

Measuring Food Security in the Dominican Republic

Adaptation of the U.S. Food Security Survey Module

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Abstract

The U.S. Household Food Security Survey Module was translated into Spanish and adapted for use in the Dominican Republic. Qualitative assessment in a focus group was conducted to confirm the relevance of the concepts and to refine the questions. A pilot survey of 110 households in a rural, economically vulnerable community was conducted, and the data were analyzed to assess the validity of the questions as a multiple-item measure of household food insecurity. Both internal and construct validity appear to be acceptable, although further assessment of two items is recommended. The Dominican survey module complements work in several other countries in Central and South American and the Caribbean to develop a common set of food security questions for use in diverse cultural and linguistic settings.

This study was conducted by Clark Atlanta University and the Instituto Dominicano De Investigaciones Agropecuarias Y Forestales under a cooperative research contract with USDA's Economic Research Service (ERS) Food and Nutrition Assistance Research Program (FANRP) (ERS project representative: Mark Nord). The views expressed are those of the authors and not necessarily those of ERS or USDA.

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REPORT SUMMARY

The purpose of this study was to adapt, translate, and test the U.S. Household Food Security Survey Module for use in the Dominican Republic. The module was translated into Spanish, assessed in a focus group, and administered as a pilot in a household survey of 110 low-income families in the Dominican Republic. The internal validity of a measure of food insecurity derived from the data was assessed using statistical methods based on the Rasch measurement model. The construct validity of the measure was assessed by examining its associations with household characteristics that were expected to cause or result from food insecurity.

The adapted Dominican Republic Household Food Security Survey Module appears to perform well as a measure of household food insecurity. Qualitative evidence from focus groups confirmed the relevance of the behaviors and conditions elicited by the module as indicators of food access difficulties. The pilot survey of an economically vulnerable sample of 110 households in a rural community confirmed the practicality of administration. Internal validity of the set of items derived from the response data was acceptable, although two of the questions should be explored further in focus groups or cognitive interviewing to improve them prior to widespread use. Separate scales to measure adult and child food insecurity are recommended for future use rather than a single scale combining adult and child items.

Construct validity was evidenced by the following associations:

- Families with literate householders were more food secure than their respective counterparts.
- Larger families were somewhat more likely to experience food insecurity with severe hunger.
- Reports that the household sometimes or often did not have enough to eat (in response to a question that is not part of the food security scale) were very strongly correlated with food insecurity with hunger.
- Households with employed members tended to enjoy a higher degree of food security than households with no employed adults.

- All food secure households reported that they resided “not far” from the market where they make purchases. Those who were located far from the market experienced severe hunger at a higher rate than households residing near by.
- The probability of being food secure was higher in households where women contributed in generating income than in families where they did not.
- The probability of being food secure was higher and the probability of severe hunger lower among respondents who felt that their current level of livelihood was “good” or “very good” than among those who described their life situation as “not very good” or “not good at all.”

Further construct validation should be undertaken with a focus on associations with food intakes and nutritional status.

The descriptive results of the pilot survey indicated a very high prevalence of food insecurity in the Las Tablas community. Seventy-six percent of the surveyed households were food insecure with hunger among adults (during the 30 days prior to the survey) and 72 percent were food insecure with hunger among children. Adults were food secure in only 12.7 percent of the surveyed households and were fully food secure (i.e., reported no food-access difficulties) in only 5.5 percent. Although these results are from a small sample in an area known to be economically vulnerable, the high prevalence of food insecurity suggests the relevance and importance of measuring food security in the Dominican Republic.

NOTE ON RELATED RESEARCH: Results from this study and similar research in several other Latin American countries were compared in a conference in 2007 (Perez-Escamilla et al., 2007). A standardized survey module recommended for use throughout the region, the Escala Latinoamericana y Caribeña de Seguridad Alimentaria (ELCSA) was developed out of that process. ELCSA differs in several ways from the scale used in the present study. Researchers should consider the ELCSA and recommendations from the conference along with the findings in this report when developing food security measurement methods for use in other Latin American and Caribbean countries.

1. INTRODUCTION

In spite of the long period of economic growth and relatively low unemployment that characterized the Americas over the previous decade, food insufficiency and hunger continue to affect a substantial proportion of the population in Latin America and the Caribbean (Leipziger, 2001; DePalma, 2001). As food insufficiency is recognized to pose long-lasting challenge to nutrition, health and social policy, researchers both at public and private institutions have recently exhibited renewed and growing interest in its measurement at the household and individual levels (Bickel, et al, 2000, 1998; Carlson, et al, 1999; Olson, 1999; U.S. Department of Agriculture, 1995; Girvan, 2001).

Most of the recent research on the subject uses food insecurity as a core indicator of the deprivation of basic food needs, drawing on concepts and measurement methods developed in the United States in the late 1980s and early 1990s. Food security, insecurity, and the related condition of hunger are conceptualized as follows:

Food Security—“Access by all people at all times to enough food for an active, healthy life. Food security includes at a minimum: (1) the ready availability of nutritionally adequate and safe foods, and (2) an assured ability to acquire acceptable foods in socially acceptable ways (e.g., without resorting to emergency food supplies, scavenging, stealing, or other coping strategies).”

Food insecurity—“Limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways.”

Hunger—“The uneasy or painful sensation caused by a lack of food. The recurrent and involuntary lack of access to food. Hunger may produce malnutrition over time Hunger ... is a potential, although not necessary, consequence of food insecurity.”
(Anderson, 1990; Bickel et al., 2000).

Food security, in this sense, is an important foundation for good nutrition, health, and children's development. Measuring and monitoring food security can provide important information on the extent of unmet food need, and the characteristics of those in greatest need.

The U.S. food security measurement methods assess food insecurity as experienced by households based on their self-reports of behaviors, experiences, and conditions that are known to characterize households having difficulty meeting their food needs. Responses to a standardized set of questions, the U.S. Household Food Security Survey Module (USHFSSM), are combined to form the U.S. Household Food Security Scale, which measures the severity of household food insecurity as perceived, experienced and described by respondents. The U.S. food security measurement methods have been adapted for use in a number of other countries (Coates et al., 2006a; Coates et al., 2006b; Melgar-Quiñonez et al., 2006; Melgar-Quiñonez et al., 2007; Frongillo and Nanama, 2006; Health Canada, 2007).

The purpose of this study was to adapt, translate, and test the USHFSSM for use in the Dominican Republic (DR). The translated module was assessed in a focus group and administered as a pilot in a household survey of 110 low-income families in the DR. The internal validity of measures of food insecurity derived from the data was assessed using statistical methods based on the Rasch measurement model. The construct validity of the measure was assessed by examining its associations with household characteristics that were expected to cause or result from food insecurity.

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2. MEASURING FOOD INSECURITY—OVERVIEW OF THE U.S. METHODS

The U.S. Household Food Security Scale is a measure of the severity of household food stress or food access problems. It is based on self-reported behaviors, experiences, and conditions in surveyed households. One member of each sampled household is interviewed using a standardized survey instrument—the USHFSSM. The food security status of each household is assessed by responses to 18 questions (in the full module) about food-related behaviors, experiences, and conditions that are known to characterize households having difficulty meeting their food needs.

The USHFSSM and U.S. Household Food Security Scale were developed by the Food Security Measurement Project, established in 1992 pursuant to the National Nutrition Monitoring and Related Research Act, 1990. The Food and Nutrition Service, U.S. Department of Agriculture (USDA), and the National Center for Health Statistics, U.S. Department of Health and Human Services, provided leadership for the project, which included several federal government agencies along with academic and private research institutions (Hamilton et al. 1997a). The project designed a survey instrument with a view to “obtaining information on a variety of specific conditions, experiences, and behaviors that serve as indicators of the varying degrees of the severity of [food insecurity]” (Bickel et al., 2000, p. 9).

The questions in the USHFSSM cover a wide range of severity of food access problems ranging from worrying about running out of food to children not eating for a whole day. Each question specifies the lack of money to obtain food as the reason for the condition or behavior, so the scale is not affected by hunger due to voluntary dieting or fasting. In the standard module, all questions are referenced to the previous 12 months, but shorter time references (e.g., 30 days) are also practical.

Responses to the 18 questions (or the 10 items in households with no child present) are combined into a scale using non-linear statistical methods based on the Rasch measurement model. The scale provides a continuous, graduated measure of the severity of food deprivation across the range of severity encountered in U.S. households. Based on their food security scale scores,

households are also classified into three categories for monitoring and statistical analysis of the food security status of the population. Prior to 2006, the categories were described as “food secure,” “food insecure without hunger,” and “food insecure with hunger.”¹ In the early development of the measure, the category “food insecure with hunger” was further subdivided into “food insecure with hunger—moderate” and “food insecure with hunger—severe.” Although this subdivision has been dropped in the U.S., it was considered to provide a useful differentiation in the more economically vulnerable population of the DR and was retained in this study.² Operationally (based on the cognitive content of the items identifying each category), the categories may be characterized as follows:

- **Food Secure**— Households show no or minimal evidence of food insecurity.
- **Food Insecure without hunger**— Food insecurity is evident in household members' concerns about adequacy of the household food supply and in adjustments to household food management, including reduced quality of food and increased unusual coping patterns. Little or no reduction in members' food intake is reported.
- **Food insecure with hunger (moderate)** — Food intake for adults in the household has been reduced to an extent that implies that adults have repeatedly experienced the physical sensation of hunger. Such reductions are rarely observed among children in households that have food insecurity in this range of severity.
- **Food insecure with hunger (severe)** — At this level, all households with children have reduced the children's food intake to an extent indicating that the children have experienced hunger. For some other households with children, this already has occurred at an earlier stage of severity. Adults in households with and without children have repeatedly experienced more extensive reductions in food intake.

¹ Beginning in 2006, USDA introduced new terminology to describe food insecurity, revising “food insecure without hunger” to “low food security” and “food insecure with hunger” to “very low food security.” In this report we have retained the labels current at the time of the research as they were used (in Spanish) in the research project in the Dominican Republic.

² In the U.S., the “food insecure with hunger-severe” category was originally developed primarily to identify households in which children, as well as adults, were likely to have been hungry because of the household’s food insecurity. The category did not perform as expected for that purpose, and was dropped in favor of a measure of children’s food insecurity based on the child-referenced food security questions only.

These methods are now accepted as a standard method of measuring household food insecurity in the United States (Bickel et al, 2000; Nord et al., 2007a). USDA has used them to monitor the food security of the nation's households annually since 1995 (Hamilton et al., 1997a; Nord et al., 2007a). The module and the classification methods, with some modifications, are also the standard for food security measurement in Canada (Health Canada, 2007).

The U.S. methods have also been employed and tested by a number of researchers who studied the prevalence of food insecurity and hunger in the U.S. among various segments of the population including mother-headed families, children, the elderly, food-stamp recipients, ethnic minorities, recent immigrants, and other potentially vulnerable groups (Kasper et al., 2000; Polit et al., 2000; Himmelgreen et al., 2000; Derrickson et al., 2000).

3. ADAPTATION AND QUALITATIVE TESTING OF THE SURVEY MODULE

The Study Site

Both qualitative testing and a pilot survey were conducted in a relatively poor community, Las Tablas, in the municipio of Bani in Peravia province in the DR. It is located at the Southwest part of the country, about 47 miles from the capital city, Santo Domingo (Figure 1). The community has 193 households and almost 900 people, with gender ratio near unity (453 female and 447 male). Las Tablas was selected because: 1) It is very poor and rural, 2) has a clear demarcation for survey sampling, and 3) has a convenient transportation route for enumeration.

Adaptation of the USHFSSM

Our interest was to adapt the USHFSSM for use in the culturally and economically distinct context of the DR. The questions in the USHFSSM as translated into Spanish by Harrison et al. (2003) for use in the United States were further modified, taking into consideration the colloquial Dominican Spanish to produce the DR Household Food Security Survey Module (DRHFSSM). The questions were then pre-tested in a focus group (Appendix A), and the results were incorporated into the final survey instrument (Appendix C).

Although the Standard USHFSSM collects information referenced to the 12 month period prior to the survey, it can be adjusted for shorter reference periods (Bickel, *et al*, 2000). Since this

study focused on populations that are prone to frequent and severe food insecurity, we used a 30 day reference period and modified questions in the module accordingly. This included changing questions 8a, 12a and 14a, which ask how often conditions occurred, to accommodate the 30 day reference period. We also omitted the first level-preliminary screener questions since a large majority of the target population was expected to be food-insecure.

Figure 1. Map of Dominican Republic. The Food Security Pilot Survey was conducted in Las Tablas.



