ENTER] TO CONTINUE.

Q.848 Do you have more than one telephone number in your household, excluding cellular phones?

Q.849 How many residential telephone numbers do you have? Again please do not include any cellular phones?  
(ENTER 99 FOR REFUSED)

Q.850 What is your zipcode?  
(DON'T KNOW=999)

Q.851 The State Department of Health is cooperating with the Cancer Research Center of the University of Hawai'i. As a result, someone from the Cancer Research Center may be contacting you at a later date to see if you would be interested in participating in a research study. I just wanted to let you know about this. Would you be interested in participating?

Q.852 Could I please have your full name?

Q.853 Could I have your street address?

Q.854 Would anyone else in your household 18 years or older be interested in participating?

Q.855 What is that person's name?

Q.856 Would anyone else be interested?

Q.857 What is that person's name?

Q.858 Would anyone else be interested?

Q.859 What is that person's name?

Q.860 Would anyone else be interested?

Q.861 What is that person's name?

Q.862 Thank you very much for your time and cooperation. All your answers will be combined to give us information about the health of the people in the state.

Q.863 (DUMMY) PRESS [ENTER] TO CONTINUE.

Q.864 (DUMMY) PRESS [ENTER] TO CONTINUE.

Q.865 (DUMMY) PRESS [ENTER] TO CONTINUE.

Q.866 Are you currently . . .

(PROBE IF CURRENTLY DOES MORE THAN ONE; ACCEPT ONLY ONE ANSWER)  
Which one primarily?

Employed for wages

1

.....  
Q.867 Is && currently . . .

(PROBE IF CURRENTLY DOES MORE THAN ONE; ACCEPT ONLY ONE ANSWER)  
Which one primarily?

Q.868 Is && currently . . .

(PROBE IF CURRENTLY DOES MORE THAN ONE; ACCEPT ONLY ONE ANSWER)  
Which one primarily?

Q.869 Is && currently . . .

(PROBE IF CURRENTLY DOES MORE THAN ONE; ACCEPT ONLY ONE ANSWER)  
Which one primarily?

Q.870 Is && currently . . .

(PROBE IF CURRENTLY DOES MORE THAN ONE; ACCEPT ONLY ONE ANSWER)  
Which one primarily?

Q.871 Is && currently . . .

(PROBE IF CURRENTLY DOES MORE THAN ONE; ACCEPT ONLY ONE ANSWER)  
Which one primarily?

Q.872 Is && currently . . .

(PROBE IF CURRENTLY DOES MORE THAN ONE; ACCEPT ONLY ONE ANSWER)  
Which one primarily?

Q.873 Is && currently . . .

(PROBE IF CURRENTLY DOES MORE THAN ONE; ACCEPT ONLY ONE ANSWER)  
Which one primarily?

Q.874 Is && currently . . .

(PROBE IF CURRENTLY DOES MORE THAN ONE; ACCEPT ONLY ONE ANSWER)  
Which one primarily?

Q.875 Is && currently . . .

(PROBE IF CURRENTLY DOES MORE THAN ONE; ACCEPT ONLY ONE ANSWER)  
Which one primarily?

Q.876 Is && currently . . .

(PROBE IF CURRENTLY DOES MORE THAN ONE; ACCEPT ONLY ONE ANSWER)  
Which one primarily?

Q.877 Is && currently . . .

(PROBE IF CURRENTLY DOES MORE THAN ONE; ACCEPT ONLY ONE ANSWER)  
Which one primarily?

Q.878 Is && currently . . .

(PROBE IF CURRENTLY DOES MORE THAN ONE; ACCEPT ONLY ONE ANSWER)  
Which one primarily?

Q.879 Is && currently . . .

(PROBE IF CURRENTLY DOES MORE THAN ONE; ACCEPT ONLY ONE ANSWER)  
Which one primarily?

Q.880 Is && currently . . .

(PROBE IF CURRENTLY DOES MORE THAN ONE; ACCEPT ONLY ONE ANSWER)  
Which one primarily?

Q.881 Is && currently . . .

(PROBE IF CURRENTLY DOES MORE THAN ONE; ACCEPT ONLY ONE ANSWER)  
Which one primarily?

Q.882 Is && currently . . .

