Estimating the Prevalence of Children's Hunger From the Current Population Survey Food Security Supplement

Mark Nord and Gary Bickel

Abstract

The USDA measure of food insecurity and hunger combines items measuring household food insecurity, adults' hunger, and children's hunger into a single scale. Although these three constructs lie largely on a single dimension, principal components analysis of the residuals of the items of the scale for households with children reveals that they are not perfectly unidimensional. The second dimension can be interpreted as the extent to which children in the household are protected from hunger at the expense of more serious adult hunger. Because of this multidimensionality, estimates of the prevalence of children's hunger based on the household-level measure understate the true prevalence of children's hunger. A measure of children's hunger based on child-specific items finds children's hunger in only 1.12 percent of households with children, compared with 0.87 percent based on the household-level measure for the same households—a 29-percent greater prevalence. Households with older children and with higher ratios of children to adults tend to register more severe levels of children's hunger on the child-specific scale than would be predicted from their household-level scores.

Introduction

Estimating the prevalence of children's hunger and identifying households with children's hunger are important objectives of the interagency Food Security Measurement Project. There is reason to believe that food sufficiency and diet quality are important for children's development, and several food assistance programs are specifically aimed at assuring adequate nutrition for children. Up to this point in the project, the severe-hunger category of the household-level food security scale has been used as a proxy, in households with children, for hunger among children (Hamilton et al., 1997a). A substantial body of research has found that children in the United States are generally shielded from hunger at less severe levels of household deprivation and begin to experience hunger when hunger among adults in the household reaches this more severe level. The data from the Current Population Survey (CPS) Food Security Supplements are consistent with these earlier findings. However, there is concern that the prevalence of children's hunger may be understated by this method (Carlson et al., 1999). Although the severe-hunger category was delineated primarily to identify households with children's hunger, not all households with children conform to the modal pattern of protecting children from hunger until adult hunger in the household reaches a severe level. In some households classified with only moderate adult hunger, evidences of children's hunger are reported.

The nonlinear factor analysis carried out by Hamilton et al. (1997b) in the scale development process confirmed that the food insecurity and hunger items now included in the core module lie fairly well on a single dimension. However, the unidimensionality is not perfect. Child items and adult items may be on somewhat different dimensions. Even if only a small proportion of moderate hunger households have children's hunger, the proportional error in the estimated prevalence of children's hunger could be substantial because there are many more households classified with moderate hunger than with severe hunger.

This paper explores the extent to which the prevalence of children's hunger may be underrepresented by the household-level severe-hunger category. First, we examine the extent to which child hunger, adult hunger, and household items lie on different dimensions by extracting principal components of the deviation of item responses from their expected values given the overall household score. Then, using Rasch modeling techniques, we scale only the 8 items in the core 18-question module that specifically ask about children. We identify the threshold of

child hunger on this child-specific scale that corresponds to the severe-hunger threshold in the household-level measure and compare the prevalence rates for children's hunger based on these two alternative scales. We cross-tabulate households by the two measures and assess the extent to which they identify the same households as having children's hunger. Then, we compare prevalence rates based on the two measures across demographic and economic categories of households to shed light on why the two measures give different results. Finally, we discuss another potentially meaningful threshold based on the child-specific scale: the severity level beyond which the quality of children's diets appears to be reduced.

Data and Methods

From the April 1995 CPS Food Security Supplement and the CPS monthly core data, we created a household analysis file including responses to the 18 items comprising the food security scale along with variables on household structure, income, and demographics. We used the 12-month food security scale score provided by Abt Associates and matched this to the Food Security Supplement file.[1] We restricted the sample to households with children as identified by the Abt file.[2] All items in the food security scale were recoded to dichotomies as specified by Hamilton et al. (1997b).

For the principal components analysis, all 18 items in the food security scale were submitted to the Bigsteps Rasch modeling software, and principal components analysis of the standardized residuals was requested. In this procedure, the items and households are first scaled by Rasch maximum likelihood methods. Then, for each household, the deviation of each item from its expected value given the household total score is calculated.[3] Each item's deviation is standardized by dividing by the model standard error for the item-household combination.[4] Then principal components are extracted from a correlation matrix of the standardized deviations.

To create a child hunger scale, the eight child-referenced items were submitted to Bigsteps Rasch modeling software without the adult-specific and household items. The household scores calculated by Bigsteps were then added to the household data file. A threshold for child hunger was identified consistent with the household-level severe-hunger threshold and conceptually consistent with the household-level threshold for adult hunger as specified by Hamilton et al. (1997a and 1997b).[5] The estimated number of households with children's hunger was then compared with the estimated number of households with severe household-level hunger. Cross-tabulation of the child-specific hunger dichotomy with the household-level severe-hunger dichotomy was examined to assess the consistency with which the two measures identify the same households as having children's hunger.

[1]Households were matched using the variable UNIQHHID, created by Abt Associates based on the CPS variables GESTCEN (State), HRHHID (household ID), and HRSERSUF (household serial suffix).