Qualitative assessment of the DRHFSSM

Ethnographic data obtained through the focus group discussion in Las Tablas complemented the FSSM-generated information and thereby enriched our understanding of how food insecure households in the DR manage and cope with actual and impending food problems. Although the DRHFSSM reflects the use of certain coping strategies, such as cutting down on the size of meal portions and switching to lower-cost food items, it obviously does not cover all conceivable and

socially acceptable ways and tactics employed by families to deal with constraints that may lead to food deprivations (see, for example, Polit et al., 2000). As a result, our study sought to conduct in-depth interview/discussions with 110 randomly selected households in order to gain further insights into the nature of food problems they experience and the food management and coping strategies they use to avoid hunger and other forms of food insecurity. These included questions on overall life conditions in Las Tablas, such as economic and physical (source of income and employment status, importance of food items, transportations and market access, etc.). The qualitative study was therefore carried out in two steps:

Step 1: We collected qualitative and ethnographic information in an exploratory exercise to better understand how households in the DR describe their food situations. This was carried out in a focus group format with in-depth and open-ended questions and discussions followed by discussion of each item in a semi-structured discussion format. Ten women selected by the two enumerators who are familiar with this community participated.

Respondents were first provided a short (2 to 5 minutes) oral orientation on the purpose and the possible long term outcome of the survey. They were then given the opportunity to describe their own current and past food situations by taking not more than five minutes each. Interviewers asked questions to clarify the respondent reports. It was made clear to each of the respondents that the result of this survey would neither bring food nor money nor employment to the area in the near future. These and other necessary steps, including the training of the enumerators, were taken so as not to promise the respondents anything in order to engage them in the interview process (further information on the focus group is included in Appendix A). Each of the proposed food security questions was then read and discussed with the focus group in a semi-structured format, with an enumerator and Co-Principal Investigator participating.

Step 2: The results from Step 1 were used to make appropriate changes in the DRHFSSM questions. Wordings of the 18 food security scale questions were edited and compared with the corresponding Harrison et al version to fit the conditions, experiences, and household behaviors in coping with various levels of severity that typifies the DR households.

The final food security questions administered in the Pilot Survey are shown in Appendix C. The food security questions of the DRHFSSM are compared with those developed by Harrison et al. (for use in Spanish speaking populations in the U.S.) in Appendix D.

4. TESTING THE DRHFSSM IN A PILOT SURVEY

The DRHFSSM was tested in a survey of 110 households, randomly selected to be representative of the community of Las Tablas, during the period September-December 2003. Additional questions on household demographics, food conditions, and economic conditions were also administered.

Using a grid of three streets, families living in every other household were selected for interview. However, 10 to 14 additional households were included in the final sample at their request, because of their interest in the project. The basic characteristics of this community, as represented by the sample households, are summarized in table 1. Most of the households surveyed (93 percent) were families with children. Family size ranged from one to ten persons, and the typical family in the sample had four or five members. Four out of five households were headed by females. The majority of the respondents (61 percent) could read and write. Roughly half of the respondents had completed primary education but not secondary, while only 7.3 percent had completed secondary.

Table 1: Selected Characteristics of the Study Sample (N=100 households)

Characteristic	Percent
Mean Household Size	4.6
Household Head, Female (%)	81.8
Household Head, Illiteracy Rate (%)	39.1
Household Head with Primary Education (%)	52.7
Household Head with Secondary Educ. (%)	7.3

Preliminary Food Security Assessment

Prior to the statistical assessment of internal validity, we examined responses to the individual questions in the DRHFSSM and conducted a preliminary examination of food security conditions in the sample using the coding and classification procedures that are used in the U.S. (Bickel et al., 2000).

Table 2 presents the percentage of households affirming each of the standard questions in the DRHFSSM. Prior to describing these findings, a brief review of the nature and implications of these questions is in order. Three of the questions (Q2, Q3, and Q4) ask about the food situation of the entire household, seven (Q8-Q12a) about the experiences and behaviors of adults, and the remaining eight (Q5, Q6, Q7, and Q13-Q16) about conditions among children. (These latter are omitted for households with no children.) Three questions (Q8a, Q12a and Q14a) are follow-up queries that elicit information on the frequency of a previously reported behavior or condition. The survey questions were administered in three stages, the first stage serving as an internal screener to the next stage of questions.³ Responses of “yes,” “often true,” or “sometimes true” were coded as affirmative responses as were reports of 3 or more days for the frequency-of-occurrence follow-up questions. While the set of questions was used in combination to derive a measure of food security status, as sub-groups they were designed to capture four kinds of food-insecurity situations or events. Affirmative responses to Q2 and Q3 would indicate an anxiety or perception that the household budget or food supply was inadequate. Affirmation of Q4, Q5, or Q6 indicates a perception that the food eaten by adults or children was inadequate in quality. Affirmation of any of Q8-Q12a indicates instances of reduced food intake, or consequences of reduced intake, for adults. Finally, instances of reduced food intake or its consequences for children are indicated by affirmation of Q7, or Q13-Q16 (Bickel et al., 2000, p. 24).

The difference in the severity of conditions indicated by the questions in the DRHFSSM is seen in the summary responses (table 2). More than 85 percent of households affirmed questions indicating anxiety about food supply and indications of reduced quality/variety/desirability of diets. Questions indicating reduced food intake by adults were affirmed by 21 to 76 percent of households. Questions indicating reduced food intake by children (except for Q7, which is rather general) were affirmed by 10 to 67 percent of households.

³ Thus, respondents would be asked the second-stage questions if they affirmatively answered any one of the first stage questions. Likewise, stage 3 questions would be posed only to households who provided at least one affirmative response to questions in the second stage.

Table 2: Household Food Security Items: Percentage of Affirmative Responses

QN*	In the last 30 days:	Percent**
	Stage 1 Questions	
Q2	Worried whether food would run out.	86.4
Q3	Food bought just didn't last.	83.6
Q4	Couldn't afford to eat balanced meals.	92.7
Q5	Relied on only a few kinds of low-cost food to feed the children.	88.2
Q6	Couldn't feed the children a balanced meal.	88.2
	Stage 2 Questions	
Q7	The children were not eating enough.	79.6
Q8	Adult(s) in the household cut size of meals or skipped meals.	75.5
Q8a	Adult(s) cut or skip meals, 3 or more days.	60.0
Q9	Ate less than felt he or she should.	81.8
Q10	Hungry but didn't eat.	72.7
Q11	Lost weight because there wasn't enough food.	31.8
	Stage 3 Questions	
Q12	Adult(s) did not eat for a whole day.	20.9
Q12a	Adult(s) did not eat for whole day, 3 or more days.	19.1
Q13	Cut size of child's meals.	66.7
Q14	Child skipped meals.	60.2
Q14a	Child skipped meals, 3 or more days.	46.2
Q15	Child hungry but couldn't afford more food.	61.3
Q16	Child did not eat for a whole day.	9.7

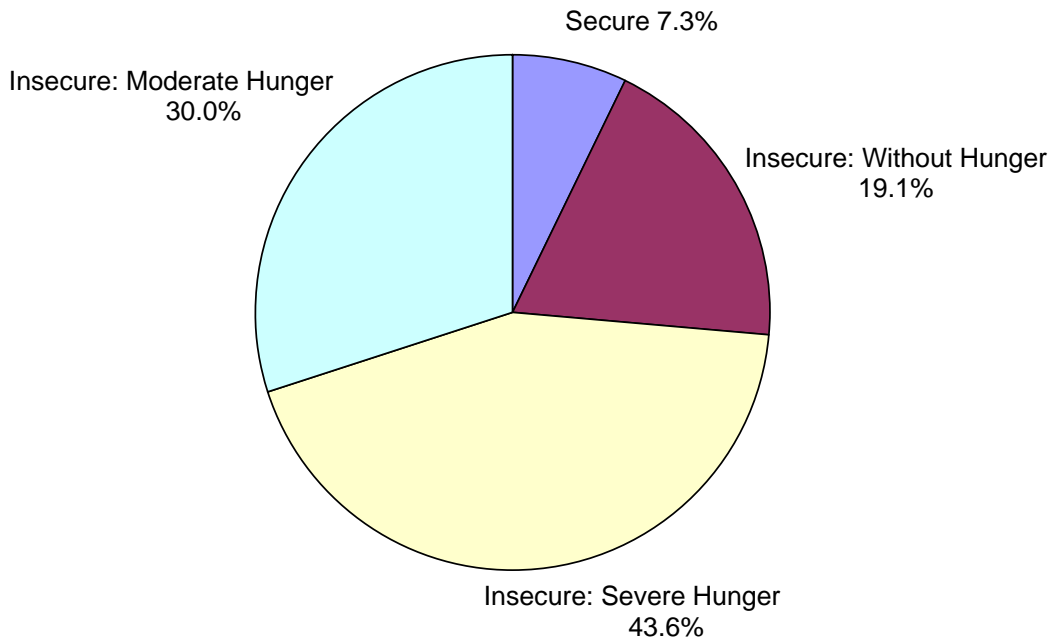
Notes:

*QN denotes the serial number of the questions as they appear in the USHHFSM (Bickel et al., 2000).

** Households without children were omitted from calculation of percentages for child-referenced questions.

Using the U.S. classification standards, 7.3 percent of the surveyed households were food secure (figure 2). The 92.7 percent that were food insecure comprised 19.1 percent food insecure without hunger, 30.0 percent food insecure with hunger (moderate) and 43.6 percent food insecure with hunger (severe).

Figure 2: Household Food Security Status



5. INTERNAL VALIDATION

The internal validity of a multiple-indicator measure can be assessed by examining the interrelationships among the indicator items. Expected patterns of association among the indicators are derived from assumptions of the measurement model about the associations of the (observed) indicators with the (unobserved/latent) condition of interest. Consistency of inter-item associations with expected patterns is evidence that the item responses, when appropriately combined, are a valid measure of the unobserved latent condition. Experiential food security measures are generally assessed based on the Rasch measurement model. An overview of the Rasch model and the item parameters and item-fit statistics based on it are provided in Appendix B.

Two food security scales were assessed, one based on adult items, the other on child items. Initial joint analysis of the adult and child items found that the child items were much less severe, relative to adult items, in the DR data than in the U.S. scale. That is, households were

more likely to affirm child-referenced food security questions in the DR than were households in the U.S. that affirmed the same adult items. Thus, a scale based on the combined items would not, in any case, be comparable with the U.S. scale. Ongoing research in the U.S. has found that the relationship between reduced food intake of adults and children in the same household depends critically on the ages of children. The Data from the DRHFSSM also showed evidence of a moderately strong second dimension corresponding to adult versus child food security. The first factor in a principle components analysis of residuals after fitting the Rasch model to the combined adult and child items loaded positively on all adult items and negatively on all child items (analysis not shown).⁴ The eigenvalue of the first factor was 3.0. Because of this lack of item independence (which violates Rasch-model assumptions), combining the items in a single scale may be problematic, and in U.S. studies has been shown to bias comparisons of food insecurity between households with and without children, and among households with children of different ages.

Adult Food Security Scale

Ten adult items were fit to the single parameter of the Rasch model and the overall models fit as well as the fit of each item to the statistical model were assessed (table 3). Overall model fit was quite good. Average item discrimination was somewhat higher than in the U.S. CPS, as measured by the standard deviations of equivalent items in the two surveys. Average item discrimination is a measure of how consistently item responses are ordered. In general, we expect that if a household affirms an item they will affirm all less severe items, and if they deny an item, they will deny all more severe items. This is expected to be only probabilistically true. Average item discrimination is a measure of the extent to which it is true. Statistically, higher average item discrimination means a better model fit, in the sense that knowing raw score allows more accurate prediction of which items were affirmed. Practically, high average item discrimination indicates that questions were generally consistently understood and that responses

⁴ Factor analysis of standardized residuals is a common method for assessing item-response data for second and higher dimensions. The residual for each item by each respondent is calculated as the difference between the response (0 or 1) and the probability of an affirmative response. The residuals are then dividing by the expected standard deviation of residuals given the probability of an affirmative response to produce a standardized residual. The correlation matrix based on correlations among standardized residuals across respondents is then submitted to principle components analysis. Under the Rasch-model assumption of conditional independence, the correlations among the standardized residuals are all zero. The first factor in this analysis corresponds to a second dimension in the raw data, since the first dimension has been extracted by the fitted Rasch model.

were thoughtful and were carefully coded by interviewers. It also indicates that the behaviors and conditions the questions ask about actually are fairly consistently ordered in the experience of the sampled population.