(PROBE IF CURRENTLY DOES MORE THAN ONE; ACCEPT ONLY ONE ANSWER)  
Which one primarily?

Q.883 Is && currently . . .

(PROBE IF CURRENTLY DOES MORE THAN ONE; ACCEPT ONLY ONE ANSWER)  
Which one primarily?

Q.884 Is && currently . . .

(PROBE IF CURRENTLY DOES MORE THAN ONE; ACCEPT ONLY ONE ANSWER)  
Which one primarily?

Q.885 Now I want to ask you some questions about the food used in your household and the ways you are managing to meet your food needs.

Which of these statements best describes the food eaten in your household in the last 12 months?

(READ THE FOLLOWING STATEMENTS COMPLETELY INCLUDING NUMBER)

1. I/We always have enough to eat, and the kinds of food I/we want.
2. I/We have enough to eat but not always the kinds of food we want to eat
3. I/We sometimes don't have enough to eat, or
4. I/We often don't have enough

(ACCEPT ONLY ONE ANSWER.)

Q.886 Now I'm going to read you statements that people have made about their food situation. Please tell me whether the statement was often, sometimes or never true for your household in the last 12 months. The first statement is:

"I/we worried about whether our food would run out before I/we got money to buy more?" In the last 12 months, was that:

(READ FIRST 3 CHOICES IN THE LIST)

Q.887 "The food I/we bought just didn't last and I/we didn't have enough to get more." In the last 12 months, was that:

(READ FIRST 3 CHOICES IN THE LIST)

- Q.888 "I/We couldn't afford to eat balanced meals." In the last 12 months, was that: (READ FIRST 3 CHOICES IN THE LIST)
- Q.889 "I/We relied on only a few kinds of low-cost food to feed the child/children because I/we was/were running out of money for food." In the last 12 months, was that: (READ FIRST 3 CHOICES IN THE LIST)
- Q.890 "I/We couldn't feed the child/children a balanced meal, because I/we couldn't afford it." In the last 12 months, was that: (READ FIRST 3 CHOICES IN THE LIST)
- Q.891 "The child/children was/were not eating enough because I/we just couldn't afford enough food." In the last 12 months, was that: (READ FIRST 3 CHOICES IN THE LIST)
- Q.892 In the last 12 months, did you or another adult in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?
- Q.893 How often did this happen?
- Q.894 How about you personally? In the last 12 months, did you ever cut the size of your meals or skip meals because there wasn't enough money for food?
- Q.895 How often did this happen?
- Q.896 In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money?
- Q.897 How often did this happen?
- Q.898 In the last 12 months, were you ever hungry but didn't eat because you couldn't afford enough food?
- Q.899 How often did this happen?
- Q.900 In the last 12 months, did you lose weight because you didn't have enough money for food?
- Q.901 In the last 12 months, did you or another adult in your household ever not eat for a whole day because there wasn't enough money for food?
- Q.902 How often did this happen?
- Q.903 How about you personally - In the last 12 months, did you ever not eat for a whole day because there wasn't enough money for food?
- Q.904 How often did this happen?
- Q.905 The next questions are about the child/children less than 18 years old living in your household.  
In the last 12 months, did you ever cut the size of the child's/children's meals because there wasn't enough money for food?

- Q.906 Now I want to ask about one particular child living in your household  
- the child that most recently had a birthday. How old is that child?
- Q.907 In the last 12 months, did you ever have to cut the size of this  
child's meal because there wasn't enough money for food?
- Q.908 In the last 12 months, was/were the child/children ever hungry but you  
just couldn't afford more food?
- Q.909 How often did this happen?
- Q.910 What about the child who most recently had a birthday, was this child  
ever hungry but you just couldn't afford more food?
- Q.911 How often did this happen?
- Q.912 In the last 12 months, did the child/children ever skip meals because  
there wasn't enough money for food?
- Q.913 How often did this happen?
- Q.914 What about the child who most recently had a birthday, did he or she  
ever skip meals because there wasn't enough money for food?
- Q.915 How often did this happen?
- Q.916 In the last 12 months, did the child/any of the children ever not eat  
for a whole day because there wasn't enough money for food?
- Q.917 What about the child who most recently had a birthday, did he or she  
ever not eat for a whole day?
- Q.918 Now some questions on food or financial assistance in the last 12  
months.
- Q.919 Did anyone in your household receive . . . (READ LIST)  
(CODE AS: 1 - YES ; 2 - NO ; 3 - DK/NOT SURE ; 4 - REFUSED)

