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Concurrent Validity of the Face Valid Food Security Measure

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Abstract

Our objective was to assess the concurrent validity of the face valid food security categorical algorithm with Hawaii residents. We also hypothesized that there would be differences in food security status between ethnic groups. We used the 18 question indicators of the Core Food Security Module (CFSM) to develop the face valid food security measure. The “face valid” measure was created previously by this research team as a more valid food security measure in Hawaii. Findings compared the face valid categorical measure and the CFSM scale measure with various demographic, economic, dietary variables, and use of assistance programs. The sample included 1,603 Hawaii residents drawn from a statewide telephone survey and a survey of charitable food recipients. Statistical analysis included ANOVA, chi-square, and regression analysis of food security measures with related variables. In general, progressively deteriorating food security status 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. WIC benefits, frequent use of a food pantry, and the presence of a senior adult in the household appeared protective. In this sample Asians, except for Filipinos, were more food secure; Hawaiians and Part-Hawaiians, and Samoans, were more likely to experience hunger. Findings were consistent with previous work and suggest that the face valid food security measure does exhibit concurrent validity.

Concurrent Validity of the Face Valid Food Security Measure

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" (Singleton, Straits, and Straits, 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, Andrews, and Klein, 1996; Life Sciences Research Office, 1990). Poverty is understood as a root cause of hunger and food insecurity (Wehler, Scott, and Anderson, 1992; Rose, Basiotis, and Klein, 1995). Socially demeaning food acquisition methods, such as using a food pantry, borrowing from others, etc., may be employed to maximize food resources. Adverse effects 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 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., 1997b; Gunderson and Gruber, forthcoming); dietary deterioration (Cristofar and Basiotis, 1992; Kendall, Olson, and Frongillo, 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 and (1) age of less than 60, (2) the head of household not having a high school

diploma, and (3) 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 (Bickel, Andrews, and Klein, 1996).

Higher rates of food insecurity have been reported among ethnic minorities, particularly African-American women (Cristofar and 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 3.7 percent of the U.S. population in 1996, to 5.1 percent by 2010, and to 8.7 percent by 2050 (USDCESA, 1996a,b,c). Asians and Pacific Islanders make up close to 50 percent of the population of Hawaii (DBEDT, 1997). A breakdown of Hawaii's population shows 23 percent Caucasian, 21 percent Mixed Non-Hawaiian, 21 percent Hawaiian and Part-Hawaiian, 20 percent Japanese, 10 percent Filipino, 3 percent Chinese, 1.4 percent African American, and 0.8 percent Samoan/Tongan. Participation in the Food Stamp Program in Hawaii is most likely among Caucasians, Hawaiians, Filipinos, and Samoans (DHS, 1997). Other researchers have reported the prevalence of hunger in Hawaii 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 the "face valid" categorical measure (Derrickson, 1999) is a valid and reliable categorical measure to use with Asians and Pacific Islanders in Hawaii. Prior to this research, a qualitative study was conducted to assess the face validity of the Core Food Security Module (CFSM) with Caucasian, Hawaiian and Part-Hawaiian, Filipino, and Samoan low-income food gatekeepers in Hawaii (Derrickson and Anderson, 2000). Qualitative findings suggested that variables thought to be related to food insecurity among this target group 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.

Face Valid Categorical Measure

Focus group respondents consistently reported that 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,"* which often precipitated "*lowering your pride and going to the food bank.*" These findings confirmed that food-insecure individuals in Hawaii perceived a situation of worry or uncertainty about their food supply as a key aspect of food insecurity. These findings are consistent with the technical definition of food insecurity (Life Sciences Research Office, 1990).