[2]The identification of households with children specified by Hamilton et al. (1997b) is problematic for a very few households. Hamilton et al. based their identification (as did the CPS survey instrument) on the presence in the household of any person less than 18 years of age. In 26 of these households, however, the only person under age 18 was either the household reference person or the spouse or partner of the reference person. Only six of the incorrectly classified households answered "yes" to any of the child items. So, the potential distortion of the scale or the prevalences estimated here is negligible.

[3]The observed value of the item is 1 if affirmed, zero if denied. The expected value is the probability of the household affirming the item given the difference between household and item score, given by $p = exp(h-i) / (1 + exp(h-i))$, where h is the scale score (severity of food insecurity) of the household and i is the calibration score (severity level) of the item.

[4]The model standard error of the item-household combination depends only on the probability of the household affirming the item (see previous footnote). The model standard error is the square root of the model variance, which is calculated as $v = p(1-p)^2 + (1-p)p^2$. Conceptually this is the sum of the squared deviation if the item is affirmed, weighted by the probability of its being affirmed, plus the squared deviation if the item is denied, weighted by the probability of its being denied.

[5]The thresholds are conceptually consistent in the sense that the child-hunger threshold bears the same relationship to child-specific items as the household-level hunger threshold bears to the analogous adult items. This is described in more detail in the "Findings" section.

The proportion of households affirming the single item that asks directly whether children in the household were hungry,[6] might also be considered a measure of children's hunger. A single-item measure is generally much less reliable than a scaled measure, and we do not recommend its use as a substitute for the full scale. However, we compared it with the two scales to provide a face-validity check on the scale-based measures.

Finally, prevalence rates of children's hunger based on the two scales were compared across categories of households classified by household structure, number of children, age of oldest child, sex of children, race/ethnicity of household reference person, household income, and metropolitan/nonmetropolitan residence.

All prevalence estimates and cross-tabulations are population estimates based on household weights prepared by the U.S. Bureau of the Census for the 1995 Food Security Supplement. The item scaling was carried out using unweighted data. The Bigsteps software we used does not handle weights, but since it uses maximum likelihood methods, the estimates are not biased by unweighted data provided that model assumptions hold.

Findings

Assessing a Second Dimension in the Items

The principal components analysis of standardized item deviations reveals a second factor[7] correlated negatively with all child-specific items, and positively with all adult-specific items. The highest positive correlations are with the more severe adult items (table 1).[8] Correlations are close to zero for two of the three general household items. This factor can be interpreted, then, as the extent to which households protect children from hunger by accepting more severe levels of adult hunger. The factor is not very strong, accounting for only about 15 percent of the shared variance of the residuals. This is consistent with the assessment by Hamilton et al. (1997b) that the phenomenon represented by these items is largely unidimensional. Still, the factor is strong enough to lend credence to the concern that some households with child hunger do not register severe household-level hunger.

Estimating the Prevalence of Child Hunger

Eight of the 18 core items in the food security and hunger module refer specifically to children. The proportions of households affirming these items ranged from 13.6 percent ("We relied on only a few kinds of low-cost food to feed the children because we were running out of money to buy food") to 0.2 percent "In the last 12 months, did any of the children ever not eat for a whole day because there wasn't enough money for food?" see table 2). The eight child-referenced items, when scaled without the adult and household items, have item scores completely consistent with their relative scores in the all-items scale (fig. 1; see also app. tables for Bigsteps summary statistics and item statistics for the 18-item and child-specific scales).[9] The correlation of item scores between the two scales is 0.998. This is not surprising, since these items have valid values only for households with children. The correlation of scores across households, however, is only moderately high. For nonextreme households on the child-specific scale (i.e., households that neither affirmed nor denied all child-specific items), the Pearson correlation coefficient between the two scales is 0.76. This is consistent with the results of the principal components analysis and suggests that the two scales will identify a somewhat different group of households as having children's hunger.

[6]The question wording was, "In the past 12 months, were the children ever hungry but you just couldn't afford more food?"

[7]This is actually the first factor extracted from the principal components analysis of the item deviations, but the scale itself should be considered the first factor in the raw data, although it is extracted using a nonlinear model.

[8]Tables are at the end of this paper.

[9]Figures follow tables at the end of this paper.

It is difficult to compare fit statistics between the two scales, both because they include different numbers of items and also because a larger group of households is nonextreme for the all-items scale, and therefore fit statistics are calculated over different groups of households. One informative statistic that can be compared across a common group of households is the mean standard measurement error. This is the expected mean measurement error for households with a given raw score if the data conformed exactly to the model expectations. Since the software provides the measurement error estimate for each household, its mean can be compared across a common group of households—those nonextreme on the child-specific scale. The model error is expressed in the measurement metric, so we adjusted the metric of the child-hunger scale so that the items had the same standard deviation as the child-specific items on the household-level scale, thus making the error estimates commensurate. The larger number of items in the household-level scale is expected to provide a more reliable measure of households' food security status, and the comparison of household standard errors indicates that this is true. The mean household standard errors were 0.80 and 1.02 for the household-level and child-specific scales, respectively. The error varies across the range of each scale, however, and near the relevant thresholds, the errors were more nearly the same, 0.70 for the household-level scale and 0.73 for the child-specific scale. On both scales, the thresholds relevant for the identification of children's hunger fall in the range of minimum measurement error, thus maximizing their discrimination at the severity level most critical for estimating the prevalence of children's hunger.