.....	Food Stamps ?
.....	<input type="checkbox"/> AFDC/Welfare (DHS) ?
.....	<input type="checkbox"/> SSI ?
.....	<input type="checkbox"/> Disability ?
.....	<input type="checkbox"/> Housing assistance (like Section 8) ?
.....	<input type="checkbox"/> Free or reduced price school lunch, preschool,
adult meals ..	<input type="checkbox"/> Head Start ?
.....	<input type="checkbox"/> Unemployment benefits ?
.....	<input type="checkbox"/>

Q.920 Did you or any other adult get food from a foodbank, food pantry or

church?

- Q.921 How often in the last year?
- Q.922 In the last 12 months, did you or any other adult ever put off paying bills to have money to buy food?
- Q.923 How often did this happen?
- Q.924 In the last 12 months, did you or any other adult get food or borrow money from friends or relatives?
- Q.925 How often did this happen?
- Q.926 In the last 12 months, did you or any other adult ever send the child/ children to friends or relatives for a meal because of not having enough food or money for food?
- Q.927 How often did this happen?
- Q.928 Now some questions about the vegetables you eat:  
Not counting salad or potatoes, how many servings of vegetables do you usually eat a day? Count 1/2 cup, like the size of a pudding cup, as one serving.  
[ENTER '99' FOR DON'T KNOW/REFUSED.]
- Q.929 Does your vegetable intake increase or decrease throughout the month because of inadequate food or money for food, or does your intake stay the same? For example, does it change around the end of the month?
- Q.930 How many times last month did you or the child/children (whoever ate more) eat Saimin that was purchased dried not frozen?  
(IF NO. GIVEN IS PER WEEK, MULTIPLY BY 4 TO GET MONTHLY)  
(ENTER '99' FOR DON'T KNOW/REFUSED)
- Q.931 How much savings do you estimate your household has?
- Q.932 (DUMMY) PRESS [ENTER] TO CONTINUE.
- Q.933 Has anyone in your household lost his or her job in the last three years, and wasn't able to get a new job with a comparable salary?  
[NOTE: 'COMPARABLE' IS WITHIN \$5,000 PER YEAR]

**Appendix 11**

Table of Item Goodness-of-Fit Without Retest Data (n=304)

Obsvd Score	Obsvd Count	Obsvd Average	Fair Avrge	Measure	Real S.E.	Infit MnSq	Infit ZStd	Outfit MnSq	Outfit ZStd	Nu Items
4	93	0.0	0.01	4.29	.61	0.8	0	0.2	0	16 Children not eat 1 day
19	140	0.1	0.08	2.51	.30	0.9	0	2.1	1	12a Not eat 1 day often
15	89	0.2	0.10	2.19	.35	1.0	0	0.6	0	15a Children skip meals often
18	91	0.2	0.12	1.99	.35	0.9	0	0.6	0	15 Children skip meals
20	92	0.2	0.14	1.82	.33	0.9	0	0.8	0	13 Children cut size meals
29	143	0.2	0.14	1.79	.26	1.1	0	2.4	2	12 Not eat 1 day
25	91	0.3	0.21	1.35	.30	1.0	0	1.2	0	14 Children hungry
54	298	0.2	0.34	.66	.20	1.0	0	0.9	0	11 Lose weight
62	300	0.2	0.41	.37	.20	0.9	0	0.7	-1	10 Hungry
45	202	0.2	0.44	.23	.23	1.0	0	0.9	0	7 Children not eat enough
77	297	0.3	0.53	-.14	.20	0.8	-2	0.5	-2	8a Cut size meals often
99	298	0.3	0.69	-.78	.19	0.8	-2	0.6	-2	8 Cut size meals
120	299	0.4	0.79	-1.34	.17	0.9	-1	0.8	-1	9 Eat less
93	205	0.5	0.84	-1.64	.19	1.0	0	0.9	0	6 Children unbalanced meals
128	206	0.6	0.94	-2.75	.19	0.9	0	0.8	0	5 Children rely few foods
187	300	0.6	0.95	-2.88	.16	1.1	1	2.1	2	4 Unbalanced meals
215	304	0.7	0.97	-3.47	.16	1.0	0	1.1	0	3 Food did not last
242	302	0.8	0.99	-4.20	.19	1.2	2	1.8	1	2 Worried food run out
Obsvd Score	Obsvd Count	Obsvd Average	Fair Avrge	Measure	Real S.E.	Infit MnSq	Infit ZStd	Outfit MnSq	Outfit ZStd	Nu Items
80.7	208.3	0.3	0.48	.00	.25	0.9	-0.4	1.1	-0.2	Mean (Count: 18)
70.5	89.6	0.2	0.35	2.27	.11	0.1	1.2	0.6	1.3	S.D.