Table 3. Estimated item severity parameters and fit statistics, Dominican Republic Adult Food Security Scale

Item	Item severity			Dominican Republic Item-fit statistics	
	U.S. CPS	Adjusted to U.S. CPS metric ¹	Logistic metric with mean of all item param. = 10	Infit	Outfit
Q2. Worried food would run out	1.49	2.39	6.69	1.40	0.60
Q3. Food bought was not sufficient	2.79	2.90	7.30	0.91	0.30
Q4. Could not afford quality/variety of food wanted ²	3.67	0.39	4.32	1.08	0.65
Q8. Adult cut size of meal or skipped meal	5.37	4.12	8.75	0.92	0.72
Q8a. Adult cut size of meal or skipped meal, 3+ days	6.42	5.98	10.95	1.26	2.87
Q9. Adults ate less than they felt they should ²	5.53	3.21	7.66	0.66	0.22
Q10. Adults felt hungry but did not eat ²	7.54	4.48	9.16	0.99	0.63
Q11. Adult lost weight	8.61	8.52	13.96	1.28	0.96
Q12. Adult did not eat for whole day	9.12	9.78	15.45	0.59	0.39
Q12a. Adult did not eat for whole day, 3+ days	9.93	10.05	15.77	0.62	0.45
Equivalent items in DR and U.S. scales					
Mean	6.250	6.250	11.265		
Standard deviation	2.996	2.996	3.549		
Discrimination	1.000	1.185	1.000		
All items					
Mean			10.000		
Standard deviation			3.713		

Notes:

¹ Metric was adjusted to that of U.S. CPS in order to compare relative item severities and average item discrimination. Adjustment consisted of a linear transformation of the DR item parameters calculated to equate the mean and standard deviation of the equivalent items in the two scales.

² These items were excluded from metric adjustment set because they were not considered equivalent in meaning to corresponding items in the U.S. scale

Source: Calculated by ERS based on data from the Dominican Republic Food Security Pilot Survey.

Item-infit statistics were quite good (near unity) for most items, indicating that they measure a common phenomenon and do so with approximately equal sensitivity. The Rasch model assumes that all items discriminate equally. Under this assumption, all infit and outfit statistics would be

1.00.⁵ However, a range of 0.8 to 1.2 is generally considered to be quite good. The infit was somewhat high for Q2 (worried food would run out) and to a lesser extent Q11 (adult lost weight) and Q8a (adult cut size of meal or skipped meal, 3+ days). Outfit was also high for Q8a, which may suggest that this item is less consistently related to food insecurity than the other items and could distort the scale. We do not recommend dropping any of these items at this stage, since this preliminary assessment is based on a rather small sample. It may be worthwhile to investigate dichotomizing Q8a at a different number of days (perhaps 4+ days rather than 3+). Prior to further use of the DRHFSSM, further cognitive testing of Q2 and Q11 should be conducted to improve consistency of understanding.⁶

It is worth noting that both infit and outfit were quite low for Q9 (Adult ate less than they felt they should). This indicates unusually high discrimination and suggests that the content of this item is, to a great extent, the character of the phenomenon measured by the item set. It is not problematic to include such an “overfitting” item in the scale, but the information it could contribute is somewhat undervalued by the unweighted raw score.

Dimensionality of the adult-referenced items was assessed using the standard procedure of principal components factor analysis of the item-household residuals from the Rasch model, normalized by expected variance. The two “how often did this occur” follow-up questions were omitted for this analysis, since their statistical dependence on their base items distorts the factor analysis. There was no evidence of any strong second factor. This analysis verifies the Rasch model assumption of conditional independence of items—that is, that item responses are uncorrelated except for their common association with food insecurity.

The severity parameters of the items in the DR adult food security scale were compared with those of corresponding items in the U.S. scale (figure 3). The comparison was intended primarily to assess the comparability of measured severity levels and prevalence statistics between the two

⁵ This assumption, along with others, is required to assure that raw score is an ordinal measure of the severity of food insecurity and that each raw score maps to a unique household scale score irregardless of which specific items are affirmed to achieve the raw score. See appendix B for a description of these item-fit statistics.

⁶ Q11, regarding losing weight, has proven problematic in several vulnerable populations in Latin America and was omitted from the final set of questions recommended in the Escala Latinoamericana y Caribeña de Seguridad Alimentaria.

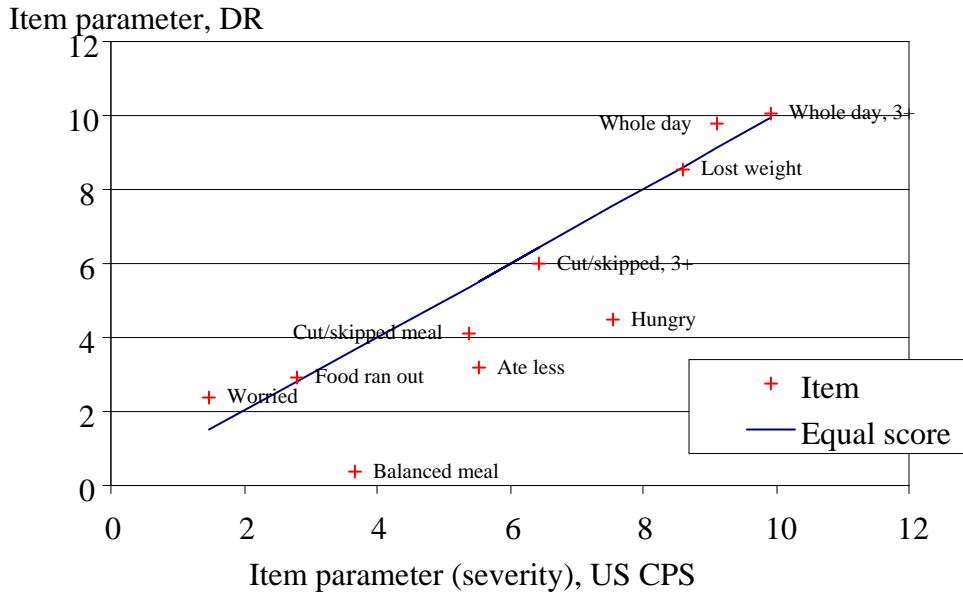
countries. The reliability of the Dominican scale does not depend on the items having similar relative item severities to their counterparts in the U.S. scale. To make this comparison, the metric of the Dominican scale was adjusted to that of the U.S. scale by applying a linear transformation to the estimated item parameters so as to equate the mean and standard deviation of items considered equivalent between the two scales.⁷ Initially, Q4 (could not afford quality/variety of food wanted) was omitted from the set of items considered equivalent for this purpose since the content of the item differed considerably from that of the corresponding item in the U.S. scale (“We couldn’t afford to eat balanced meals.”) In fact, the Dominican item was much less severe than the U.S. balanced meals item. That is, the Dominican item is much more likely to be affirmed than the U.S. item by households with the same responses to other items. Two other items, Q9 (adults ate less than they felt they should) and Q10 (adult felt hungry but did not eat) also appear to be less severe in the Dominican scale than in the U.S. scale. This could be because the translated questions refer to somewhat different objective conditions, or because the objective conditions tend to be ordered differently in the two countries. For purposes of the present comparison, these two items also were omitted from the set of items considered equivalent. The relative severities of the remaining items were quite similar between the two scales. The lower severity of several items in the DR scale will bias estimated prevalence rates of food insecurity and food insecurity with hunger upward somewhat relative to the prevalence of these conditions in the U.S. The extent of the biases will be explored after examining the household measures based on the scale.

An additional question, Q12B (Which of these best describes the number of meals each day you and your family have eaten during the last 4 weeks, once a day, twice a day, three times a day?), was tested in the pilot survey as a candidate for the DR food security scale. After assessment, however, it was decided not to include it in the scale at this time. The estimated parameter of the lower-severity coding of the item (eating less than 3 times a day) placed it in a range of severity that is well covered by other items. The more severe coding (eating only once a day) had a

⁷ Rasch scales are interval, but not ratio measures, so the zero point is arbitrary, and the additive constant in the linear transformation simply adjusts the zero point of the scale. The multiplicative constant in the linear transformation does, however, contain meaningful information, as it registers differences in the average item discrimination in the two models. The linear transformation to equate mean and standard deviation of items that are considered to be equivalent in two scales allows comparison of relative item severity and average item discrimination separately.

somewhat weak item-infit statistic (infit 1.27) and would not strengthen the scale appreciably. The item may be considered promising enough to test it in a further survey, however.

Figure 3. Comparison of item parameters (severities) on adult food security scale, DR food security pilot survey versus US CPS-FSS



Household scale scores (levels of severity of food insecurity) corresponding to each raw score on the adult food security scale are presented in table 4. These are based on item parameters on the logistic metric (i.e., with discrimination parameter equal to 1) and mean 10 from table 3. Table 4 also specifies food security status categories for each raw score that are roughly comparable with categories specified on the U.S. household food security scale. These categories should be considered only illustrative, however. Ranges of food insecurity and language to describe them for use in the Dominican Republic should be established by experts in the country taking into account official definitions, popular and professional understanding of terms, and policy purposes for the measure and statistics based upon it.

Table 4. Food security scale scores (levels of severity of food insecurity) on the Dominican Republic Adult Food Security Scale, and distribution of households in the survey sample by severity of food insecurity

Raw score (number of food- insecure conditions reported)	Household scale score		Percentage of households		Food security status (For illustrative purposes only, roughly equivalent to U.S. categories) ²
	Score	Meas. error	In raw- score group	Cumula tive	
0 ¹	NA	NA	5.45	5.45	Fully food secure ³
1	4.97	1.37	2.73	8.18	Marginally food secure ³
2	6.42	1.07	4.55	12.73	Marginally food secure ³
3	7.43	0.96	4.55	17.27	Food insecure without hunger
4	8.34	0.96	5.45	22.73	Food insecure without hunger
5	9.31	1.03	10.91	33.64	Food insecure without hunger
6	10.56	1.22	5.45	39.09	Food insecure with hunger-moderate
7	12.44	1.49	27.27	66.36	Food insecure with hunger-moderate
8	14.35	1.26	14.55	80.91	Food insecure with hunger-moderate
9	15.89	1.28	8.18	89.09	Food insecure with hunger-severe
10 ¹	16.87	1.59	10.91	100.00	Food insecure with hunger-severe

Notes:

¹ Household scale scores cannot be calculated precisely for households that affirm no items or for households that affirm all valid items. When using scale scores in linear models, appropriate account must be taken of the uncertainty with respect to household scale scores of households that affirmed no items. The scale scores presented here for households affirming all 10 items is an approximation based on a hypothetical case of affirming 9.5 items. For most purposes, households with this score could be used in linear models without introducing serious distortions because the proportion of households with this score is small.

² The food security categories specified here are for illustrative purposes only. They are roughly comparable with categories specified on the U.S. household food security scale. Ranges of food insecurity and language to describe them for use in the Dominican Republic should be established by experts in the country taking into account official definitions, popular and professional understanding of terms, and policy purposes for the measure and statistics based upon it.

³ The fully food secure and marginally food secure categories are not disaggregated in the official U.S. Government reports, but they have been distinguished for some analytic research applications.

Source: Calculated by the authors based on data from the Dominican Republic Food Security Pilot Survey.

The measured range of the DR Adult Food Security Scale extends from 4.97 to 15.89, a total of 10.92 logistic units. (Technically, the scale score for raw score 10 cannot be computed without additional assumptions about the distribution of food insecurity in the population. The value presented in the table is an approximation.) Measurement error across most of the measured range is about 1.0 to 1.5 units. Thus, at least three categories can be identified with reasonable reliability.

Based on the illustrative categories specified in table 4, 12.7 percent of households in this economically vulnerable sample were food secure (although this included 7.3 percent that were

only marginally secure). 87.3 Percent were food insecure, including 20.9 percent food insecure without hunger and 66.4 percent food insecure with hunger. The latter category can be further disaggregated as 47.3 percent food insecure with hunger (moderate) and 9.1 percent food insecure with hunger (severe).

If the assumptions of item equivalency in table 3 and figure 3 are correct, the prevalence of both food insecurity and food insecurity with hunger will be overestimated somewhat in the DR compared with the U.S. The extent of the overestimate of food insecurity would be some substantial proportion of the households with raw score 3—about 4.5 percent of households. Similarly the extent of the overestimate of food insecurity with hunger may be a substantial proportion of the percentage of households with raw score 6—about 5.4 percent of households.

*Children's Food Security Scale*⁸

In general, the child-referenced items fit the measurement model assumptions reasonably well (table 5). However, only 42 of the 93 households with children could be used for the scaling analysis after excluding “extreme” response patterns—those those in which the household affirmed no child items (10.75 percent) or affirmed all valid child items (9.68 percent).

Therefore, item parameters are not estimated very precisely and item-fit statistics may be elevated substantially by just a single uncharacteristic response. Average item discrimination was substantially higher than in the U.S. CPS, suggesting that questions were understood consistently and answered thoughtfully and that responses were carefully recorded. Outfit was high for Q7 (children were not eating enough), and infit was also slightly high for this item. Further cognitive testing of this item is recommended.