We set the threshold for children's hunger on the child-specific scale at the severity level midway between the scores of households (with no items missing) that affirmed four and five items (fig. 2). In other words, to be classified as having children's hunger, a household must have affirmed five items — typically the first five, up to and including that children were hungry because the household could not afford more food. This corresponds very nearly with the item score of the item that asked directly whether the children were hungry, and among the child items it corresponds exactly with the severe-hunger threshold in the household-level scale. It is no accident that these two thresholds coincide. The severe-hunger threshold was selected specifically to identify households in which, if children are present, child hunger is very likely. This child-hunger threshold is also conceptually consistent —considering analogous child and adult items— with the operational principles used to set the food-insecure-with-moderate-hunger threshold (i.e., the level of severity of food insecurity beyond which adult hunger is evident) on the 18-item food security scale (Hamilton et al., 1997a and 1997b). To pass each threshold, at least three indicators of reduced intake are required— three indicators of reduced intake among children in the one case, and three indicators of reduced intake among adults in the other. Households with no missing items and with scores just above the child-hunger threshold affirmed at least three items that indicate reduced food intake, typically that children were not eating enough, the size of children's meals were cut, and children were hungry. The only sense in which this threshold is not conceptually consistent with the adult hunger threshold is that it does not require affirmation of any item that indicates repeated experiences of insufficient food intake. Among the child-specific items, frequency information was requested only for the "skipped meals" question, comparatively a much more severe item than the threshold item for adult hunger—"cutting the size of meals or skipping meals in three or more months."

Classifying households based on the child-specific scale produced a population estimate of 425,200 households with children's hunger (table 3). This is 1.12 percent of all households with children and is 29 percent higher than the estimate based on the severe-hunger category of the household-level scale. The estimate based on the single "child hungry" question was 670,700 households, which is 1.76 percent of all households with children and just over twice the

estimate based on the severe adult hunger classification.[10]

About three-fourths of the households in the severe-hunger category were also classified as having children's hunger by the child-specific scale and by the single child hunger item (table 4). The child-specific scale identified additional sample households representing 173,500 households nationally that had children's hunger even though they did not register severe hunger at the household level. This was partially offset by 80,200 households classified as having severe hunger at the household level in which the child-specific scale did not indicate child hunger. The single "child hungry" item was answered affirmatively by households representing 417,100 households nationally that did not register severe adult hunger. This was partially offset by 78,300 households with severe hunger that denied the "child hungry" item.

Assessing Differences in the Households Identified as Having Children's Hunger by the Two Scales

Differences between the prevalence rates of households with children's hunger (based on the child-specific scale) and household-level severe hunger (based on the full 18-item scale) varied among demographic and economic categories of households, and the differences shed some light on why the two measures differ. The most notable variation is across categories based on age of oldest child (table 5). The difference in prevalence rates (households with children's hunger less households with household-level severe hunger) was greatest for households with older children and was actually negative for households in which all children were age 6 and under. This indicates that younger children are protected from hunger, even at the cost of rather serious adult hunger, to a greater extent than are older children. Compared with young children, older children experience hunger when adult hunger in the household is at lower levels of severity. Even among households with older children, however, the children registered hunger on the child-specific scale in only about one-fourth of the households with adult hunger (i.e., moderate or severe household-level hunger).[11]

Single-parent families and larger families also had greater differences between child-hunger and household-level severe hunger prevalences. Households with a lower ratio of adults to children are, arguably, less able to protect the children from hunger by reducing adult consumption. Also, these households are more likely to be in poverty over longer periods of time. If periods of economic stress and food insufficiency are relatively short, adults may be better able to maintain adequate food supply to the children by stinting themselves. But this becomes less achievable over long periods of time. The somewhat greater difference observed for low-income households than for higher income households also suggests this process.

Differences between the two prevalence rates were greater for black and Hispanic households than for non-Hispanic whites. In part, these differences may be due to the substantially higher poverty rates and longer term character of the poverty of blacks and Hispanics. Additionally, blacks have a substantially larger share of single-

[10]The higher prevalence estimate for children's hunger based on the the child-hunger scale could result, in part, from the higher measurement error inherent in that scale. The child-hunger threshold is well out in a tail of the distribution, so a measure with random measurement error will misclassify more nonhungry households as hungry than vice versa because there is a larger population share within a given severity distance below the threshold than within the same distance above it. This upward bias of prevalence estimates affects the 18-item scale also, but since the bias increases as measurement error increases, the bias on the child-hunger-scale-based prevalence estimate is greater than that on the 18-item-scale-based estimate. Preliminary work by Nord (1999) estimated the size of the bias at about 12 percent for the 18-item scale at the severe-hunger threshold. Similar analysis for the child-hunger scale suggests an upward bias of 15 to 18 percent. The difference in bias, then, accounts for, at most, about one-fifth of the difference in prevalence estimates. It should be emphasized that these bias estimates are based on rather crude methods and that much more work remains to be done in this area.