RMSE (Real) .28 Adj S.D. 2.26 Separation 8.20 Reliability .99  
 Fixed (all same) chi-square: 1562.0 d.f.: 17 significance: .00  
 Random (normal) chi-square: 16.9 d.f.: 16 significance: .39

**Appendix 10**

Table of Item Goodness-of-Fit Without Retest Data (n=304)

Obsvd Score	Obsvd Count	Obsvd Average	Fair Avrge	Measure	Real S.E.	Infit MnSq	Infit ZStd	Outfit MnSq	Outfit ZStd	Nu Items
4	93	0.0	0.01	4.29	.61	0.8	0	0.2	0	16 Children not eat 1 day
19	140	0.1	0.08	2.51	.30	0.9	0	2.1	1	12a Not eat 1 day often
15	89	0.2	0.10	2.19	.35	1.0	0	0.6	0	15a Children skip meals often
18	91	0.2	0.12	1.99	.35	0.9	0	0.6	0	15 Children skip meals
20	92	0.2	0.14	1.82	.33	0.9	0	0.8	0	13 Children cut size meals
29	143	0.2	0.14	1.79	.26	1.1	0	2.4	2	12 Not eat 1 day
25	91	0.3	0.21	1.35	.30	1.0	0	1.2	0	14 Children hungry
54	298	0.2	0.34	.66	.20	1.0	0	0.9	0	11 Lose weight
62	300	0.2	0.41	.37	.20	0.9	0	0.7	-1	10 Hungry
45	202	0.2	0.44	.23	.23	1.0	0	0.9	0	7 Children not eat enough
77	297	0.3	0.53	-.14	.20	0.8	-2	0.5	-2	8a Cut size meals often
99	298	0.3	0.69	-.78	.19	0.8	-2	0.6	-2	8 Cut size meals
120	299	0.4	0.79	-1.34	.17	0.9	-1	0.8	-1	9 Eat less
93	205	0.5	0.84	-1.64	.19	1.0	0	0.9	0	6 Children unbalanced meals
128	206	0.6	0.94	-2.75	.19	0.9	0	0.8	0	5 Children rely few foods
187	300	0.6	0.95	-2.88	.16	1.1	1	2.1	2	4 Unbalanced meals
215	304	0.7	0.97	-3.47	.16	1.0	0	1.1	0	3 Food did not last
242	302	0.8	0.99	-4.20	.19	1.2	2	1.8	1	2 Worried food run out
Obsvd Score	Obsvd Count	Obsvd Average	Fair Avrge	Measure	Real S.E.	Infit MnSq	Infit ZStd	Outfit MnSq	Outfit ZStd	Nu Items
80.7	208.3	0.3	0.48	.00	.25	0.9	-0.4	1.1	-0.2	Mean (Count: 18)
70.5	89.6	0.2	0.35	2.27	.11	0.1	1.2	0.6	1.3	S.D.