Based on our qualitative findings (Derrickson and Anderson, 2000) and our previous CFSM scale validation efforts (Derrickson, 1999), an alternative food security categorical measure called the "face valid measure" was developed to be true to the "grounded experience" (Glaser and Strauss, 1967) reported by low-income residents of Hawaii (Derrickson and Anderson, 2000). Like the Radimer/Cornell Measure (Radimer et al., 1992; Radimer, 1990) and the Community Childhood Hunger Identification Project (CCHIP) measure, in the face valid measure, any affirmative response was initially classified as "at risk of hunger." The term "at risk of hunger" was preferred rather than food insecure, since the term food insecurity is a complex, multidimensional phenomenon not generally used or understood by the public. However, unlike the Radimer/Cornell or CCHIP measures, to be undeniably classified as hungry in the face valid measure, an affirmative response to either Q10 "respondent hungry" or Q12 "any adult did not eat for a whole day" was required for adult hunger, and an affirmative response to Q14 "any child hungry" was required for child hunger. Q12 was added to Q10 since Q10 only captures the hunger of the respondent, not of other adult members of the household.

Objectives

The primary objective of this study was to document the concurrent validity of the face valid food security categorical measure and the national scale measure (Carlson, Andrews, and Bickel, 1999; Hamilton et al., 1997b) with residents of Hawaii. We hypothesized that findings would be consistent with

the literature and that there would be differences in the prevalence of food insecurity among ethnic groups in Hawaii, specifically that Hawaiians and Part-Hawaiians would be the most hungry.

METHODS

Samples

The samples and data collection methods have been described previously (Derrickson, 1999). To summarize, two samples surveyed between June and November 1998 included:

1. a statewide sample of 1,469 respondents gathered through the Hawaii 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 (Derrickson, 1999; SMS, 1998). 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 Table 1 preceded by the four-part food insufficiency question (Rose, Basiotis, and Klein, 1995).

Questions pertaining to the use of various resource augmentation behaviors (Hamilton et al., 1997b), income-related indices, and dietary indices were completed after the food security questions. Questions were limited to:

- 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.

TABLE 1
The Core Food Security Module

	Question. In the last 12 months. . . because there wasn't enough money for food?
Food Insecurity Indicators[a]	
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.
Stop if no affirmative response or food insufficiency response is not indicative of hunger.[b]	
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?
Stop if all questions 7H–11H are negative.[b]	
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?

[a]Q1, by design, is the four-part food insufficiency question.
[b]Skip patterns were used, as recommended, to reduce respondent burden (Price, Hamilton, and Cook, 1997).

- 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 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 1 or 2 months, don't know, or refused.

- Categorical questions about finances included:

  - reported household income earned in the last year ($\leq$ $5,000; then 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 anyone in the household had lost a job in the last 3 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; $5,001–10,000; and >$10,000).

- Dietary questions included one about the maximum monthly frequency of consumption of an inexpensive fried noodle product locally called Saimin, and two about vegetable consumption. These questions were developed from our initial qualitative work indicating that vegetable intake was low, particularly at the end of the month, and that many families relied on Saimin at the end of the month (Derrickson and Anderson, 2000). The question "Not counting salad or potatoes, on average, how many servings of vegetables do you eat a day?" was used to estimate the respondent's average daily vegetable intake. Validity and stability testing (Derrickson, 1999) 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

How food security responses were coded and how respondent food security scale measures were created using the FACET Rasch program (Linacre, 1986–1994) have been described elsewhere (Derrickson, 1999). The CFSM scale measure was developed using a log-linear measurement model called the Rasch model (Hamilton et al., 1997b). Applied to the CFSM, the assertions of the simple Rasch model are:

- the more food secure a respondent, the more likely s/he is to respond negatively to easier items, i.e., those indicating food security would answer "almost never" to Q2, "worried that food would run out'; and

- food insecurity items (Q2–Q6) are more likely to be answered affirmatively than the hunger items (Q7–Q16), i.e., more respondents will respond affirmatively to the least severe Q2 than to the more severe Q10 in which the respondent indicates hunger.

The scale values range from –4.5 indicative of mild food insecurity to +4.5 indicative of severe hunger. Scale measures could only be completed for the 304 respondents with one or more affirmative responses (Derrickson, 1999).