Estimated item parameters were quite similar to those of corresponding items in the U.S. scale with two exceptions. Q6 (could not give children good quality meals) was not expected to be exactly equivalent to the corresponding U.S. question (couldn't feed children a balanced meal) and was, in fact, somewhat less severe. The most striking difference was the very high severity

⁸ In the DR survey, persons age 0 to 14 years were considered children. In U.S. food security analyses, those ages 15-17 years are also considered children.

of Q16 (children did not eat for a whole day).⁹ As discussed above, inadvertent change of reference (“the children” rather than “any of the children”) in translation may be partly responsible for this, but the item is so much more severe than its U.S. counterpart that the change of reference is unlikely to be the only factor. It would be premature to drop the item based on only this preliminary survey. If further research confirms this high severity relative to other items, consideration should be given to dropping it from the scale. It added no food security classification information in this survey, although it did identify households with unusually severe levels of food insecurity with hunger among children.

Household scale scores (levels of severity of food insecurity) on the children’s food security scale are presented in table 6. As in the case of the adult scale, the categorical specifications and labels should be considered illustrative only. Based on these illustrative categories, children were food secure in 10.75 percent of households with children. Children were food insecure in 89.25 percent, including 62.37 percent food insecure with hunger among children. Of particular note, 43 percent had raw scores of 7 or 8 on the children’s scale, indicating quite a severe level of food insecurity among children.

⁹ All households that affirmed Q16 also affirmed all other child-referenced items. This makes it impossible to include the item in the scaling analysis along with just the other 7 child-referenced items. To approximate the parameter of Q16, we scaled the 8 child items jointly with the 10 adult and household items. The relative scores of other child items differed little between the two scaling scenarios (i.e., scaled jointly with the adult items compared with scaled with only the 7 non-extreme child items), so the true severity level of Q16 is not likely to differ greatly from that shown in table 4.

Table 5. Item severity parameters and fit statistics, Dominican Republic Children’s Food Security Scale

Item	Item severity			Dominican Republic Item-fit statistics	
	U.S. CPS	Adjusted to U.S. CPS metric ¹	Logistic metric with mean of all item param. = 10	Infit	Outfit
Q5. Children had to eat few kinds of low-cost foods	3.27	3.78	5.44	0.94	0.18
Q6. Could not give children good quality meals ²	5.04	3.78	5.44	1.19	1.45
Q7. Children were not eating enough	6.66	6.38	8.65	1.21	2.67
Q13. Cut size of child’s meal	8.79	8.32	11.04	0.70	0.48
Q14. Skipped child’s meal	9.94	9.25	12.20	0.60	0.35
la. Skipped child’s meal, 3+ days	10.63	11.70	15.22	1.24	0.92
Q15. Child hungry, could not give more food	9.24	9.09	12.00	1.13	0.96
Q16. Children did not eat for whole day ^{2,3}	11.94	18.06	23.12	1.13	0.53
Equivalent items in DR and U.S. scales					
Mean	8.087	8.087	10.760		
Standard deviation	2.482	2.482	3.064		
Discrimination	1.000	1.235	1.000		
All items					
Mean			10.000		
Standard deviation			3.393		

Notes:

¹ Metric was adjusted to that of U.S. CPS in order to compare relative item severities and average item discrimination. Adjustment consisted of a linear transformation of the DR item parameters calculated to equate the mean and standard deviation of the equivalent items in the two scales.

² These items were excluded from metric adjustment set because they were not considered equivalent in meaning to corresponding items in the U.S. scale.

³ All households that affirmed Q16 also affirmed all other child items. Its response pattern is, therefore, “extreme,” and the item could not be scaled with the only the other child items. Its item severity parameter and fit statistics were estimated based on scaling the child items jointly with the adult-household items and should be considered only an approximation. The true item-fit statistics for Q16 are also probably larger than the tabled values, since average item discrimination of the combined adult and child items was lower than that of the child items scaled separately.

Source: Calculated by ERS based on data from the Dominican Republic Food Security Pilot Survey.

The food security of adults and children in the same household are strongly related (table 7). Of households classified as food insecure with hunger among children, 93 percent also registered hunger among adults. Children appear to be affected quite strongly by household-level food access problems in this sample. Among households that were food insecure with hunger among adults, 84 percent also registered hunger among children. Considering conditions among both adults and children, 87 households out of the 93 with children (93.5 percent) were food insecure,

and in 68 (73.1 percent), either adults or children or both were hungry at times because the household could not afford enough food.

Table 6. Food security scale scores (levels of severity of food insecurity) on the Dominican Republic Children’s Food Security Scale, and distribution of households in the survey sample by severity of food insecurity

Raw score (number of food-insecure conditions reported)	Household scale score		Percentage of households (n=93)		Food security status (For illustrative purposes only, roughly equivalent to U.S. categories) ²
	Score	Meas. error	In raw-score group	Cumulative	
0 ¹	NA	NA	10.75	10.75	Children food secure ³
1	5.36	1.36	0.00	10.75	
2	7.36	1.52	6.45	17.20	Children food insecure without hunger ³
3	9.53	1.38	12.90	30.11	
4	11.12	1.16	7.53	37.63	
5	12.43	1.18	8.60	46.24	Food insecure with hunger among children
6	14.20	1.52	10.75	56.99	
7	19.22	5.06	33.33	90.32	
8 ¹	23.12	2.00	9.68	100.00	

Notes:

¹ Household scale scores cannot be calculated precisely for households that affirm no items or for households that affirm all valid items. When using scale scores in linear models, appropriate account must be taken of the uncertainty with respect to household scale scores of these households. The scale scores presented here for households affirming all 8 items is an approximation based on a hypothetical case of affirming 7.5 items. For most purposes, households with this score could be used in linear models without introducing serious distortions because the proportion of households with this score is small.

² The food security categories specified here are for illustrative purposes only. They are roughly comparable with categories specified on the U.S. household food security scale. Ranges of food insecurity and language to describe them for use in the Dominican Republic should be established by experts in the country taking into account official definitions, popular and professional understanding of terms, and policy purposes for the measure and statistics based upon it.

³ The food secure and food insecure without hunger categories for children are not disaggregated in the official U.S. Government reports, but they have been distinguished for analytic purposes in some research applications.

Source: Calculated by ERS based on data from the Dominican Republic Food Security Pilot Survey.

Table 7. Crosstabulation of food security status¹ of adults and children in households with children in the Dominican Republic Food Security Pilot Survey

Number of households Percent of all households with child Percent of row total Percent of column total		Children's food security status			Total
		Children food secure ²	Food insecure, no hunger among children ²	Food insecure with hunger among children	
Adults' food security status	Adults food secure	6	6	0	12
		6.45	6.45	0.00	12.90
		50.00	50.00	0.00	
		60.00	24.00	0.00	
	Food insecure, no hunger among adults	3	10	4	17
		3.23	10.75	4.30	18.28
		17.65	58.82	23.53	
		30.00	40.00	6.90	
	Food insecure with hunger among adults	1	9	54	64
		1.08	9.68	58.06	68.82
		1.56	14.06	84.38	
		10.00	36.00	93.10	
Total	10	25	58	93	
	10.75	26.88	62.37	100.00	

Notes:

¹ These food security categories are for illustrative purposes only. They are roughly comparable with categories specified on the U.S. household food security scale. Ranges of food insecurity and language to describe them for use in the Dominican Republic should be established by experts in the country taking into account official definitions, popular and professional understanding of terms, and policy purposes for the measure and statistics based upon it.

² The food secure food insecure without hunger categories are not disaggregated in the official U.S. Government reports, but they have been distinguished for analytic purposes in some research applications.

Source: Calculated by ERS based on data from the Dominican Republic Food Security Pilot Survey.

Cross tabulation of the DR Children's Food Security Scale by the 18-item combined scale (not shown) confirmed that the "food insecure with hunger (severe)" category on the latter does not provide a reliable proxy for food insecurity with hunger among children. About 19 percent of households that were classified as food insecure with hunger among children based on the Children's Food Security Scale would be classified as food insecure with hunger (moderate) based on the 18-item scale using U.S. classification specifications. Thus, if a combined adult-child scale is to be used in the Dominican Republic, it will not be appropriate to use the U.S. specifications of the "food insecure with hunger (severe)" category as a proxy for food insecurity with hunger among children.¹⁰ Rather, a single threshold will need to be specified that identifies "food insecurity with hunger among adults or children," since the level of severity of food

¹⁰ This category is no longer used in the U.S. Rather the Children's Food Security Scale is used to identify food insecurity with hunger among children—described since 2006 as "very low food security among children (Nord and Bickel, 2002).

insecurity in the household at which indications of hunger are observed appears to be about the same for children as for adults.

6. Construct Validation

The construct validity of a food security measure is assessed by examining its association with conditions that are known (or expected) to be either causes or consequences of food insecurity or measures of closely related conditions.¹¹ For most of the construct validation we used the 18-item (combined adult-child) scale because the analyses were conducted prior to the internal validation analyses. The scales are strongly correlated, so the construct validation analyses are not substantially affected by this decision.

Larger households generally need more resources to meet household needs and are expected to be more food insecure. In the pilot sample, larger households were more likely to be food insecure with severe hunger. However, the prevalence of food insecurity overall and food insecurity with hunger did not differ greatly between large and small households. Households with more highly educated adults were more likely to be food secure and considerably less likely to be food insecure with hunger, especially with severe hunger (table 8).

Table 8: Food Security Status by Household (HH) Attributes

Food Security Status	Full Sample	HH Members*		Education			Degree of Food Sufficiency	
		1-4	5-10	Illiterate	Primary	Secondary	Food Sufficient	Food Insufficient
Secure	7.3	7.0	7.5	0.0	12.1	12.5	36.4	0
Insecure	92.7	93.0	92.5	100.0	88.0	87.5	63.6	100
without hunger	19.1	19.3	18.9	16.3	19.0	37.5	59.1	9.1
with moderate hunger	30.0	35.1	24.5	27.9	32.8	12.5	4.5	36.4
with severe hunger	43.6	38.6	49.1	55.8	36.2	37.5	0	54.5
Sample Size**	110	57	53	43	58	8	22	88

Notes:

* The cutoff for household size is based on the mean size, which is about 5 members.

** Figures are in percentages except sample size. The sum of observations for the “Education” column is 109 due to one missing observation.

¹¹ Another common form of validation, “criterion validity” compares the measure with a known “gold standard.” Criterion validation is not generally feasible for food security measures, since food security is a latent trait and not, in a practical sense, directly observable.

A single-question assessment of food insufficiency was administered just prior to the food security scale questions. Respondents were categorized as food insufficient if they reported that they “sometimes” or “often” did not have enough to eat. Eighty percent of survey respondents were food insufficient, and this condition was strongly associated with the more severe range of food insecurity. The prevalence of food insecurity with hunger was 91% among food-insufficient households compared with 4.5% among those that were food sufficient.

Children’s food security was not associated, or was only very weakly associated, with household size (table 9). Children’s food security was, however, associated with education of adults in the household similarly to food security as measured by the 18-item scale.

Table 9: Children’s Food Security Status by Household (HH) Attributes

Children’s Food Security Status	Sample of HHs with Children	HH Members		Education		
		1-4	5 -10	Illiterate	Primary	Secondary
Secure	10.8	10.0	11.3	5.7	11.8	28.6
Insecure	89.2	90.0	88.7	94.3	88.2	71.4
Insecure without hunger	26.9	25.0	28.3	14.3	35.3	28.6
Insecure with hunger	62.4	65.0	60.4	80.0	52.9	42.9
Sample Size	93	40	53	35	51	7

We expected that households living farther from markets (and generally in more remote locations) would be more food insecure. In the pilot survey, distance to the market where households bought food was self-defined as very near, near, far, or very far. Households living far or very far from markets were more likely to be food insecure, food insecure with hunger (including both moderate and severe), and food insecure with severe hunger than were households living near or very near markets (table 15).

Households with employed members were more likely to be food secure and less likely to be food insecure with severe hunger than households with no employed adults. Among families with employed adults, those engaged in the service sector and in other nonagricultural activities

appear to be more food secure than those engaged in agricultural, although the sample sizes are too small to draw definitive conclusions.

Table 15: Food Security by Employment Status and Other Dimensions

Category and Outcome	Full Sample	Distance To Buy(18)		Employment Status		Type of Work			Women's Contribution		Self assessed current level of livelihood	
		Near	Far	Empd	Not Employed	Agr.	Nonag.	Serv.	Yes	No	Good or very good	Not very good or not good at all
Secure	8	11.4	0.0	14.0	3.0	0.0	16.7	21.4	14.8	4.8	15.8	2.8
Insec., w/o hunger	21	18.6	21.6	14.0	22.4	8.3	11.1	21.4	14.8	20.5	21.1	18.1
Moderate hunger	33	32.9	27.0	37.2	25.4	41.7	38.9	28.6	37.0	27.7	26.3	31.9
Severe hunger	48	37.1	51.4	34.9	49.3	50.0	33.3	28.6	33.3	47.0	36.8	47.2
Sample Size*	110	70	37	43	67	12	18	14	27	83	38	72

Notes:

All figures except sample size are percentages. The aggregate sample size for “Distance To Buy” is 107 because of 3 missing responses. Four alternative responses about distance to where purchases are made were collapsed into “Near” (including “near” and “very near”), and “Far” (including “far” and “very far”).