RMSE (Real) .28 Adj S.D. 2.26 Separation 8.20 Reliability .99  
 Fixed (all same) chi-square: 1562.0 d.f.: 17 significance: .00  
 Random (normal) chi-square: 16.9 d.f.: 16 significance: .39

**Appendix 11a**  
**Food Security Status by Selected Demographic Characteristics**

Indicator	Overall No. (%)	National Categorical Algorithm					Face Valid Categorical Algorithm				
		Food secure No. (%)	Food Insecure No. (%)	Moderate Hunger No. (%)	Severe Hunger No. (%)	X2 (p value)	Food secure No. (%)	At risk of hunger No. (%)	Adult Hunger No. (%)	Child Hunger No. (%)	X2 (p value)
N	1603	1396 (87.1)	132 (8.2)	50 (3.1)	25 (1.6)		1296 (80.8)	220 (13.7)	61 (3.9)	26 (1.6)	
HHS Pantry	1453 (92.1) 144 (9.0)	1360 (97.4) 36 (2.6)	72 (54.5) 60 (45.5)	20 (40.0) 30 (60.0)	7 (28.0) 18 (72.0)	565 (0.00)	1278 (98.6) 18 (1.4)	147 (66.8) 73 (33.2)	29 (47.5) 32 (52.5)	5 (19.2) 21 (80.8)	553 (0.00)
<b>Ethnicity</b>											
Caucasian	614 (38.4)	547 (39.2)	41 (31.1)	20 (40.0)	4 (24.0)	138 (0.00)	523 (40.4)	59 (26.8)	25 (44.0)	7 (26.9)	160 (0.00)
Hawaiian	263 (16.5)	198 (14.2)	42 (31.8)	12 (24.0)	11 (44.0)		173 (13.3)	62 (28.2)	17 (27.9)	11 (42.3)	
Samoaan	18 (1.1)	5 (0.4)	8 (6.1)	3 (6.0)	2 (8.0)		3 (0.2)	9 (4.1)	4 (22.2)	2 (11.6)	
Filipino	196 (12.3)	174 (12.4)	18 (13.6)	4 (8.0)	2 (8.0)		149 (11.4)	40 (18.2)	5 (8.2)	4 (15.4)	
Japanese	291 (18.2)	287 (20.6)	5 (3.8)	2 (4.0)			278 (21.5)	15 (6.8)	1 (1.6)		
Other Asian	91 (5.7)	81 (5.8)	6 (4.5)	4 (8.0)			78 (6.0)	11 (5.0)	2 (3.3)		
Other/Mix	64 (4.0)	58 (4.2)	4 (3.0)	1 (2.0)	2 (8.0)		52 (4.0)	10 (4.5)	3 (4.6)		
His/AA/NA <sup>a</sup>	60 (3.8)	46 (3.3)	8 (6.1)	4 (8.0)	2 (8.0)		40 (3.1)	14 (6.4)	4 (6.6)	2 (7.7)	
No Children	938 (58.7)	888 (63.6)	27 (20.5)	22 (44.0)	4 (16.0)	116 (0.00)	840 (64.8)	82 (37.3)	19 (31.1)		117(0.00)
Children	659 (41.3)	508 (36.4)	105 (79.5)	28 (56.0)	21 (84.0)		456 (35.2)	138 (62.7)	43 (68.9)	25 (100)	
Singles	296 (18.5)	265 (19.0)	11 (8.3)	16 (32.0)	4 (16.0)	171 (0.00)	243 (18.8)	38 (17.3)	15 (24.6)		191 (0.0)
Adults only	641 (40.1)	622 (44.6)	16 (12.1)	6 (12.0)			596 (46.0)	44 (20.0)	4 (6.5)		
Family	408 (25.5)	327 (23.4)	58 (43.9)	15 (30.0)	9 (36.0)		296 (22.8)	82 (37.3)	20 (31.1)	12 (46.0)	
Sing.Parent	71 (4.4)	41 (2.9)	17 (12.9)	6 (12.0)	7 (28.0)		34 (2.6)	19 (8.6)	9 (14.8)	9 (34.6)	
Mul. Family	181 (11.3)	141 (10.1)	30 (22.7)	7 (14.0)	5 (20.0)		127 (9.8)	37 (16.8)	14 (23.0)	5 (19.2)	

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Notes: a. Statistics indicate the percent of those classified in a food security category (column) that were also classified by the row variable.  
b. Hispanics, African Americans and Native Americans.