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 (Derrickson, 1999). 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 (Q10) or any adults not eating for a whole day (Q12) were required for classification of adult hunger. Similar responses to Q14 were required for classification of hunger among children.

After a preliminary inspection of the data, the following reclassifications were completed:

- Income was recategorized into five groups: <$5,000; $5,000–14,999; $15,000–34,999; $35,000–54,999; ≥$55,000.

- Savings was recategorized into four groups: <$250; $250–1,000; $1,001–10,000; >$10,000.

- The 19 ethnic categories were combined into eight groups: Hawaiian and 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 recategorized into four groups: one child, two children, three children, and ≥ four children.

- For households without children, household size was recategorized into four groups: one, two, three, and 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. Risk ratios were calculated to illustrate differences between households categorized as food secure versus households categorized as experiencing hunger among children. One-way ANOVA and Scheffe's post-hoc test were used to assess differences in selected numerical variables by food security category and in mean values of the respondent's food scale measure by selected categorical variables. Bivariate correlation analysis was employed to document the direct relationship between the food security scale measure and numerical variables. The alpha value for all significance tests was set at $p = 0.05$.

RESULTS

Food security status comparisons of selected demographic characteristics, income indices, government assistance programs, and resource augmentation behaviors are depicted in Tables 2–9. The means and standard deviations were 3.04 ± 1.8, range 1–14, for household size; 1.17 ± 0.76, range of 0–7, for number of seniors in each household; and 0.85 ± 1.3, range of 0–12, for number of children. All variables were significantly associated with food security status ($p \leq .05$) except for social security income, WIC program benefits, unemployment benefits, and frequent use of a food pantry. As indicated in Table 8, the four-part food insecurity question was significantly related to food security status ($X^2 = 595$, df = 12, $p = 0.00$). However, only 79 percent were correctly identified by the food insufficiency question, and only 35 percent were accurately identified in the three food insecurity categories.

The difference between the samples used must be kept in mind when comparing findings: Tables 2–8 include (n = 1,603) all households, whereas in Tables 10 and 11 (following page 17) only those with one or more affirmative food security responses could be included (n = 304 maximum). Table 9 indicates that the food security scale measure, resource augmentation index, respondent daily vegetable intake, and

TABLE 2
Food Security Status by Selected Demographic Characteristics

Indicator	Overall No. (%)		Face Valid Food Security Measure: No Hunger No. (%)		At Risk of Hunger No. (%)		Adult Hunger No. (%)		Child Hunger No. (%)		X^2 (p value)	
N	1603		1296	(80.8)	220	(13.7)	61	(3.9)	26	(1.6)	553	(0.00)
Site												
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)		
Ethnicity												
Caucasian	614	(38.3)	523	(85.2)	59	(9.6)	25	(4.1)	7	(1.1)	160	(0.0)
Hawaiian/Part-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/Mixed	65	(4.1)	52	(80.0)	10	(15.4)	3	(4.6)		—		
Hisp/AA/NA[a]	60	(3.7)	40	(66.7)	14	(23.3)	4	(6.7)	2	(3.3)		
Family Status												
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)		
Household Status												
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)				
Single Parent	71	(4.4)	34	(47.9)	19	(26.8)	19	(26.8)	9	(12.7)		
Multiple Family	183	(11.4)	127	(69.4)	37	(20.2)	14	(7.7)	5	(2.7)		