[11]The statistics for this comparison are not shown in the table. Among households with older children, 5.7 percent registered adult hunger—i.e., moderate or severe household hunger—while only 1.3 percent registered child hunger on the child-specific scale.

parent families, and Hispanics have, on average, more children. Both of these factors are associated with larger differences between child hunger and severe adult hunger. There may also be cultural differences among racial and ethnic groups either in the way household resources are managed or in the way hunger and food insufficiency are described. In nonmetro areas, the prevalence of children's hunger was virtually identical to the prevalence of severe adult hunger and was much lower than the prevalence of children's hunger in metro areas. This may result, in part, from the smaller share of racial and ethnic minorities in rural areas, but further research is needed to account fully for the rural-urban difference.

Reduced Diet Quality for Children

The child-specific scale provides the basis for another potentially meaningful classification. Households affirming two or more child-specific items, typically that they fed the children a few kinds of low-cost foods and that they could not feed the children balanced meals, may be classified as providing reduced quality diets to the children.[12] The estimated prevalence of such households is 3.51 million, or 9.2 percent of all households with children. This threshold falls in the "food insecure with no hunger evident" range of the household-level scale, about two-thirds of the distance from the threshold of that range to the threshold of the "food insecure with moderate hunger evident" range. It coincides closely in severity with the first two items, indicating that adults reduce their food intake. "Adults cut size of meals or skipped meals" falls just below it, and "adult ate less than felt he/she should" lies just above it in severity. If this is an appropriate threshold for the phenomenon, then its prevalence is not adequately represented by any of the thresholds on the household-level measure. All households with children that registered severe hunger and the vast majority (83.2 percent) of those with moderate hunger registered reduced quality of children's diets by this measure. Thirty-eight percent of households with children that registered food insecurity short of hunger also provided reduced quality diets to the children, and these households comprised 50 percent of the households with reduced quality of children's diets. The proportion of food secure households that reduced the quality of children's diets was negligible.

[12]It is important to keep in mind that this is perceived quality/variety/desirability of diet as reported by an adult member of the household. Whether it also indicates a reduction in the nutritional quality of the children's diet is an empirical question.

Confirmation From 1998 CPS Food Security Supplement Data

The findings reported above were all based on the 1995 CPS Food Security Supplement. We replicated the entire analysis using the unedited 1998 CPS Food Security Supplement data. In part, this was done simply to verify our findings with an additional year of data. But also, there are two reasons why the 1998 data might produce different results than the 1995 data. First, in 1998, the order of administration of the items was changed to approximate the order of severity of the items, and three internal screeners imputed negative responses to further questions if all questions up to the screener were denied. Since the more serious items, including most of the child items, were administered earlier in the 1995 instrument and without any screeners beyond the initial entry screener, the relationship between child and adult items could have changed in 1998. Second, in 1995, for households with only one child, the child's name was inserted into the child-referenced questions, whereas in 1998 the child was referred to as "your child." Analysis by the authors (unpublished) revealed that naming the child (as in 1995) depressed the proportion of affirmative responses for households at the same overall level of food security. This could account for some of the lack of congruence between the child-specific and household-level scales.

In spite of these questionnaire differences, the 1998 findings were in all important respects completely consistent with those based on the 1995 data. The factor extracted from the item residuals was nearly identical in strength and character to that observed in the 1995 data, the scaling of the child-specific items was essentially the same, the

difference in prevalence estimates was the same, the cross-tabulation was the same, and the patterns across household categories was substantially the same. We do not report the 1998 results in detail here, because they are based on unedited data (using core CPS household weights in the absence of supplement weights) and the results are so similar that the additional material would be redundant.

Conclusions

There is convincing evidence that a nontrivial, second dimension exists in the items in the food security and hunger scale, a dimension that corresponds with the extent to which children are protected from hunger at the expense of more severe adult hunger. As a result, estimates of the prevalence of children's hunger based on the household-level severe-hunger category understate the actual prevalence of hunger among children. A Rasch-based scale using only the child-specific items in the Food Security Supplement produces a prevalence estimate of households with children's hunger that is about 29 percent higher than the estimate based on the "food insecure with severe hunger" category of the household-level 18-item food security scale (1.12 percent compared with 0.87 percent). Differences between prevalence estimates based on the two scales were greatest for households with older children. In fact, for households in which all children were age 6 or younger, children's hunger was less prevalent than household-level severe hunger, indicating that young children are more effectively shielded from reduced food intake—even at the cost of more severe stinting by adults—than is true for older children. Differences between prevalence estimates from the two scales were also greater, although less dramatically so, for single-parent families and for households with more children, presumably because households with a higher ratio of children to adults are less able to shield the children from hunger by adult stinting.

The child-specific scale also suggests that in about 9 percent of all households with children, the quality or variety of children's diets is reduced due to inadequate household resources. The appropriate threshold for identifying these households does not correspond with any of the thresholds identified on the household-level measure.