**Appendix 11b**  
**Food Security Status by Selected Income and Dietary Characteristics**

Indicator	Overall No. (%)	National categorical algorithm					Face Valid Algorithm				
		Food secure No. (%)	Food Insecure No. (%)	Moderate Hunger No. (%)	Severe Hunger No. (%)	X2 (p value)	Food secure No. (%)	At risk of hunger No. (%)	Adult Hunger No. (%)	Child Hunger No. (%)	X2 (p value)
<b>Lost Job<sup>b</sup></b>	188 (16.8)	126 (13.3)	33 (31.7)	17 (42.5)	12 (54.5)	65.5 (0.00)	109 (12.4)	45 (26.8)	21 (43.8)	13 (52.0)	70.8 (0.00)
<b>Income</b>											
<\$5K	71 (6.9)	33 (3.8)	24 (4.7)	9 (27.3)	5 (25.0)	210 (0.00)	21 (2.6)	34 (22.5)	12 (27.3)	4 (25.0)	251 (0.00)
\$5-19.9K	138 (13.5)	87 (10.0)	26 (26.8)	15 (48.5)	9 (45.0)		70 (8.6)	45 (29.8)	16 (36.1)	7 (43.8)	
\$20-34.9K	258 (25.2)	218 (25.0)	31 (32.0)	4 (12.1)	5 (25.0)		201 (24.8)	43 (28.5)	10 (22.7)	4 (25.0)	
\$35-54.9K	260 (25.4)	246 (28.2)	12 (12.4)	1 (3.0)	1 (5.0)		238 (29.3)	18 (11.9)	3 (6.8)	1 (6.3)	
\$>54.9K	296 (28.9)	289 (33.1)	4 (4.1)	3 (9.0)			282 (34.7)	11 (3.7)	3 (6.8)		
<b>Savings</b>											
< \$250	251 (27.3)	139 (18.5)	58 (56.3)	34 (81.0)	20 (90.9)	198 (0.0)	107 (15.5)	86 (53.4)	37 (14.7)	21 (91.3)	242 (0.00)
\$250-1000	189 (20.5)	155 (20.6)	27 (26.2)	5 (11.9)	2 (9.1)		139 (20.2)	42 (26.1)	6 (12.8)	2 (8.7)	
\$1001-10K	221 (24.0)	208 (27.6)	11 (10.7)	2 (4.8)			198 (28.7)	21 (13.0)	2 (4.3)		
> \$10K	259 (28.2)	151 (33.3)	7 (6.8)	1 (2.4)			245 (35.6)	12 (7.5)	2 (4.3)		
<b>Vegetable Intake</b>											
Increases	103 (6.6)	68 (5.0)	15 (11.7)	1.4 (29.8)	6 (24.0)	332 (0.00)	60 (4.7)	24 (11.4)	12 (20.7)	7 (26.9)	304 (0.00)
Decreases	112 (7.2)	46 (3.4)	35 (27.3)	20 (42.6)	11 (44.0)		36 (2.8)	41 (10.4)	23 (39.7)	12 (46.2)	
Stays Same	1350 (86.3)	1251(91.6)	78 (60.9)	12 (27.7)	8 (32.0)		1174 (92.4)	146 (69.2)	22 (39.7)	7 (26.9)	

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**Notes.**

- a. Statistics indicate the percent of those classified in a food security category (column) that were also classified by the row variable.
- b. Indicates that someone in the household lost their job in the last three years and was unable to find another job with comparable salary