The probability of being food secure was substantially higher among households in which women contributed to family income than among families where women were not reported to have generated income.¹² Households in which women contributed to family income also experienced severe hunger at a lower rate.

Respondents were asked a general question about satisfaction with their current level of livelihood. Those who felt good or very good about their current level of livelihood were more likely to be food secure and less likely to be food insecure with severe hunger than those who felt their current level of livelihood was not very good or not good at all.

7. SUMMARY AND CONCLUSIONS

The adapted DRHFSSM appears to perform well as a measure of household food insecurity. Qualitative evidence from focus groups confirmed the relevance of the behaviors and conditions

¹² Although most households were headed by women, many depended entirely on earnings sent by male members who worked (and lived most of the time) in other parts of the country.

elicited by the module as indicators of food access difficulties. The pilot survey of an economically vulnerable sample of 110 households in the Las Tablas community confirmed the practicality of administration. Internal validity of the set of items derived from the response data was acceptable, although two of the questions should be explored further in focus groups or cognitive interviewing to improve them prior to widespread use.

Comparison of the severity of items in the DRHFSSM with equivalent items in the USHFSSM indicates that the two modules measure essentially the same phenomenon in their respective countries. The levels of severity of food insecurity indicated by raw scores are approximately equivalent for the two modules.

Based on the evidence from food security measurement in the U.S. and the evidence of separate adult and child dimensions in the pilot survey response data, separate scales to measure adult and child food insecurity are recommended for future use. The relationship between the food insecurity of adults and children in the same household is likely to be contingent on the ages of children. The adult scale provides a measure that is fully comparable between households with and without children and across households with children of different ages. For some purposes, the adult scale alone may serve for many monitoring and research purposes, making it unnecessary to collect the child items, which may be more sensitive.

Further construct validation is recommended when data from a larger, more widely representative survey is available. Of particular value would be separate construct validation of the adult and child scales against measures of food intake and nutritional status.

The descriptive results of the pilot survey indicated a very high prevalence of food insecurity in the Las Tablas community. Seventy-six percent of the respondent households had food insecurity with hunger among adults (during the 30 days prior to the survey) and 72 percent had food insecurity with hunger among children. Although these results are from a small sample in an area known to be economically vulnerable, the high prevalence of food insecurity suggests the relevance and importance of measuring food security in the Dominican Republic.

References

- Anderson, S.A., ed. 1990. "Core Indicators of Nutritional State for Difficult-to-Sample Populations," a report of the Life Sciences Research Office of the Federation of American Societies for Experimental Biology, *Journal of Nutrition*, 120, No.11S.
- Baker, Frank B. 1992. *Item Response Theory: Parameter Estimation Techniques*. New York: Marcel Dekker, Inc.
- Bond, Trevor G., and Christine M. Fox. 2001. *Applying the Rasch Model: Fundamental Measurement in the Human Sciences*. Mahway, New Jersey: Lawrence Erlbaum Associates, Publishers.
- Bickel, Gary, Mark Nord, Cristofer Price, William L. Hamilton, and John T. Cook. 2000. *Guide to Measuring Household Food Security, Revised 2000*. Alexandria, VA: Office of Analysis, Nutrition, and Evaluation, Food and Nutrition Service, U.S. Department of Agriculture.
- Carlson, Steven J., Margaret S. Andrews, and Gary W. Bickel. 1999. "Measuring Food Insecurity and Hunger in the United States: Development of a National Benchmark Measure and Prevalence Estimates," *Journal of Nutrition* 129:510-516.
- Coates, Jennifer, Parke E. Wild, Patrick Webb, Beatrice L. Rogers and Robert F. Houser. 2006a. "Comparison of Qualitative and Quantitative Approach to Developing a Household Food Insecurity Scale for Bangladesh," *Journal of Nutrition* 136: 1420S-1430S (Supplement).
- Coates, Jennifer, Edward A. Frongillo, Beatrice L. Rogers, Patrick Webb, Parke E. Wild, and Robert F. Houser. 2006b. "Commonalities in the Experience of Household Food Security Across Cultures: What are Measures Missing?" *Journal of Nutrition* 136: 1438S-1448S (Supplement).
- Cohen, Barbara, Mark Nord, Robert Lerner, James Parry, and Kenneth Yang. 2002. *Household Food Security in the United States, 1998 and 1999: Technical Report*. E-FAN-02-010, prepared by I Q Solutions and USDA, Economic Research Service. Available: www.ers.usda.gov/publications/efan02010/
- DePalma, A. 2001, *Latin America's Poor Survive It All Even Boon Times*, New York Times, March 24.
- Derrickson, Joda P., Anne G. Fisher, and Jennifer E.L. Anderson. 2000. "The Core Food Security Module Scale Measure Is Valid and Reliable When Used with Asians and Pacific Islanders," *Journal of Nutrition* 130: 2666-2674.
- Fischer, Gerhard H., and Ivo W. Molenaar, eds. 1995. *Rasch Models: Foundations, Recent Developments, and Applications*. New York: Springer-Verlag.

- Frongillo, Edward A., and Simeon Nanama. 2006. "Development and Validation of an Experience –Based Measure of Household Food Insecurity within and across Seasons in Northern Burkina Faso," *Journal of Nutrition* 136: 1409-1419S (Supplement).
- Girvan, N. 2001, *Societies at Risk? The Caribbean and the Global Change*, Discussion Paper Series -No.17, UNESCO, NY, NY.
- Hambleton, Ronald K., H. Swaminathan, and H. Jane Rogers. 1991. *Fundamentals of Item Response Theory*. Newbury Park, CA: Sage Publications, Inc.
- Hamilton, William L., John T. Cook, William W. Thompson, Lawrence F. Buron, Edward A. Frongillo, Jr., Christine M. Olson, and Cheryl A. Wehler. 1997a. *Household Food Security in the United States in 1995: Summary Report of the Food Security Measurement Project*. Washington DC: Office of Analysis, Nutrition, and Evaluation, Food and Nutrition Service, United States Department of Agriculture.
- Hamilton, William L., John T. Cook, William W. Thompson, Lawrence F. Buron, Edward A. Frongillo, Jr., Christine M. Olson, and Cheryl A. Wehler. 1997b. *Household Food Security in the United States in 1995: Technical Report*. Washington DC: Office of Analysis, Nutrition, and Evaluation, Food and Nutrition Service, United States Department of Agriculture. Available: www.fns.usda.gov/oane/menu/published/foodsecurity/tech_rpt.pdf
- Harrison, Gail G., Ame Stormer, Dena R. Herman and Donna M. Winham. 2003. "Development of a Spanish-Language Version of the U.S. Household Food Security Survey Module," *Journal of Nutrition* 133:1192-1197.
- Health Canada. 2007. *Canadian Community Health Survey Cycle 2.2 Nutrition (2004): Income-Related Household Food Security in Canada*. Office of Nutrition Policy and Promotion, Health Products and Food Branch, Health Canada.
- Himmelgreen, David A., Rafael Perez-Escamilla, Sofia Segura-Millan, Yu-Kuei Peng; et al. 2000. "Food Insecurity Among Low-Income Hispanics in Hartford, Connecticut: Implications for public health policy," *Human Organization*.
- Kasper, Jennifer, Sundeep K. Gupta, Phuong Tran, John T. Cook, Alan F. Meyers. 2000. "Hunger in Legal Immigrants in California, Texas, and Illinois," *American Journal of Public Health*.
- Linacre, J.M., and B.D. Wright. 1994. "Reasonable Mean-Square Fit Values." *Rasch Measurement Transactions* 8(3):370. Available: <http://www.rasch.org/rmt/rmt83.htm>
- Melgar-Quiñonez, Hugo, Mark Nord, Rafael Perez-Escamilla, and A.M. Segall-Correa. 2007. "Psychometric properties of a modified US-household food security survey module in Campinas, Brazil," *European Journal of Clinical Nutrition*. Advance online publication 18 April 2007: doi:10.1038/sj.ejcn.1602760.

- Melgar-Quiñonez, Hugo, Ana C. Zubieta, Barbara MKNelly, Anastase Nteziyaremye, Maria Filipinas D. Gerardo, and Christopher Dunford. 2006. "Household Food Insecurity and Food Expenditure in Bolivia, Burkina Faso, and the Philippines," *Journal of Nutrition* 136: 1431S-1437S (Supplement).
- Nord, Mark. 2002. *A 30-Day Food Security Scale for Current Population Survey Food Security Supplement Data*. E-FAN No. 02015. USDA, Economic Research Service. Available: <http://www.ers.usda.gov/publications/efan02015>
- Nord, Mark. 2003. "Measuring the Food Security of Elderly Persons," *Family Economics and Nutrition Review* 15(1): 33-46. Available: <http://www.usda.gov/cnpp/FENR/FENRv15n1/index.html>
- Nord, Mark. 2006. "Exploring Item Fit Statistics and Measurement Reliability of Food Security Scales Using Simulated Data," paper presented at Annual Meeting of the American Agricultural Economics Association, Long Beach, CA, July 23-26, 2006.
- Nord, Mark, and Gary Bickel. 2002. *Measuring Children's Food Security in U.S. Households, 1995-99*. Food Assistance and Nutrition Research Report No. 25, USDA, Economic Research Service. Available: www.ers.usda.gov/publications/fanrr25
- Nord, Mark, Margaret Andrews, and Steven Carlson. 2007a. *Household Food Security in the United States, 2006*. Economic Research Report No. 49, USDA, Economic Research Service. Available: <http://www.ers.usda.gov/publications/err49>
- Nord, Mark, Hugo Melgar-Quiñonez, and Rafael Perez-Escamilla. 2007b. "Desarrollando Métodos Estandarizados para Medir la Inseguridad Alimentaria del Hogar en América Latina y el Caribe," in Rafael Pérez-Escamilla, Martha Cecilia Alvarez uribe, Ana Maria Segall-Correa, and Hugo Melgar-Quiñonez (eds.), *Perspectivas en Nutrición Humana, Separata, Octubre 2007: Memorias 1a Conferencia en América Latina y el Caribe sobre la medición de la seguridad alimentaria en el hogar; Junio 8, 9 y 10 de 2007, Carmen de Viboral, Antioquia, Colombia*.
- Ohls, James, Larry Radbill, and Allen Schirm. 2001. *Household Food Security in the United States, 1995 -1997: Technical Issues and Statistical Report*. Prepared by Mathematic Policy Research, Inc., for USDA, Food and Nutrition Service. Available: www.fns.usda.gov/oane/MENU/Published/FoodSecurity/FoodSecurityTech.pdf
- Olson, Christine M. 1999. "Nutrition and Health Outcomes Associated With Food Insecurity and Hunger," *The Journal of Nutrition* 129:521-524.
- Pérez-Escamilla, Rafael, Martha Cecilia Alvarez Uribe, Ana Maria Segall-Correa, and Hugo Melgar-Quiñonez (eds.). 2007. *Perspectivas en Nutrición Humana, Separata, Octubre 2007: Memorias 1a Conferencia en América Latina y el Caribe sobre la medición de la*

seguridad alimentaria en el hogar; Junio 8, 9 y 10 de 2007, Carmen de Viboral, Antioquia, Colombia.

Polit, Denis F., Andrew S. London, and John M. Martinez. 2000. "Food Security and Hunger in Poor, Mother-Headed Families in Four U.S. Cities," *MDRC Working Paper. Manpower Development Research Corporation*, New York City, NY.

U.S. Department of Agriculture. 1995. *Food Security Measurement and Research Conference: Papers and Proceedings*. Alexandria, VA: U.S. Dept. of Agri., Food and Nutrition Service, Office of Analysis, Nutrition, and Evaluation.

Wright, B. D. 1977. *Solving Measurement Problems with the Rasch Model*. Mesa Psychometric Laboratory, the University of Chicago, College of Education, Chicago, IL. Available: www.rasch.org/memos.htm

Wright, B. D. 1983. *Fundamental Measurement in Social Science and Education*. Mesa Psychometric Laboratory, the University of Chicago, College of Education, Chicago, IL. Available: www.rasch.org/memos.htm

Appendix A: Focus Group

The first stage of adapting the U.S. Household Food Security Survey Module (USHFSSM) for use in the Dominican Republic was to conduct a focus group to collect qualitative and ethnographic information on how households in the Dominican Republic describe their food situations. The focus group results were used to modify and adapt the questions in the survey module.

A focus group was organized and carried out on December 12, 2002 in Las Tablas, Bani, the community selected for the pilot survey. Preparatory to the focus group, several meetings took place with the social leader of the community. She was provided with all the relevant information including who was to conduct the survey, its overall purpose, and the time it would take to complete. She in turn provided general information about the residents of Las Tablas and their food situations. She was very open and her assessments of general food conditions were confirmed by subsequent findings of the study. For example, she indicated that the food situation was very bad in the area, and that many people suffer from hunger because they have neither permanent jobs nor good land to produce their own food. She provided important assistance in organizing the focus group.