[a]Hispanic, African American, and Native American

TABLE 3
Food Security Status by Selected Income and Dietary Characteristics

Indicator	Overall No. (%)[a]		Face Valid Food Security Measure: Food Secure No. (%)		At Risk of Hunger No. (%)		Adult Hunger No. (%)		Child Hunger No. (%)		X^2 (p value)	
Job												
Lost job[b]	188	(16.8)	109	(12.4)	45	(26.8)	21	(43.8)	13	(52.0)	70.8	(0.00)
Did not lose job	929	(83.2)	767	(87.6)	123	(73.2)	27	(56.3)	12	(48.0)		
	1117		876		168		48		25			
Income												
<$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)	1	(6.3)		
$>54.9K	296	(28.9)	282	(34.7)	11	(3.7)	3	(6.8)				
	1023		812		151		44		16			
Savings												
< $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)	2	(8.7)		
$1001–10K	221	(24.0)	198	(28.7)	21	(13.0)	2	(4.3)		—		
> $10K	259	(28.2)	245	(35.6)	12	(7.5)	2	(4.3)		—		
	920		689		161		47		23			
Vegetable Intake at End of Month												
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	1350	(86.3)	1174	(92.4)	146	(69.2)	22	(39.7)	7	(26.9)		
	1565		1270		211		58		26			

[a]All percentages are column percentages.
[b]Indicates that someone in the household lost his/her job in the last 3 years and was unable to find another job with comparable salary.

TABLE 4
Food Security Status by Use of Various Government Assistance Programs[a]

Indicator	Overall No. (%)[a]		Face Valid Food Security Measure									
			Food Secure No. (%)		At Risk of Hunger No. (%)		Adult Hunger No. (%)		Child Hunger No. (%)		X^2 (p value)		Risk Ratio[e]
TANF[b]	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 assistance	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[c]	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[d]	79	(35.4)	30	(37.0)	30	(34.5)	11	(32.4)	8	(38.1)	<1	(0.95)	1.0

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

TABLE 5
Food Security Status by Selected Resource Augmentation Behaviors[a]

Indicator	Overall No. (%)[a]	Face Valid Food Security Measure					
		Food Secure No. (%)	At Risk of Hunger No. (%)	Adult Hunger No. (%)	Child Hunger No. (%)	X^2 (p value)	Risk Ratio[b]
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)	

[a]All percentages are column percentages.
[b]Risk ratios indicate percentage experiencing hunger among children divided by percentage experiencing food security for the row variable.

TABLE 6
Household Size versus Food Security Status for Households without Children: Number (Percent)[a,b]

	Face Valid Food Security Measure			
Household Size	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

[a]All percentages are row percentages except for the total column, which includes column percentages.
[b]Pearson's chi-square value: $X^2 = 34.7$, df = 6, p = 0.00.

TABLE 7
Number of Children Versus Food Security Status: Number (Percent)[a,b,c]

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

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

TABLE 8
Four-Part Food Insufficiency Question versus Food Security Status: Number (Percent)[a,b]

Four-Part Food Insufficiency	Face Valid Food Security Measure: 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

[a]All percentages are row percentages except for the total column which includes column percentages.
[b]Pearson's chi-square value: $X^2 = 595$, df = 12, p = 0.00, r = .534.

TABLE 9
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)	
All households (n=603)						
Food security scale measure (n=302)	None	-2.84 ±0.09 [a]	0.10±0.19 [b]	1.61±0.31 [c]	188	(0.00)
Resource Augmentation Index	0.2± 0.0 [a]	1.8 ± 0.1[b]	3.8 ±0.2 [c]	5.0 ±0.3[d]	582	(0.00)
Respondent daily vegetable intake	2.02±0.04 [a]	1.67±0.08 [b]	1.45 ±0.16 [b]	1.0 ±0.12 [b]	9.8	(0.00)
Maximum Saimin intake per month	3.7±0.2 [a]	8.4 ±0.9 [b]	7.9 ±1.2 [b]	13.5±2.3 [b]	28	(0.00)
Households Without Children						
Total household size	2.04±.03 [a]	1.94±.12 [a]	1.31±.15 [b]		5.3	(0.001)
Total number of seniors	1.4±.03 [a]	1.0±.13 [b]	0.2±.13 [c]		26	(0.00)
Saimin	2.3±.22 [a]	4.5±.99 [b]	4.3±.1.2 [b]		3.5	(0.03)
Households with Children						
Total number of children	1.0±.05 [a]	2.3±.12 [b]	2.8±.34 [b]	3.0±.28 [b]	16	(0.00)
Total number of seniors	1.09±.63 [a]	.0.49±.08 [b]	0.60±.22 [b]	.23±.11 [b]	12	(0.00)
Saimin	5.0±0.4 [a]	10.7±1.3 [b]	9.8±.1.7 [a]	13.5±.2.3 [b]	10	(0.00)