These findings raise the question of whether the U.S. Department of Agriculture should consider creating a second, child-specific scale for estimating the prevalence of children's hunger, rather than basing those estimates on the household-level scale. There are advantages in supporting only a single scale. However, given the strong national interest in children's nutritional and developmental well-being, the value of improving the accuracy of prevalence estimates for children's hunger and reduced diet quality by basing them on a child-specific scale may well outweigh the costs of supporting the additional scale.

Further research is needed to determine whether one or more of the household-level items that are not adult-specific should be included along with the child-specific items in a full range food insecurity-hunger scale for children. Although these do not ask specifically about children, they register household experiences that may affect children. Whether they do so consistently enough to add to the accuracy of a child-specific scale is an empirical question. It is not likely that they would improve classification accuracy much at the child-hunger threshold, but they might substantially improve the "reduced quality of children's diet" classification accuracy.

For research purposes, too, it is likely that the more accurate identification of households with children's hunger (and, perhaps, with reduced quality of children's diets) that can be achieved by using a child-specific scale will improve the fitting of models of determinants and outcomes of children's hunger. These issues will be one dominant focus of the next major phase in food security research as surveys that study children's development, health, well-being, and behavior also carry the food security and hunger items. Establishing a standard child-specific scale early will improve the consistency and comparability of the many research efforts that will address these important issues.

References

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*. Vol. 129, pp. 1S-7S (February, Supplemental Issue).

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*. U.S. Department of Agriculture, Food and Consumer Service (currently Food and Nutrition Service), Office of Analysis and Evaluation, Alexandria, VA.

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 of the Food Security Measurement Project.* U.S. Department of Agriculture, Food and Consumer Service (currently Food and Nutrition Service), Office of Analysis and Evaluation, Alexandria, VA.

Nord, Mark. 1999. "Upward Bias on Food Insecurity and Hunger Prevalence Estimates Due to Measurement Error." Working Paper No. FS-8. Unpublished—available from the author at U.S. Department of Agriculture, Economic Research Service.

Table 1—Factor loadings of the first factor extracted by principal components from the correlation matrix of the standardized deviations of items from their expected values given the household score

Item	Loading
Household items:	
Worried food would run out	0.04
Food bought didn't last	.03
Couldn't afford to eat balanced meals	-.24
Adult-specific items:	
Adults cut size of meals or skipped meals	.42
Adult ate less than felt he/she should	.30
Adults cut size of meals or skipped meals in 3 or more months	.40
Adult hungry but didn't eat	.38
Adult lost weight	.33
Adults did not eat whole day	.62
Adults did not eat whole day in 3 or more months	.60
Child-specific items:	
Children fed few low-cost foods	-.26
Couldn't feed children balanced meals	-.57
Children not eating enough	-.56
Cut size of children's meals	-.35
Children hungry	-.31
Children skipped meal	-.43
Children skipped meal in three or more months	-.38
Children did not eat whole day	-.03

Note: The analysis is based on households with children who answered at least one food security or hunger question affirmatively (n = 4,340). The factor explained 2.74 times the proportion of shared variance expected under random conditions, or about 15 percent of the total shared variance. Item wording is abbreviated. For complete wording of child-specific items see table 2; for complete wording of other items, see Hamilton et al., 1997a.

Source: Prepared by USDA, ERS, based on data from the U.S. Bureau of the Census, Current Population Survey, Food Security Supplement, April 1995.

Table 2—Proportion of households with children who affirmed child-specific items in the food security supplement

Item	Percent affirming
"We relied on only a few kinds of low-cost food to feed the children because we were running out of money to buy food." Was that often, sometimes or never true for you in the last 12 months? (Often or sometimes = yes)	13.6
"We couldn't feed the children a balanced meal because we couldn't afford that." Was that often, sometimes or never true for you in the last 12 months? (Often or sometimes = yes)	8.6
"The children were not eating enough because we just couldn't afford enough food." Was that often, sometimes or never true for you in the last 12 months? (Often or sometimes = yes)	4.6
In the last 12 months, did you ever cut the size of any of the children's meals because there wasn't enough money for food?	1.8
In the last 12 months, were the children ever hungry but you just couldn't afford more food?	1.6
In the last 12 months, did any of the children ever skip a meal because there wasn't enough money for food?	.8
(If yes), how often did this happen—almost every month, some months but not every month, or in only 1 or 2 months? (Almost every month or some months but not every month = yes)	.5
In the last 12 months, did any of the children ever not eat for a whole day because there wasn't enough money for food?	.2

Note: The sample for this analysis consisted of all households with children that gave valid responses to at least half of the 18 core-module questions (n = 16,914). Wording of items was modified as appropriate for households with only one adult and for households with only one child.

Source: Prepared by USDA, ERS, based on data from the U.S. Bureau of the Census, Current Population Survey, Food Security Supplement, April 1995.

Table 3—Prevalence of children's hunger in households with children—comparison of three measures

Measure	Number of households	Percent of households
	Thousands	*Percent*
Severe household-level hunger based on 18-item scale	331.9	0.87
Child hunger based on child-items-only scale	425.2	1.12
Child hunger based on response to single question	670.7	1.76

Note: Tabled values are population estimates based on household weights prepared by the U.S. Bureau of the Census for the Food Security Supplement. The estimated total number of households with children is 38,115,000. The unweighted number of cases is 16,914.