Ten people from the community were selected for the focus group. All were women between 24 and 38 years old, most of them were household heads. Only 4 of them could read and write; all of them were born in the area.

A total of 15 people met at the focus group: 10 women from the community, 4 enumerators (2 women and 2 men) and one of the Co-Principal Investigators. The process at the focus group started as a very open and informal conversation about their food situation. All the participants were very open, probably because they were well acquainted with the two women enumerators. All women, except one said that they always feel food insecure. They feel they do not eat enough food every day and usually eat only twice a day. They usually buy low quality food for their children because they do not have enough money to buy high quality and adequate food for them.

After the conversation, the Co-Principal Investigator and the enumerators applied the survey to each participant. At the same time the instrument was being applied notes were taken which were later used to adjust and modify the instrument. This resulted in the final survey instrument, which was implemented in the pilot survey in Las Tablas.

Appendix B: The Rasch Model in Food Security Measurement: Basic Concepts, Parameters, and Statistics

The Rasch measurement model provides a set of analytic tools to assess the suitability of a set of survey items for scale construction, to create a scale from the items, and to compare performance of the set of items in various populations and survey contexts. This appendix presents basic concepts and mathematics underlying the Rasch model and describes the model parameters and item-fit statistics commonly used to assess food security survey data. More detailed information on the Rasch model is available in Bond and Fox (2001), Fischer and Molenaar (1995), Baker (1992), Hambleton et al. (1991), and Wright (1977; 1983). Information about applications of Rasch methods to the development and assessment of food security scales is available in Hamilton et al. (1997a; 1997b), Bickel et al. (2000); Nord and Bickel (2002), Nord (2002); and Nord (2003). A Spanish-language overview of the Rasch-based statistical methods as applied to food security measurement is available in Nord et al. (2007b; see especially the appendix).

Basic Concepts: Item Severity and Household Severity

An essential characteristic of the food security scale is that the items comprising it vary across a wide range of severity of food insecurity. The precise severity level of each item (the “item severity parameter,” discussed below) is estimated empirically from the overall pattern of responses to the scale items by the interviewed households. However, the range of severity of the conditions identified by the items is also intuitively evident from inspection of the items. For example, the item, *children did not eat for a whole day*, is a more severe manifestation of food insecurity than is the item, *adults cut the size of meals or skipped meals*, and the latter indicates a more severe level of food insecurity than does the item, *worried whether food would run out before we got money to buy more*. These differences in severity are observed in the response patterns of surveyed households. The more severe items are less frequently affirmed than less severe items. Moreover, a household that affirms a specific item is likely to have also affirmed all items that are less severe. Similarly, a household that denies a specific item is likely to deny all items that are more severe. These typical response patterns are not universal, but they are predominant, and the extent of deviation tends to be small.

In essence, the Rasch model (named for the Danish Mathematician, Georg Rasch) formalizes this concept of the severity-ordering of items and provides standard statistical methods to estimate the relative severity of each item and to assess the extent to which the response patterns observed in a data set are consistent with the severity-order concept. The Rasch model was developed primarily in the educational testing field, where multiple correct/incorrect items, varying in difficulty, are used to measure an individual’s level of knowledge or skill. More generally, the model can be used to assess the location of an individual or household along a continuum—in the present case, a continuum of the severity of deprivation in the basic need for food—by combining information from multiple dichotomous (yes/no) items that vary as to the point on the continuum that each one uniquely reflects.

Mathematics of the Rasch Model

Rasch-model assessment statistics are based on the assumption that both the indicator items making up the scale and the households responding to the items can be located on the same underlying, unobserved continuum of severity of food insecurity. A further assumption is that the probability of a specific household affirming a specific item depends on the difference between the severity levels of the household and the item. The single-parameter Rasch model, which is used to create the food security scale, assumes specifically that the log of the odds of a household affirming an item is proportional to the difference between the “true” severity level of the household and the “true” severity level of the item. Thus, the odds that a household at severity-level h will affirm an item at severity-level i is:

$$(1) \quad P_{h,i}/(1-P_{h,i})=e^{(h-i)}$$

where P is the probability of affirming the item and e is the base of the natural logarithms. Solving equation (1) for $P_{h,i}$, the probability that the household will affirm the item can be expressed as:

$$(2) \quad P_{h,i} = e^{(h-i)}/(1+e^{(h-i)})$$

The severity of an item, then, can be thought of as the severity level of households that are just at the threshold of affirming or denying that item. The odds that a household will affirm an item right at the severity level of the household is 1, corresponding to a probability of 0.5. The odds that a household will affirm an item with a severity parameter one unit lower than that of the household is e^{-1} , or about 0.37, corresponding to a probability of 0.27 [i.e., $0.37/(1+0.37)$]. The probability that the household will affirm an item two units lower than its own severity measure is 0.14, and for an item three units lower, it is 0.05.

Scale Metrics and Average Item Discrimination

Since it is the difference between the household measure and item parameters that determines the probability of affirmation, it is clear that the metric can be transformed by adding a constant to both the household measure and item parameter without changing the character of the scale. That is, the size of the intervals on the scale conveys meaningful information, but the zero point is arbitrary. The U.S. Household Food Security Scale uses a metric for the 18-item scale based on a mean item of 7 for parameters of the 18 items in order to keep all item parameters and household scale scores positive (Bickel et al. 2000). This results in household scale scores that range from about 1.5 to 13.

Although the size of the interval on the Rasch scale is inherently meaningful, it can be affected by factors such as random measurement error (statistical “noise”) in the item responses that are not fundamental to the measurement construct. To meaningfully compare item severities between two surveys, it is, therefore, often convenient to multiply the item parameters of one of the scales by a constant so as to equate the dispersion of item parameters in the two scales. (Dispersion is commonly measured by the standard deviation or mean absolute deviation of the item scores.) In this case the comparison is referred to as a comparison of relative item severities. Mathematically, this adjustment is equivalent to fitting the Rasch model as in (1) above, with the addition of a discrimination parameter, k , as follows:

$$(3) \quad P_{h,i}/(1-P_{h,i})=e^{k(h-i)}$$

For a scale based on a given set of data, the discrimination parameter is inversely proportional to the standard deviation (or any other linear measure of dispersion such as mean absolute deviation) of the parameters of the items in the scale. This relationship is used to assess how well the items in a survey discriminate, compared to a standard. If test data are fitted to the Rasch model with the discrimination parameter constrained to 1, then the ratio of the standard deviation of the items in the test data to the standard deviation of the same items in a standard scale (such as that based on the 1998 CPS) compares the average discrimination of the items in the test data to their average discrimination in the standard.

Rasch Model Estimation and Household Severity Measures

Software that implements the Rasch model begins with the household-by-item matrix of responses. Maximum-likelihood methods are then used to estimate the household measures and item severity parameters most consistent with the observed responses under the Rasch assumptions.¹³ The resulting household scores are a continuous interval-level measure of the extent of food insecurity in the household. These scores are appropriate for associative analyses such as correlation and regression, with the caveat that the score for households that denied all items cannot be estimated by the Rasch model. Such households are more secure than those that affirm one item, but the extent of the difference, and thus the precise measure of the food security of households that deny all items is not known.

Assessing Individual Items: Item-Fit Statistics

The Rasch model also provides the basis for “fit” statistics that assess how well each item, each household, and the overall data conform to the assumptions of the measurement model. Two statistics commonly used to assess how well responses to items correspond to the Rasch-model assumptions (or “fit” the model) are “infit” and “outfit.” After item parameters and household scores have been estimated, the probability of an affirmative response in each cell of the household-by-item matrix is calculated. The infit and outfit statistics are then calculated by

¹³ Three different maximum likelihood approaches are commonly used to estimate Rasch parameters from item response data, joint maximum likelihood (JML), conditional maximum likelihood (CML), and marginal maximum likelihood (MML). A full discussion of these methods is beyond the scope of this paper. All analyses reported here are based on JML. Cohen et al. (2002) compare JML with MML estimates and find that relative item severities are almost identical between the two methods, although JML overestimates the dispersion of item parameters modestly. (This is a well-known characteristic of JML estimates of Rasch item parameters.) CML estimates recover item parameters without bias from simulated, perfectly Rasch-consistent data (Nord, 2006).

comparing the actual responses to the probabilistically expected responses in each cell of the matrix. Infit is an “information-weighted” fit statistic for each item, so that it is sensitive to responses by households with severity scores in the range near the severity level of the particular item.¹⁴ Outfit is sensitive to unexpected responses from households with severities much higher or lower than that of the item—that is, to highly improbable responses (outliers).¹⁵

Both statistics compare observed deviations of responses from the deviations expected under Rasch assumptions, so the expected values of the statistics are 1. Fit statistics higher than 1 indicate items that are less strongly or consistently related to the underlying condition (food insecurity) measured by the set of items. Such an item will have a disproportionate share of “out-of-order” responses (i.e., affirmative responses by households with severity scores below that of the item or denials by households with severity scores above that of the item). Values of infit and outfit below 1.0 indicate items that are more strongly and consistently related to food insecurity than the average item.

The single-parameter Rasch model, which is used in creating the food security scales, assumes that all items discriminate equally sharply, so fit-statistic values (especially infit) that are far

¹⁴ Item infit is calculated as follows:

$$\text{INFIT}_i = \text{SUM} [(X_{i,h} - P_{i,h})^2] / \text{SUM}[P_{i,h} - P_{i,h}^2]$$

where:

$X_{i,h}$ is the observed response of household h to item i (1 if response is yes, 0 if response is no);
 $P_{i,h}$ is the probability of an affirmative response by household h to item i under Rasch assumptions, given the item parameter and the estimated level of severity of food insecurity in the household.

The expected value of each item’s infit statistic is 1.0 if the data conform to Rasch model assumptions. Values above 1.0 indicate that the item discriminates less sharply than the average of all items in the scale.

¹⁵ Item outfit is calculated as the average across households of the squared error divided by the expected squared error:

$$\text{OUTFIT}_i = \text{SUM} [(X_{i,h} - P_{i,h})^2 / (P_{i,h} - P_{i,h}^2)] / N$$

where:

$X_{i,h}$ is the observed response of household h to item i (1 if response is yes, 0 if response is no);
 $P_{i,h}$ is the probability of an affirmative response by household h to item i under Rasch assumptions, given the item parameter and the estimated level of severity of food insecurity in the household;
 N is the number of households.

The expected value of each item’s outfit statistic is 1.0 if the data conform to Rasch model assumptions. Values above 1.0 indicate a higher than expected proportion of “erratic” responses—affirmative responses to a severe item by households that affirmed few other items or denials of a low-severity item by households that affirmed many other items.

from unity call into question the suitability of the item for use in the scale. As a general rule, infits in the range of 0.8 to 1.2 are considered to be good and 0.7 to 1.3 may be acceptable. Infits in the range 1.3 to 1.5 may not distort measurement to an unacceptable degree, but should be improved for general use (Linacre and Wright, 1994). Infit below 0.7 indicates an item that is strongly associated with the underlying condition measured by all of the items (food insecurity). Including such an item may be acceptable practice, but the information provided by the item is undervalued in the equal-weighted Rasch measure.

Similar standards may be applied to outfit statistics, but, in practice, outfits are very sensitive to a few highly unexpected observations. As few as two or three highly unexpected responses (i.e., denials of the least severe item by households that affirm most other items) among several thousand households can elevate the outfit for that item to 10 or 20. Furthermore, outfit statistics are seriously distorted if households that deny all less severe items are skipped over the remaining, more severe, items. Carefully interpreted, outfit statistics may help identify items that present cognitive problems or have idiosyncratic meanings for small subpopulations, but there are no standard cutoffs for assessment.

Food Security Scale: Applications and Standards

Food security data have been collected annually in the U.S. since 1995 through a nationally representative household survey sponsored by USDA and conducted by the U.S. Census Bureau (Nord et al., 2007a). The food security scale was initially developed and tested using data from the April 1995 CPS Food Security Supplement (Hamilton et al., 1997b). The food security scale has been reassessed in the succeeding years and found to be essentially stable (Ohls et al., 2001; Cohen et al., 2002). Item parameters based on the August 1998 food security survey are presented in *Guide to Measuring Household Food Security, Revised 2000* (Bickel et al., 2000) and are the basis of the standard method described in the Guide for assigning household scores, a method that does not require Rasch software. The standard scores in the Guide are also the basis for household scores in the public-use data files of the CPS food security surveys beginning in 1998. These item scores are used as a standard of comparison in the present study.