Notes: All tests were conducted with Scheffe'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.

maximum Saimin intake per month all varied significantly with food security status. Table 10 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 differences 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 11, 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 confirmed 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 = .58). Of the individual coping behaviors, use of a food pantry and delayed bill payment were the most highly associated (r = .37 and r = .30, respectively) with the food security scale measures. Table 5 indicates that those classified as experiencing hunger among children were 14.3 times (73 percent vs. 5 percent) 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 percent vs. 1.6 percent) 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 = .56), nor was it associated with the food security scale measure (r = .10) for all respondents, or for respondents who only reported using a food pantry (r = .06).

TABLE 10
One-Way ANOVA of Respondent Food Security Scale Values by Selected Variables (n = 304)

Variable	Mean ± Standard Error	N	Scheffe's Post-Hoc Test	*F* (p value)
Ethnicity				
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 Asian	-1.99±.55	13		
Other/Mixed/Unidentified	-2.52±.66	12		
Hispanic/African American/ Native American	-1.97±.50	20		
Household Income				
<$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		
Household Savings				
< $250	-1.16±.19	143		8.45 (0.00)
$250–1000	-2.31±.24	50	[a]	
$1001–10K	-2.91±.32	23	[a]	
> $10K	-2.71±.30	13	[a]	
Vegetable Intake at End of the Month				
Increases	-1.08±.34	42	[a]	22.6 (0.00)
Decreases	-.84±.24	76	[a]	
Stays the same	-2.52±.14	175		

Notes: Respondent scale measures were calculated using the Rasch model. Larger food security values (less negative) indicate more severe food insecurity. All tests were conducted with Scheffe's post-hoc test after significant *F* tests.

[a] = mean value significantly different than all those unmarked.

TABLE 11
Correlation between the Food Security Scale Measure and Selected Indices (n = 304)

Selected Variables	Correlation Coefficient	p value
Factors with direct relationship with deteriorating food security status		
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 3 years and couldn't find another with a comparable salary	0.24	0.00
Child sent to friend's or family member's 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
Not significant/No relationship with deteriorating food security status		
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
Inverse relationship with deteriorating food security status		
Mean daily vegetable intake	-0.14	0.014
WIC program participation	-0.19	0.026
Number of seniors in household	-0.21	0.000

Government Assistance Programs

The relationship between use of government assistance programs and food security status is outlined in Tables 4 and 11. Findings indicate that 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 percent were on welfare, 58 percent received food stamps, and 65 percent were beneficiaries of free or reduced-price school meals. Comparably, for food-secure households, 4 percent were on welfare, 6 percent received food stamps, and 5 percent were beneficiaries of free or reduced-price school meals. Receipt of disability income was more prevalent among those classified as at risk of hunger (13.6 percent) or experiencing adult hunger (14.8 percent), but was lower for households experiencing hunger among children (3.8 percent) when compared to food-secure households (5.9 percent). The inverse relationship between WIC and deteriorating food security status was confirmed through correlation analysis with the respondent food security scale measure ($r = -19$, $p = .026$).

Financial Indicators

Tables 3, 10, and 11 indicate that whereas low income was a factor contributing to food insecurity in many households, recent loss of a job and amount of household savings were more important determinants of food security status.

- The mean food security scale measure ($F = 2.2$, $p = .07$) 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 closest to the item scale value of Q9, “Did you ever eat less than you felt you should?” Also, 89 percent of those classified as food secure had household incomes greater than $20,000 and 78 percent of those who experienced hunger among children reported household incomes of less than $20,000.