Source: Prepared by USDA, ERS, based on data from the U.S. Bureau of the Census, Current Population Survey, Food Security Supplement, April 1995.

Table 4—Cross-tabulation of alternative household measures of child hunger

Number of households	Unit	Severe hunger based on 18-item scale: No	Yes	Total
Child hunger based on child-items-only scale:				
No—	*Thousands*	37,609.6	80.2	37,689.8
	Row percent	(99.79)	(0.21)	(100.00)
	Column percent	(99.54)	(24.16)	(98.88)
Yes—	*Thousands*	173.5	251.7	425.2
	Row percent	(40.80)	(59.20)	(100.00)
	Column percent	(0.46)	(75.84)	(1.12)
Total—	*Thousands*	37,783.1	331.9	38,115.0
	Row percent	(99.13)	(.87)	
	Column percent	(100.00)	(100.00)	
Child hunger based on single child-specific item:[1]				
No—	*Thousands*	37,366.0	78.3	37,444.3
	Row percent	(99.79)	(.21)	(100.0)
	Column percent	(98.90)	(23.59)	(98.24)
Yes—	*Thousands*	417.1	253.6	670.7
	Row percent	(62.19)	(37.81)	(100.00)
	Column percent	(1.10)	(76.41)	(1.76)
Total—	*Thousands*	37,783.1	331.9	38,115.0
	Row percent	(99.13)	(.87)	
	Column percent	(100.00)	(100.00)	

Note: Tabled values are population estimates based on household weights prepared by the U.S. Bureau of the Census for the Food Security Supplement. The estimated total number of households with children is 38,115,000. The unweighted number of cases is 16,914.

[1]"In the last 12 months, were the children ever hungry but you just couldn't afford more food?"

Source: Prepared by USDA, ERS, based on data from the U.S. Bureau of the Census, Current Population Survey, Food Security Supplement, April 1995.

Table 5—Difference in prevalence of children's hunger and household-level severe hunger in households with children, by demographic and economic characteristics of households

Household demographic and economic characteristics	Prevalence rate of child hunger	Prevalence rate of household-level severe hunger	Difference in child hunger less household-level severe hunger	Difference in child hunger less household-level severe hunger
	---------*Percent*---------		*Percentage points*	*Percent*
Family structure:				
Two-parent family	0.52	0.42	0.10	23.0
Single-parent family	2.70	2.02	.68	33.6
Other[1]	1.38	1.14	.24	21.6
Number of children:				
One	.71	.61	.10	17.2
Two	1.07	.89	.18	20.2
Three or more	1.76	1.21	.55	46.3
Age of oldest child:				
0-6	.55	.64	-.09	-14.7
7-14	1.34	.97	.37	37.4
15-17	1.31	.87	.44	49.7
Sex of children:				
Boys only	.79	.69	.10	14.9
Girls only	.97	.84	.13	14.9
Both	1.48	1.00	.48	47.6
Race/ethnicity of reference person:				
White non-Hispanic	.69	.63	.06	8.8
Black	2.22	1.63	.59	36.4
Hispanic	2.27	1.30	.97	73.9
Income of household:				
Below 130% of poverty line	3.18	2.46	.72	29.4
Above 130% of poverty line	.38	.31	.07	24.3
Residence:				
Metro	1.29	.96	.33	33.4
Nonmetro	.56	.57	-.01	-1.3

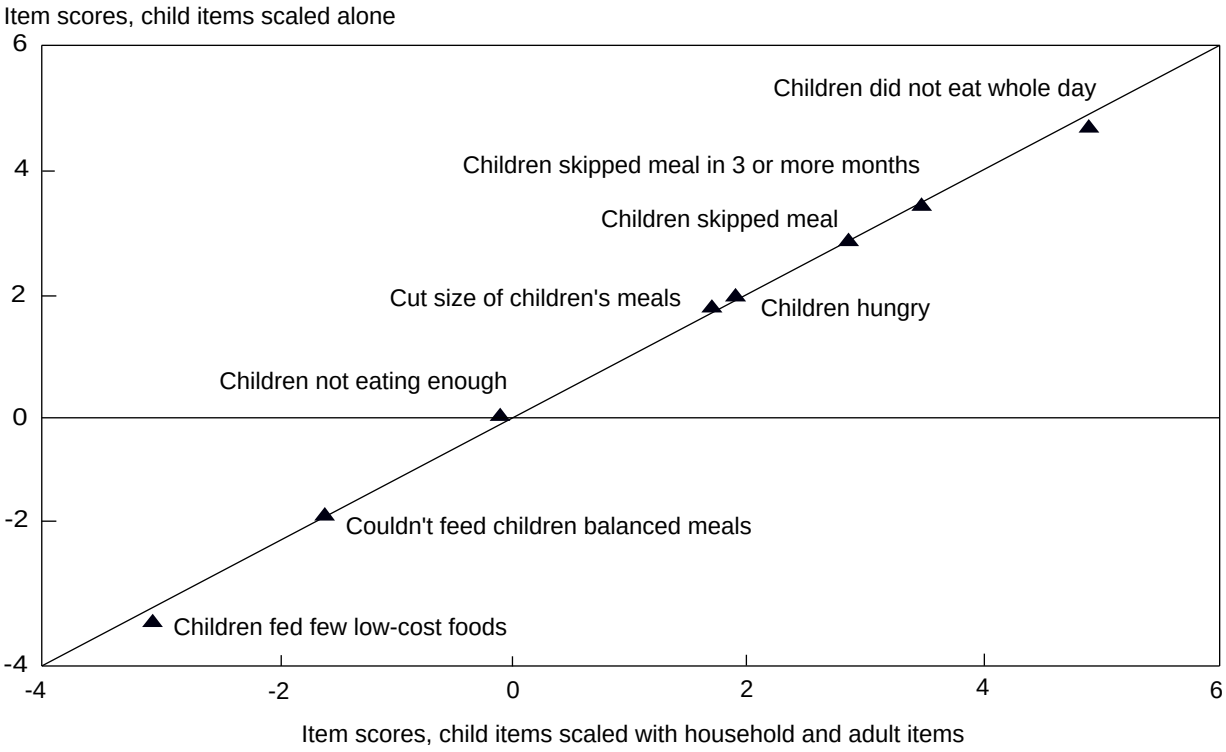
Note: Tabled values are population estimates based on household weights prepared by the U.S. Bureau of the Census for the Food Security Supplement, April 1995. The unweighted number of cases is 16,914.