Appendix C: the Dominican Republic Food Security Questions: the Pilot Survey

ENCUESTA SOBRE LA SEGURIDAD ALIMENTARIA EN HOGARES DOMINICANOS

Lugar de entrevista _____
Fecha de la entrevista _____
Nombre del encuestador _____
Dirección del entrevistado _____

DATOS GENERALES

- a. Nombre y apellidos de la persona entrevistada-----
-----.
- b. Sexo: 1).Masculino----- 2).Femenino-----
- c. Lugar de Nacimiento _____ Edad _____.
- d. Sabe leer: 1).Si----- 2).No-----
- e. Sabe Escribir: 1)Si----2)No-----.
- f. Grado escolar: 1) analfabeto-----2) semianalfabetos-----
3) primaria _____ 4) secundaria _____ 5) universitaria _____
6) Otro, especifique _____.
- g. Número de Hijos que viven en el hogar: -----
- h. Numero de personas total que viven en la casa del entrevistado _____
- i. ¿Cuántas dormitorios tiene la casa? _____
- j. ¿Donde realizan sus necesidades fisiológicas (defecación)
1)Letrina ___ 2)inodoros ___ 3)campo abierto ___ 4) otros (especificar) _____

Pregunta general / control:

1. ¿Cuál de estas afirmaciones describe mejor la situación de la alimentación de usted y su familia durante las últimas 4 semanas? (Leer todas las afirmaciones antes de responder).

La comida ha sido:

- [7] Suficiente del tipo de alimento que quieren comer (**Salte 1a y 1b**)
[8] Suficiente pero no del tipo de alimento que quieren comer (**Salte 1a; pregunte 1b**)
[9] A veces no ha sido suficiente (**Pregunte 1a; salte 1b**)
[10] Frecuentemente no ha sido suficiente (**Pregunte 1a y 1b**)
[5] No sabe (NS) o no responde (NR) (**Salte 1a y 1b**)

- 1.a [SI LA OPCION [9] O [10] ES SELECCIONADA ARRIBA] Aquí hay algunas razones para explicar porque la comida en su hogar ha sido insuficiente Para cada una dígame si es una razón por la cual ustedes no comen suficiente. Leer todas; marcar donde aplique)

- | Sí | No | NS | |
|-------|-------|-------|--|
| [1] | [4] | [5] | No ha habido suficiente dinero para comida |
| [1] | [4] | [5] | No ha habido suficiente tiempo para comprar o cocinar |
| [1] | [4] | [5] | En dieta |
| [1] | [4] | [5] | No ha habido gas, leña o carbón, o equipo para cocinar |
| [1] | [4] | [5] | No puede cocinar o comer por razones de salud |

- 1b [SI LA OPCION [8] ES SELECCIONADA] Aquí hay algunas razones para explicar por qué la familia algunas veces no tienen la calidad o variedad de comida que desean. Para cada una dígame si es una razón por la cual ustedes no comen la clase de comida que ustedes quisieran.(Leer todas; marcar donde aplique)

- | Sí | No | NS | |
|-------|-------|-------|---|
| [1] | [4] | [5] | No ha habido suficiente dinero para esa comida |
| [1] | [4] | [5] | No ha estado disponible la clase de comida que deseamos |
| [1] | [4] | [5] | No ha habido suficiente tiempo para comprar o cocinar |

- [1] [4] [5] Mucha dificultad para llegar al lugar de expendio
(Colmado, pulpería, mercado...)
[1] [4] [5] En dieta especial

MODULO CLAVE

NIVEL 1: Preguntas 2-6

Aquí hay algunas afirmaciones que las personas hacen acerca de la situación de la comida en su familia. Para estas afirmaciones, por favor dígame si ha sido frecuentemente verdad, algunas veces verdad, nunca verdad o si no sabe (durante las últimas 4 semanas).

La primera afirmación es:

2. “En la familia hubo preocupación que se fuera acabar la comida antes de tener dinero para comprar más” (durante las últimas 4 semanas).

- [2] Frecuentemente verdad
[3] Algunas veces verdad
[4] Nunca verdad
[5] NS o NR

3. “La comida que se compró no fue suficiente, porque no se tenía dinero para comprar más” durante las últimas 4 semanas.

- [2] Frecuentemente verdad
[3] Algunas veces verdad
[4] Nunca verdad
[5] NS o NR

4. “En la familia no hubo dinero para comprar la clase de comida con la calidad y variedad que deseábamos (“una comida balanceada”) durante las últimas 4 semanas.

- [2] Frecuentemente verdad
[3] Algunas veces verdad
[4] Nunca verdad
[5] NS o NR

SI HAY NIÑOS O NIÑAS RESIDENTES EN EL HOGAR MENORES DE 18 AÑOS PREGUNTAR 5 Y 6; de lo contrario pasar a la pregunta 7.

5. “Durante las últimas 4 semanas han tenido los niños que comer algunos alimentos baratos porque ustedes no tuvieron dinero para comprar otros”.

- [2] Frecuentemente verdad
[3] Algunas veces verdad
[4] Nunca verdad
[5] NS o NR

6. “Durante las últimas 4 semanas no pudieron darles a los niños una comida de calidad (balanceada) porque no tenían dinero para comprarla”.

- [2] Frecuentemente verdad
[3] Algunas veces verdad
[4] Nunca verdad
[5] NS o NR

SI RESPONDE LAS OPCIONES [2] O [3] (“frecuentemente verdad” O “algunas veces verdad”) A CUALQUIERA DE LAS PREGUNTAS DE 2 A 6, O LAS OPCIONES [8], [9], O [10] DE LA PREGUNTA 1, ENTONCES CONTINUE EN EL NIVEL 2

NIVEL 2: preguntas 7-11

SI HAY NIÑOS(AS) RESIDENTES EN EL HOGAR MENORES DE 18 AÑOS HACER PREGUNTA 7; SI NO PASAR A LA PREGUNTA 8

7. **¿Durante las últimas 4 semanas los niños no comieron suficiente porque ustedes no pudieron comprarles la cantidad de comida necesaria?**
 [2] Frecuentemente verdad
 [3] Algunas veces verdad
 [4] Nunca verdad
 [5] NS o NR
8. **¿Durante las últimas 4 semanas usted o alguno de los adultos del hogar tuvieron que reducir la cantidad de alguna de las comidas, o eliminar alguna comida porque no había suficiente dinero para comprarla?**
 [1] Sí
 [4] No (Salte 8a)
 [5] NS o NR (Salte 8a)
- 8a (SI LA RESPUESTA ES SÍ ARRIBA) **¿Cuántos días le ocurrió esto durante las últimas 4 semanas?**
 [3, 2 o 4] _____ días (Si menor o igual a 4 días (3); Si mayor de 4 días (2), Si es igual a 0 (4)
 [5] NS o NR
9. **¿En las últimas 4 semanas, alguna vez comieron menos de lo que ustedes sentían que debían haber comido porque no había suficiente dinero para comprar comida?**
 [1] Sí
 [4] No
 [5] NS o NR
10. **¿En las últimas 4 semanas se sintieron con hambre pero no comieron porque no podían comprar suficiente comida?**
 [1] Sí
 [4] No
 [5] NS o NR
11. **¿En las últimas 4 semanas, alguno de ustedes perdió peso porque no tenían suficiente dinero para comprar comida?**
 [1] Sí
 [4] No
 [5] NS o NR

SI LA RESPUESTA ES AFIRMATIVA PARA CUALQUIERA DE LAS PREGUNTAS DEL 7 AL 11, ENTONCES CONTINUE EN EL NIVEL 3; SI NO PASE A LA PREGUNTA 17.

NIVEL 3: preguntas 12-16

12. **¿En las últimas 4 semanas, usted o alguno de los adultos de este hogar alguna vez no comieron durante todo el día porque no tenían dinero para comprar comida?**
 [1] Sí
 [4] No (Salte 12a)
 [5] NS o NR (Salte 12a)

- 12a (SI RESPONDE SÍ ARRIBA)? **¿Cuántos días le ocurrió esto durante las últimas 4 semanas?**
 [3, 2 o 4] _____ días (Si menor o igual a 4 días (3); Si mayor de 4 días (2), Si es igual a 0 (4)
 [2] NS o NR

- 12b **¿Cuál de estas afirmaciones describe mejor el # de comidas al día que usted y su familia han comido durante las últimas 4 semanas?**
 [] 1 vez al día

- 2 veces al día
- 3 veces al día

SI HAY NIÑOS(AS) EN EL HOGAR MENORES DE 18 AÑOS HACER LAS PREGUNTAS DEL 13 AL 16; De lo contrario salte a la 17.a

13. ¿En las últimas 4 semanas, alguna vez se redujo la cantidad de comida para los niños porque no había suficiente dinero para comprar comida?

- 1] Sí
- 4] No
- 5] NS o NR

14. ¿En las últimas 4 semanas, alguna vez se eliminó alguna comida durante el día para los niños porque no había suficiente dinero para comprarla?

- 1] Sí
- 4] No (Salte 14a)
- 5] NS o NR (Salte 14a)

14a (SI RESPONDE SÍ ARRIBA) ¿Cuántos días le ocurrió esto durante las últimas 4 semanas?

- 3, 2 o 4] _____ días (Si menor o igual a 4 días (3); Si mayor de 4 días (2), Si es igual a 0 (4))
- 2] NS o NR

15. ¿En las últimas 4 semanas, alguna vez los niños sintieron hambre pero no podían comprarles más comida?

- 1] Sí
- 4] No
- 5] NS o NR

16. ¿En las últimas 4 semanas, alguna vez los niños no comieron durante un día completo porque no había suficiente dinero para comprar comida?

- 1] Sí
- 4] No
- 5] NS o NR

17. a Cuáles de estos alimentos son importantes para usted y su familia (PÓNGALO EN ORDEN DE IMPORTANCIA DONDE 1 = MAS IMPORTANTE Y 9 = MENOS IMPORTANTE)

- 11] Habichuela []
- 12] Leche []
- 13] Arroz []
- 14] Plátano []
- 15] Pollo []
- 16] Huevos []
- 17] Yuca []
- 18] Batata []
- 19] Papa []
- 20] Guineo []

17b. Cuales de estos alimentos fueron importantes para usted dos o tres años atrás. (PÓNGALO EN ORDEN DE IMPORTANCIA DONDE 1 = AL MENOS IMPORTANTE).

- 11] Habichuela []
- 12] Leche []
- 13] Arroz []
- 14] Plátano []
- 15] Pollo []

- [16] Huevos []
- [17] Yuca []
- [18] Batata []
- [19] Papa []
- [20] Guineo []

17c. Que importante son los siguientes alimentos para usted? (PÓNGALO EN ORDEN DE IMPORTANCIA DONDE 1= AL MÁS IMPORTANTE)

- [20] Frutas []
- [21] Vegetales []
- [22] Carne de res []
- [23] Carne de chivo []
- [15] Carne de Pollo []
- [16] Huevos []
- [24] Pescado []
- [19] Papa []
- [17] Yuca []
- [20] Guineo []

18a ¿Cual de los siguientes enunciados describe mejor la forma de usted obtener sus alimentos?

- [29] Los produzco
- [30] Los compro
- [31] Produzco y compro a la vez
- [32] Mis familiares y vecinos me proveen

18b.¿Que distante esta usted del lugar donde compra sus alimentos?

- [25] Muy lejos
- [26] Lejos
- [27] Cerca
- [28] Muy cerca

18c. (EN CASO DE QUE VENDA, sino pase a la 19.a) ¿Que distante esta usted del lugar donde generalmente vende sus alimentos?

- [25] Muy lejos
- [26] Lejos
- [27] Cerca
- [28] Muy cerca

19. a ¿Que es lo mas importante para usted en cuanto a la comercialización de productos?

- [33] Poder vender cualquier producto que usted desee ya sean alimentos o no alimento
- [34] Comprar cualquier producto que usted desee (alimentos, o no alimento)
- [35] Ambas cosas por igual, vender y comprar.

19. b ¿Esta usted o alguno miembro de su familia empleado?

- [36] Si
- [37] No
- Si selecciona [No] pase a la 20

19. c ¿Cómo se recibe el pago?

- [38] En dinero
- [39] En comida o producción
- [40] En ambas formas: dinero y alimentos
- [41] Otra forma, favor de especificar_____

19. d ¿Qué se produce donde usted trabaja?

- [42] Productos agrícolas o pecuarios

- [43] Productos no agrícolas
- [44] Servicios
- [45] Otro, especificar_____

20. ¿Cuál de estas le provee mayores ingresos a usted y a su familia? (LÍSTELOS EN ORDEN DE IMPORTANCIA DEL 1 AL 5)

- [46] Ofreciendo algún servicio
- [47] Vendiendo lo que produce en el campo
- [48] Salario recibido en la empresa
- [49] Dinero que recibe de familiar o amigo que vive en el país
- [50] Dinero que recibe del extranjero
 - [50.1] Estados Unidos
 - [50.2] Puerto Rico
 - [50.3] Europa
 - [50.4] Otro, especificar_____
- [51] Otro, especificar_____

21. Realiza la mujer de este hogar alguna actividad que genere recursos para contribuir con la alimentación de la familia?