- Those classified as experiencing hunger among children were four times more likely (52 percent vs. 12 percent) than those classified as experiencing food security to report that someone in the household had lost a job in the last 3 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 from the mean scale measures of all other savings categories and indicates an item scale value that was closest to the item scale value of Q9. Ninety-one percent of those experiencing child hunger reported household savings of less than $250. No families that reported either adult or child hunger had savings greater than $1,000

Demographic Indices

Table 2 indicates that although food insecurity and hunger were more likely among households with children than those without children (30 percent vs. 11 percent), only 82 percent of single households were food secure versus 93 percent 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 seniors (0.2 versus 1.4) than adults-only households that were classified as food secure.

Table 2 also suggests that single-parent families were the most food-insecure type of household: only 34 (47 percent) single-parent households were food secure, 19 (27 percent) were at risk of hunger, 9 (13 percent) experienced hunger among adults, and 9 (13 percent) experienced hunger among children. Table 9 confirms that households experiencing hunger among children had a higher mean number of children (3.0 vs. 1.0) than their food-secure counterparts. The risk of hunger (either adult or child) was 4.36 times greater for families with four or more children than for families with only one child. Table 9 also indicates that regardless of whether a household had children, having one or more adults older than 60 years (a senior) increased the likelihood of food security. Households classified as experiencing hunger among children averaged only 0.23 seniors versus 1.09 seniors for those that were food secure.

Fifty-four percent of the sample were either Asians or Pacific Islanders. Results of the relationship between ethnic variation and food security status depend on the sample used. Table 10 indicates that differences in the food security scale measures, which are only calculated for those who responded to one or more questions affirmatively, were not statistically significantly different in a Scheffe's post-hoc test. The mean food security scale values of Caucasians (−1.58), Hawaiians (−1.51), and Samoans (−1.45) were lowest, and the mean scale value of Japanese was not different from that of

Filipinos (−2.77 vs. −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 2, 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 Hawaii (X^2=160, p=0.00). Ninety-five percent of Japanese respondents, 86 percent of Other Asians, 85 percent of Caucasians, 80 percent of others, 75 percent of Filipinos, 67 percent of Hispanics, African Americans, and Native Americans, 65 percent of Hawaiians and Part-Hawaiians, and 17 percent of the Samoans surveyed were food secure. Hawaiians and Part-Hawaiians were more likely to be hungry, particularly experiencing child hunger, than were the Japanese and Other Asian groups. Of the 263 Hawaiians and Part-Hawaiians sampled only 173 (67 percent) were food secure, 62 (24 percent) were food insecure, 17 (6 percent) experienced hunger among adults, and 11 (4 percent) experienced hunger among children. Forty-two percent of the households classified as experiencing hunger among children were Hawaiians and 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 Samoan households (17 percent) were food secure, nine (50 percent) were at risk of hunger, four (22 percent) were classified as experiencing hunger among adults, and two (11 percent) were classified as experiencing hunger among children.

Dietary Indices

Analyses of dietary intake are reported on Tables 3 and 9. Results from one-way ANOVA and correlation analysis indicate an inverse relationship of deteriorating food security status with both average vegetable intake (r = −.24) and an increased reliance on Saimin (r = .11). However, Table 9 indicates that increased reliance on Saimin is more common in households with children than in those without children. The mean vegetable intake (2.02 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. 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 percent 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, 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 did not change at the end of the month (−2.52).

DISCUSSION

Both the national food security scale measure and the face valid food security categorical measure are designed to measure food deprivation stemming from inadequate resources for food (Hamilton et al., 1997b). They capture 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 nonprofit 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 might confound the measure when it is used to assess the effectiveness of assistance programs. Furthermore, scale measures cannot be created for households that do not respond affirmatively to one or more indicators. Neither is it useful for those who respond affirmatively to all questions asked (Wright and Stone, 1979). In our study, scale measures were only possible for 304 of 1,603 respondents (19

percent). Due to the large number of food-secure respondents who do not have scale measures, concurrent validity assessment must depend heavily on a categorical measure. Research verifying the strong relationship between the scale measures and the algorithm was produced in our previous study (Derrickson, 1999) and was a major reason why concurrent validity assessment was presented only for the face valid categorical measure.