**Appendix 11c  
Food Security Status by Government Assistance Programs.<sup>a</sup>**

Indicator	Overall No. (%)	National categorical algorithm					Face Valid categorical algorithm				
		Food secure No. (%)	Food Insecure No. (%)	Moderate Hunger No. (%)	Severe Hunger No. (%)	X2 (p value)	Food secure No. (%)	At risk of hunger No. (%)	Adult Hunger No. (%)	Child Hunger No. (%)	X2 (p value)
TANF <sup>b</sup>	141 (8.9)	71 (5.1)	44 (33.3)	15 (30.0)	11 (44.0)	188 (0.00)	51 (4.0)	55 (25.1)	23 (37.7)	12 (46.0)	218 (0.00)
Disability	115 (7.2)	88 (6.3)	18 (13.6)	8 (6.0)	2 (8.0)	15 (0.00)	76 (5.9)	30 (13.6)	9 (14.8)	1 (3.8)	22 (0.00)
Food Stamps	205 (12.8)	109 (7.8)	57 (43.2)	24 (48.0)	16 (64.0)	253 (0.00)	82 (6.3)	76 (34.5)	33 (54.1)	15 (57.7)	280 (0.00)
Housing Asst.	76 (4.8)	35 (2.5)	22 (16.7)	11 (22.0)	8 (32.0)	130 (0.00)	25 (1.9)	31 (14.2)	15 (24.6)	5 (19.2)	130 (0.00)
Head Start	25 (1.6)	8 (0.6)	10 (7.6)	3 (6.0)	4 (16.0)	80 (0.00)	6 (0.5)	10 (4.5)	7 (11.7)	2 (7.7)	69 (0.00)
Reduced or Free meals <sup>c</sup>	164 (10.3)	78 (5.6)	55 (42.0)	16 (32.0)	15 (60.0)	269 (0.00)	61 (4.7)	62 (28.2)	24 (40.0)	17 (65.4)	263 (0.00)
Social Security Income	324 (20.6)	277 (20.2)	29 (22.1)	13 (26.5)	6 (24.0)	2 (NS <sup>e</sup> )	15 (25.4)	50 (23.0)	15 (25.4)	5 (19.2)	2 (NS)
WIC <sup>d</sup>	79 (35.4)	41 (38.0)	26 (29.4)	7 (22.6)	5 (27.8)	1 (NS)	30 (37.0)	30 (34.5)	11 (32.4)	8 (38.1)	<1 (NS)

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**Notes:**

- a. Statistics indicate the percent of those classified in a food security category (column) who were also classified by the row variable
- b. TANF = Temporary Assistance for Needy Families
- c. Received free or reduced price school lunch, preschool or adult meals.
- d. WIC = Supplemental Nutrition Program For Women, Infants and Children.
- e. NS indicates difference was not statistically significantly different.

**Appendix 11d**  
**Food Security Status by Selected Resource Augmentation Behaviors<sup>a</sup>**

Indicator	Overall No. (%)	National categorical algorithm					Face Valid categorical algorithm				
		Food secure No. (%)	Food Insecure No. (%)	Moderate Hunger No. (%)	Severe Hunger No. (%)	X2 (p value)	Food secure No. (%)	At risk of hunger No. (%)	Adult Hunger No. (%)	Child Hunger No. (%)	X2 (p value)
Delays bill payments	204 (12.8)	92 (6.6)	60 (45.5)	32 (64.0)	20 (80.0)	392 (0.00)	66 (5.1)	75 (34.2)	44 (72.1)	19 (73.1)	436 (0.00)
Delays bill often	142 (8.8)	49 (3.5)	47 (35.6)	26 (52.0)	20 (80.0)	16.7 (0.00)	32 (2.5)	56 (25.5)	37 (60.7)	17 (65.4)	15 (0.002)
Borrows food or money	183 (11.5)	75 (5.4)	49 (37.4)	37 (74.0)	23 (92.0)	488 (0.00)	53 (4.1)	66 (30.0)	44 (73.3)	21 (80.8)	490 (0.00)
Borrows often	125 (7.8)	43 (3.1)	35 (27.2)	26 (52.0)	21 (84.0)	17 (0.00)	32 (2.5)	42 (20.5)	33 (54.1)	18 (69.2)	13.2 (0.01)
Uses pantry	181 (11.5)	60 (4.3)	70 (53.0)	31 (62.0)	22 (88.0)	567 (0.00)	37 (2.9)	85 (38.6)	37 (60.7)	24 (92.3)	569 (0.00)
Uses Pantry often	121 (7.5)	36 (2.5)	47 (35.6)	22 (75.9)	16 (67.4)	1 (NS)	21 (1.6)	58 (26.4)	25 (40.0)	17 (65.3)	2 (NS)
Kids sent to friends	18 (1.1)		4 (3.0)	8 (17.0)	6 (24.0)	242 (0.00)		4 (1.8)	7 (12.1)	7 (26.9)	231 (0.00)
Kids sent often	14 (0.9)		4 (3.0)	5 (10.0)	5 (2.0)	10 (0.02)		4 (1.8)	4 (6.6)	6 (23.0)	9.3 (0.03)

**Notes:** a. Statistics indicate the percent of those classified in a food security category (column) that were also classified by the row variable.  
b. NS indicates difference was not statistically significantly different.