- [52] Sí
- [53] No

De ser si, especifique cual_____

22. ¿Qué tan satisfecho te sientes con tu nivel de vida actual? Si tomas en cuenta todas las cosas, cuál de estos enunciados definiría mejor como te sientes.

- [54] Muy bien
- [55] Bien
- [56] No muy bien
- [57] Nada bien

¿Por qué?

Appendix D: Comparison of Questions in the The Dominican Republic Food Security Pilot Survey and the UCLA/USDA Standard

Dominican Republic Pilot Food Security Survey	UCLA/USDA Standard
<p>1. ¿Cuál de estas afirmaciones describe mejor la situación de la alimentación de usted y su familia durante las últimas 4 semanas? La comida ha sido:</p> <p><input type="checkbox"/> Suficiente del tipo de alimento que quieren comer</p> <p><input type="checkbox"/> Suficiente pero no del tipo de alimento que quieren comer</p> <p><input type="checkbox"/> A veces no ha sido suficiente</p> <p><input type="checkbox"/> Frecuentemente no ha sido suficiente</p>	<p>1. ¿Cuál de las siguientes oraciones describe mejor la situación de comida en su casa en los últimos doce meses ?</p> <p><input type="checkbox"/> Siempre como (comemos) lo suficiente y los tipos de alimentos que deseo (deseamos)</p> <p><input type="checkbox"/> Como (comemos) lo suficiente pero no siempre lo que deseo (deseamos)</p> <p><input type="checkbox"/> A veces no como (comemos) lo suficiente o</p> <p><input type="checkbox"/> Frecuentemente no como (comemos) lo suficiente</p>
<p>Aquí hay algunas afirmaciones que las personas hacen acerca de la situación de la comida en su familia. Para estas afirmaciones, por favor dígame si ha sido frecuentemente verdad, algunas veces verdad o nunca verdad durante las últimas 4 semanas.</p> <p>2. La primera afirmación es: “En la familia hubo preocupación que se fuera acabar la comida antes de tener dinero para comprar más” durante las últimas 4 semanas.</p> <p><input type="checkbox"/> Frecuentemente verdad</p> <p><input type="checkbox"/> Algunas veces verdad</p> <p><input type="checkbox"/> Nunca verdad</p>	<p>Ahora le voy a leer algunas respuestas de la gente sobre su situación de comida. Para cada repuesta, favor de indicarme si ocurre en su casa frecuentemente, a veces, o nunca en los últimos 12 meses, es decir desde el ultimo (mes actual).</p> <p>2. La primera oración es "Me (nos) preocupó que la comida se podía acabar antes de tener dinero para comprar mas." Para (Usted./su casa), ¿ Esto fue frecuentemente, a veces, o nunca en los últimos 12 meses?</p> <p><input type="checkbox"/> Frecuentemente</p> <p><input type="checkbox"/> A veces</p> <p><input type="checkbox"/> Nunca</p>
<p>3. “La comida que se compró no fue suficiente, porque no se tenía dinero para comprar más” durante las últimas 4 semanas.</p> <p><input type="checkbox"/> Frecuentemente verdad</p> <p><input type="checkbox"/> Algunas veces verdad</p> <p><input type="checkbox"/> Nunca verdad</p>	<p>3. La comida que compré (compramos) no duró mucho y no había dinero para comprar más.Para (Usted./su casa), ¿ Esto fue frecuentemente, a veces, o nunca en los últimos 12 meses?</p> <p><input type="checkbox"/> Frecuentemente</p> <p><input type="checkbox"/> A veces</p> <p><input type="checkbox"/> Nunca</p>
<p>4. “En la familia no hubo dinero para comprar la clase de comida con la calidad y variedad que deseábamos (“una comida balanceada”) durante las últimas 4 semanas.</p> <p><input type="checkbox"/> Frecuentemente verdad</p> <p><input type="checkbox"/> Algunas veces verdad</p> <p><input type="checkbox"/> Nunca verdad</p>	<p>4. (Yo/Nosotros) no teníamos lo suficiente para comer una comida balanceada (nutritiva). Para (Usted./su casa), ¿ Esto fue frecuentemente, a veces, o nunca en los últimos 12 meses?</p> <p><input type="checkbox"/> Frecuentemente</p> <p><input type="checkbox"/> A veces</p> <p><input type="checkbox"/> Nunca</p>

(continued)

(Comparison of Questions in the The Dominican Republic Food Security Pilot Survey and the UCLA/USDA Standard, continued)

Dominican Republic Pilot Food Security Survey	UCLA/USDA Standard
<p>5. “Durante las últimas 4 semanas han tenido los niños que comer pocos tipos de alimentos baratos porque ustedes no tuvieron dinero para comprar otros”.</p> <p><input type="checkbox"/> Frecuentemente verdad <input type="checkbox"/> Algunas veces verdad <input type="checkbox"/> Nunca verdad</p>	<p>5. Dependía (Dependíamos) de unos pocos alimentos de bajo costo para dar comida a los niños por que se nos terminó el dinero disponible para comprar alimentos. Para (Usted./su casa), ¿ Esto fue frecuentemente, a veces, o nunca en los últimos 12 meses?</p> <p><input type="checkbox"/> Frecuentemente <input type="checkbox"/> A veces <input type="checkbox"/> Nunca</p>
<p>6. “Durante las últimas 4 semanas no pudieron darles a los niños una comida de calidad (balanceada) porque no tenían dinero para comprarla”.</p> <p><input type="checkbox"/> Frecuentemente verdad <input type="checkbox"/> Algunas veces verdad <input type="checkbox"/> Nunca verdad</p>	<p>6. No tenía (teníamos) suficiente dinero para ofrecer una comida balanceada (nutritiva) a los niños. Para (Usted./su casa), ¿ Esto fue frecuentemente, a veces, o nunca en los últimos 12 meses?</p> <p><input type="checkbox"/> Frecuentemente <input type="checkbox"/> A veces <input type="checkbox"/> Nunca</p>
<p>7. “Durante las últimas 4 semanas los niños no comieron suficiente porque ustedes no pudieron comprarles la cantidad de comida necesaria”</p> <p><input type="checkbox"/> Frecuentemente verdad <input type="checkbox"/> Algunas veces verdad <input type="checkbox"/> Nunca verdad</p>	<p>7. Mi (s)/nuestros hijo(s) no comía(n) lo suficiente por que no tenía(mos) dinero para comprar suficiente comida. Para (Usted./su casa), ¿ Esto fue frecuentemente, a veces, o nunca en los últimos 12 meses?</p> <p><input type="checkbox"/> Frecuentemente <input type="checkbox"/> A veces <input type="checkbox"/> Nunca</p>
<p>8. Durante las últimas 4 semanas usted o alguno de los adultos del hogar tuvieron que reducir la cantidad de alguna de las comidas, o eliminar alguna comida porque no había suficiente dinero para comprarla?</p> <p><input type="checkbox"/> Sí <input type="checkbox"/> No (Salte 8a)</p>	<p>8. En los últimos 12 meses, desde el último (nombre del mes presente) . ¿ Usted o algún miembro de su familia comió menos o dejó de comer por que no había suficiente dinero para la comida?</p> <p><input type="checkbox"/> Sí (GO TO 8A) <input type="checkbox"/> No (SKIP TO 9)</p>
<p>8a. (SI LA RESPUESTA ES SÍ ARRIBA) ¿Cuántos días le ocurrió esto durante las últimas 4 semanas?</p> <p>_____ días</p>	<p>8a. ¿Con qué frecuencia sucedió esto --casi cada mes, algunos meses, o solo en uno o dos meses?</p> <p><input type="checkbox"/> Casi cada mes <input type="checkbox"/> Algunos meses <input type="checkbox"/> Solo en uno o dos meses</p>
<p>9. ¿En las últimas 4 semanas, alguna vez comieron menos de lo que ustedes sentían que debían haber comido porque no había suficiente dinero para comprar comida?</p> <p><input type="checkbox"/> Sí <input type="checkbox"/> No</p>	<p>9. En los últimos 12 meses, ¿ Comió usted menos de lo que pensaba que debía por que no hubo suficiente dinero para comida?</p> <p><input type="checkbox"/> Sí <input type="checkbox"/> No</p>

(continued)

(Comparison of Questions in the The Dominican Republic Food Security Pilot Survey and the UCLA/USDA Standard, continued)

Dominican Republic Pilot Food Security Survey	UCLA/USDA Standard
<p>10. ¿En las últimas 4 semanas se sintieron con hambre pero no comieron porque no podían comprar suficiente comida?</p> <p><input type="checkbox"/> Sí <input type="checkbox"/> No</p>	<p>10. En los últimos 12 meses, ¿Alguna vez tuvo hambre pero no comió por que no tuvo suficiente dinero para comida?</p> <p><input type="checkbox"/> Sí <input type="checkbox"/> No</p>
<p>11. ¿En las últimas 4 semanas, alguno de ustedes perdió peso porque no tenían suficiente dinero para comprar comida?</p> <p><input type="checkbox"/> Sí <input type="checkbox"/> No</p>	<p>11. En los últimos 12 meses, ¿Perdió usted peso por que no tuvo suficiente dinero para comprar comida?</p> <p><input type="checkbox"/> Sí <input type="checkbox"/> No</p>
<p>12. ¿En las últimas 4 semanas, usted o alguno de los adultos de este hogar alguna vez no comieron durante todo el día porque no tenían dinero para comprar comida?</p> <p><input type="checkbox"/> Sí <input type="checkbox"/> No (Salte 12a)</p>	<p>12. En los últimos 12 meses, ¿Usted o algún otro adulto de su familia no comió por todo el día por que no hubo suficiente dinero para comida</p> <p><input type="checkbox"/> Sí (GO TO 12A) <input type="checkbox"/> No (SKIP TO 13)</p>
<p>12a. (SI RESPONDE SÍ ARRIBA)? ¿Cuántos días le ocurrió esto durante las últimas 4 semanas?</p> <p>_____ días</p>	<p>12a. ¿Con qué frecuencia sucedió esto --casi cada mes, algunos meses, o solo en uno o dos meses?</p> <p><input type="checkbox"/> Casi cada mes <input type="checkbox"/> Algunos meses <input type="checkbox"/> Solo en uno o dos meses</p>
<p>13. ¿En las últimas 4 semanas, alguna vez se redujo la cantidad de comida para los niños porque no había suficiente dinero para comprar comida?</p> <p><input type="checkbox"/> Sí <input type="checkbox"/> No</p>	<p>13. En los últimos 12 meses, ¿Alguna vez le dió menos cantidad de comida a su(s) hijo(s) por que no hubo suficiente dinero para comida?</p> <p><input type="checkbox"/> Sí <input type="checkbox"/> No</p>
<p>14. ¿En las últimas 4 semanas, alguna vez se eliminó alguna comida durante el día para los niños porque no había suficiente dinero para comprarla?</p> <p><input type="checkbox"/> Sí <input type="checkbox"/> No (Salte 14a)</p>	<p>14. En los últimos 12 meses, ¿Alguna vez su hijo o cualquiera de sus hijos no comió por que no hubo suficiente dinero para comida?</p> <p><input type="checkbox"/> Sí (GO TO 12A) <input type="checkbox"/> No (SKIP TO 13)</p>
<p>14a. (SI RESPONDE SÍ ARRIBA) ¿Cuántos días le ocurrió esto durante las últimas 4 semanas?</p> <p>_____</p>	<p>14a. ¿Con qué frecuencia sucedió esto --casi cada mes, algunos meses, o solo en uno o dos meses?</p> <p><input type="checkbox"/> Casi cada mes <input type="checkbox"/> Algunos meses <input type="checkbox"/> Solo en uno o dos meses</p>

(continued)

(Comparison of Questions in the The Dominican Republic Food Security Pilot Survey and the UCLA/USDA Standard, continued)

Dominican Republic Pilot Food Security Survey	UCLA/USDA Standard
<p>15. ¿En las últimas 4 semanas, alguna vez los niños sintieron hambre pero no podían comprarles más comida?</p> <p><input type="checkbox"/> Sí <input type="checkbox"/> No</p>	<p>15. En los últimos 12 meses, ¿ Alguna vez su hijo o cualquiera de sus hijos tuvo hambre pero no tuvo suficiente dinero para comprar mas comida?</p> <p><input type="checkbox"/> Sí <input type="checkbox"/> No</p>
<p>16. ¿En las últimas 4 semanas, alguna vez los niños no comieron durante un día completo porque no había suficiente dinero para comprar comida?</p> <p><input type="checkbox"/> Sí <input type="checkbox"/> No</p>	<p>16. En los últimos 12 meses, ¿ Alguna vez sus hijos no comieron por todo el día por que no hubo suficiente dinero para comida?</p> <p><input type="checkbox"/> Sí <input type="checkbox"/> No</p>

Sources: Dominican Republic Food Security Pilot Survey; Harrison et al., 2003.