Concurrent Validity

Table 12 presents a summary of concurrent validity findings. In general, findings link worsening financial insecurity to deteriorating food security status. This is very important because resource constraints—"not having enough money for food"—are a fundamental construct of the CFSM (Hamilton et al., 1997b). In general, the use of assistance programs and coping behaviors correlated directly with both the food security scale measure and the categorical algorithm. This finding confirms national research (Hamilton et al., 1997b), other literature (Scott, 1994), and our qualitative findings (Derrickson and Anderson, 2000) indicating the extent to which food insecurity is a "managed process" (Radimer et al., 1992; Radimer, 1990). Likewise, both the face valid categorical measure and the national scale measure 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, Andrews, and Klein, 1996). More households with children reported hunger among adults (n = 43) than hunger among children (n = 25), suggesting that many parents or caregivers protect children from hunger at their own expense. Combined with our qualitative findings (Derrickson and Anderson, 2000), the evidence herein supports the concurrent validity of the face valid categorical algorithm among at least Asians and Pacific Islanders in Hawaii.

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 question were not consistent and recommended that it not be used. His rationale was that it

TABLE 12
Summary of Concurrent Validity Findings

Factors concurrently related to increased hunger

1. Resource augmentation behaviors (delayed bill payments, use of a food pantry, etc).
2. Someone in the household lost a job in the last 3 years
3. Inadequate savings
4. Use of food stamps, housing assistance, welfare assistance
5. Single-parent household
6. Single-adult household
7. Increased number of children
8. Decreased or no seniors
9. Inadequate savings
10. Overall decreased vegetable intake
11. Decreased or increased vegetable intake at the end of the month
12. Hawaiian or Samoan ethnicity

Factors concurrently related to decreased hunger

13. Two or more adults in household
14. One or more seniors in household
15. WIC program participation
16. Adequate savings
17. Japanese ancestry

Factors unclear without further analysis

18. Frequent use of a food pantry
19. Social Security income
20. Unemployment benefits

is a complex, confusing question. Our subjects and interviewers reported similar findings. Many times the interviewer reported having to read the question two or three times before a response was given; thus the question is also time-intensive. This food insufficiency question in 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, 1998). Although the median income for a four-person household in Hawaii in 1999 was projected to be $57,909—sixth among all the states (DBEDT, 1997, Table 13.16)—approximately 10.7 percent of its residents live at the Hawaii poverty threshold of $18,920 for a four-person household (*Federal Register,* February 24, 1998). At 121 percent of the national average, Honolulu was the second most expensive U.S. city to live in during 1996 (DBEDT, 1997; Table 14.08). Cost of food eaten at home is 142 percent of U.S. urban prices (DBEDT, 1997; Table 14.07). Relatively little of the food consumed in Hawaii 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 (forthcoming) premise that inadequate savings and recent loss of a job are "income shocks" which destabilize a household's financial status regardless of income. Though not studied here, 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 Hawaii.

Resource Augmentation Behaviors

Tables 5 and 10 indicate that the hungrier households are, 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). Comparisons between Tables 4 and 5 indicate that use of a food pantry may be more "socially acceptable" or more common among the very needy than use of food stamps. Of the 132 households categorized as at risk of hunger, 76 (34.5 percent) received food stamps and 85 (38.6 percent) used a food pantry. Of the 61 households classified as adult hungry, 33 (54 percent) used food stamps and 37 (61 percent) used food pantries. Of the 26 households classified as child hungry, only 15 (58 percent) received food stamps, but 24 (92 percent) used a food pantry. Of those who experienced hunger among children and used a food pantry (n = 24), 17 (71 percent) did so often.