[1]"Other" households have children living in them not related to the reference person. These include children of an unmarried housemate or partner, foster children, and other unrelated children.

Source: Prepared by USDA, ERS, based on data from the U.S. Bureau of the Census, Current Population Survey, Food Security Supplement, April 1995.

Figure 1

Comparison of item scale scores for child items scaled alone versus child items scaled along with household and adult items, households with children, 1995

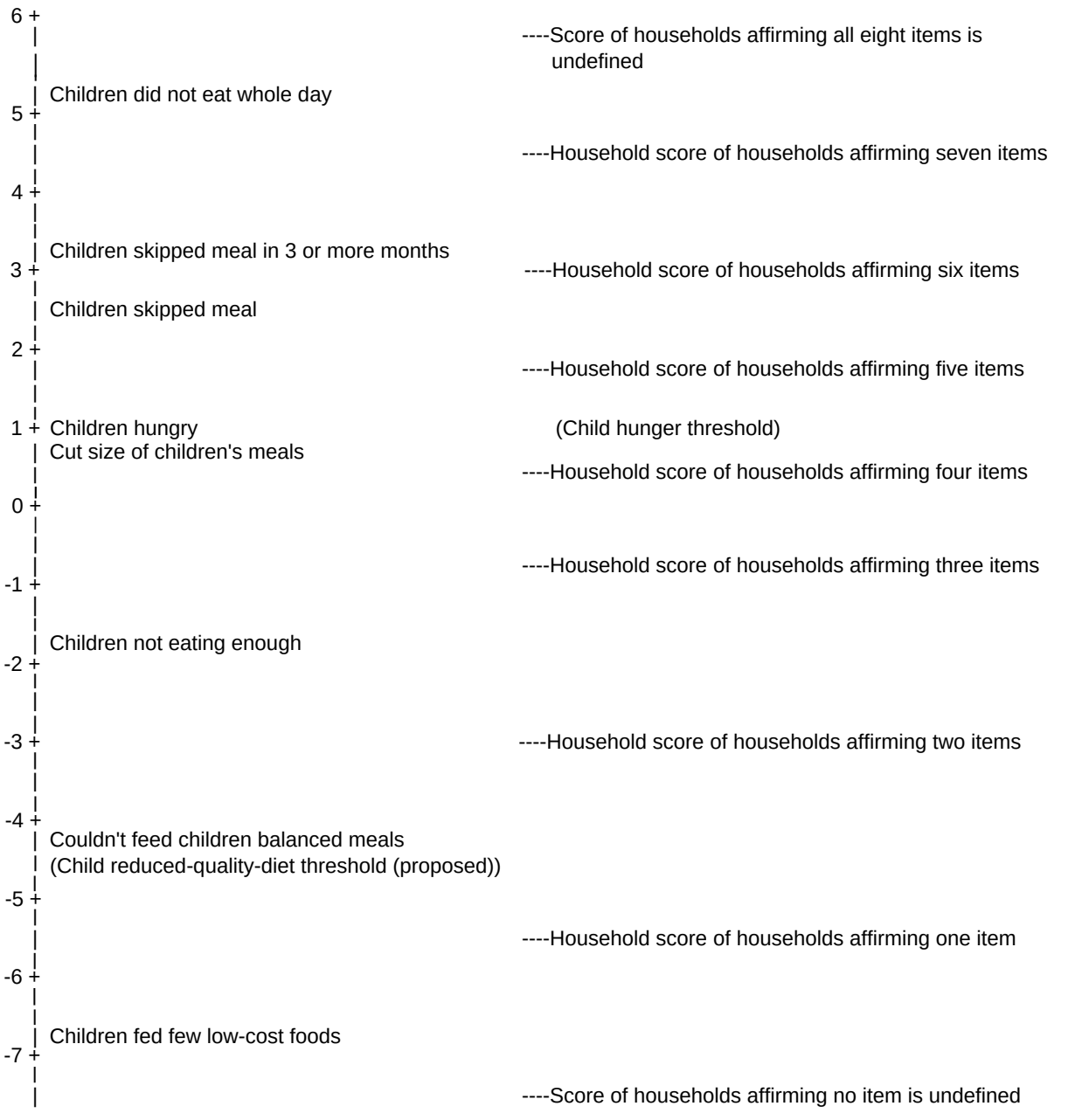


Note: Item scores were normalized by specifying the same means and standard deviation for the child items.