Food banks and food pantries in Hawaii have reported increased demand for food (Van Amburg Group, 1998). It is the author's (JD) experience that food pantry programs in Hawaii not only are available in most geographical locations but, because of their cultural diversity, meet the needs of many ethnic groups to the extent possible with salvaged foods. However, the ability of charitable organizations to fill the holes in the increasing large "nutrition safety net" is questioned, particularly when the cap on welfare benefits begins to affect 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 4 and 12) is like the classic "chicken and egg" problem—it is difficult to tease out the causality between the two. Government assistance programs are designed to enhance food and nutrition security (Food and Nutrition Service, 1997). We found participation rates to be generally higher among those who were hungry. However, the Food Stamp Program served only 55 percent of those who admitted to experiencing hunger among adults or children. Our results are similar to those of Tarasuk and Beaton (1999) and suggest that, 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 that shame and ignorance may be factors for some, while the paperwork,

hassles, and investigations into one's financial affairs are barriers for others (Derrickson and Anderson, 2000).

Chi-square analysis indicated no differences in food security status with SSI, unemployment, and WIC benefits. Although 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 indicate that WIC program participation may enhance food security status. This raises the next question of whether income transfer assistance programs—e.g., food stamps—as well as food distribution programs—WIC, food pantries, and commodity programs—are truly enhancing food security of the most needy. Questions related to program effectiveness cannot be answered by this study.

Dietary Indices

The finding of reported decreases in vegetable intake with deteriorating food security status is also consistent with other studies (Kendall, Olson, and Frongillo, 1996; Tarasuk and Beaton, 1999) and with dietary studies in Hawaii (DOH, 1994; Derrickson and Gans, 1996) which indicate poor intake of vegetables among those with less income. Findings 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 forgo vegetables for foods perceived as less expensive, while others may increase vegetable intake and possibly reduce intake of other more expensive foods like meat and processed foods. Clearly, both decreasing and increasing vegetable intake at the end of the month due to financial pressures are coping tactics to stretch food resources, but their divergent effects on diet quality and health point 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, since many of the food-insecure and lower-income people in Hawaii 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 Hawaii (DBEDT, 1997). It is well known that many Hawaiian, Part-Hawaiian, and Samoan families in Hawaii are large, and that grandparents sometimes live with or nearby the family (OHA, 1998). Many families live together to decrease housing-related costs (Derrickson and Anderson, 2000). On the other hand, except on military bases, 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 and bearing the costs of transportation, food, and housing by oneself can also be quite difficult for those who 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 enhances 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. Not surprisingly, these ethnic groups are most at risk of poor diet quality, excess intake, increased morbidity, and early mortality (DOH, 1994; OHA, 1998). They are also disproportionately likely to be beneficiaries of government assistance (DHS, 1998). Traditionally, Pacific Islanders were thought of as quite healthy and food secure (Cook, 1778), but increased Westernization—including an appealing high-salt, high-sugar, high-sodium diet resulting in decreased food and nutrition security—has had detrimental effects on 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. The sample sizes of

various distinct ethnic groups also prevent further analysis of the relationship between family size, ethnicity, and food security status. Asking about household income and savings is difficult because of the invasion of privacy, recall bias, and the 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 more detailed dietary assessments and measures of psychological health.

IMPLICATIONS

Findings support the concurrent validity of the CFSM food security scale measure and the face valid algorithm among residents in Hawaii, of which more than 50 percent of our sample were of Asian and Pacific Island origin. Results confirm our hypothesis that Asians, except for Filipinos, appear less likely to be food insecure. Hawaiians and Part-Hawaiians, and Samoans, who constituted the majority of Pacific Islanders sampled, were more likely to be hungry. In general, progressively deteriorating food security status as experienced among Hawaii residents resulted in concurrent decreased vegetable intake, and increased reliance on a cheap high-fat, high-sodium noodle product. 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 the 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 aspect of what is needed. Further funding is also needed for nutrition education programs designed to assist the food insecure in maximizing the health value of their food choices. This work and studies of its kind

(Radimer et al., 1992; Frongillo et al., 1997, Alaimo et al., 1998) raise many questions that merit further investigation. The most important issue may be determining the best way to continually monitor 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.

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