Source: Prepared by USDA, ERS, using data from the U.S. Bureau of the Census, Current Population Survey, Food Security Supplement, April 1995.

Figure 2

Rasch model item scores and household scores as calculated by Bigsteps software based on child-specific items only



Note: The sample for this analysis consisted of all households with children that gave valid responses to at least half of the 18 core module questions (n = 16,914). Rasch model estimates are based on 2,588 nonextreme households, i.e., households that affirmed at least one item but not all items. Household scores shown are for households with no missing child-specific items.

Source: Prepared by USDA, ERS, based on data from the U.S. Bureau of the Census, Current Population Survey, Food Security Supplement, April 1995.

Appendix table 1—Bigsteps household and item summaries for households with children: All 18 core items scaled

SUMMARY OF 4,333 MEASURED (NONEXTREME) HHLDS

	RAW SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	4.4	18.0	-2.66	0.90	0.99	-0.2	0.76	-0.1
S.D.	3.4	.3	2.12	.19	.55	1.1	1.32	.4
MAX.	17.0	18.0	4.98	1.34	4.39	5.2	9.90	4.1
MIN.	1.0	10.0	-5.23	.70	.24	-2.3	.08	-1.1

REAL RMSE	1.02	ADJ. SD	1.87	SEPARATION	1.84	HHLD RELIABILITY 0.77
MODEL RMSE	.92	ADJ. SD	1.92	SEPARATION	2.09	HHLD RELIABILITY .81
S.E. OF HHLD MEAN	.03					
WITH 12,581 EXTREME HHLDS =	16,914			HHLDS MEAN	-5.26	S.D. 1.88
REAL RMSE	1.45	ADJ. SD	1.20	SEPARATION	.82	HHLD RELIABILITY .40
MODEL RMSE	1.43	ADJ. SD	1.22	SEPARATION	.85	HHLD RELIABILITY .42

MAXIMUM EXTREME SCORE: 6 HHLDS
MINIMUM EXTREME SCORE: 12,575 HHLDS
VALID RESPONSES: 99.9%

SUMMARY OF 18 MEASURED ITEMS

	RAW SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	1,068.4	4,328.4	0	0.07	0.99	0.1	1.23	-0.3
S.D.	1,023.2	3.6	2.69	.04	.09	2.8	1.22	1.6
MAX.	3,582.0	4,333.0	4.89	.21	1.15	7.0	6.08	3.5
MIN.	29.0	4,322.0	-5.29	.04	.83	-3.6	.27	-2.6

REAL RMSE	0.08	ADJ. SD	2.69	SEPARATION	32.31	ITEM RELIABILITY 1.00
MODEL RMSE	.08	ADJ. SD	2.69	SEPARATION	32.92	ITEM RELIABILITY 1.00
S.E. OF ITEM MEAN	.65					

Source: Prepared by USDA, ERS, based on data from the U.S. Bureau of the Census, Current Population Survey, Food Security Supplement, April 1995.

Appendix table 2—Bigsteps item statistics for households with children: All 18 core items scaled

ITEMS STATISTICS: MEASURE ORDER

ENTRY NUMBER	RAW SCORE	COUNT	MEASURE	ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBIS CORR.	ITEMS
18	29	4,333	4.89	0.21	1.08	0.5	6.08	1.9	0.18	chwhlday
16	87	4,331	3.47	.13	.83	-1.9	.27	-1.6	.34	chskipf
15	135	4,332	2.85	.10	.87	-1.8	.74	-.6	.37	chskip
13	191	4,332	2.34	.09	.97	-.4	.51	-1.6	.40	whldayf
17	257	4,333	1.89	.08	.92	-1.5	.93	-.2	.44	chhungry
12	288	4,333	1.71	.07	1.03	.6	1.07	.3	.43	whlday
14	290	4,332	1.69	.07	1.00	0	1.29	1.0	.44	chcut
11	317	4,322	1.54	.07	1.05	1.1	.86	-.6	.44	losewt
10	652	4,328	.25	.06	.94	-2.0	.80	-1.7	.56	hungry
6	779	4,324	-.11	.05	1.06	1.8	.85	-1.4	.53	chenuf
8	971	4,329	-.60	.05	.97	-1.2	.79	-2.6	.57	cutskipf
9	1,437	4,328	-1.57	.04	.96	-1.7	.94	-1.0	.58	eatless
5	1,453	4,325	-1.60	.04	1.08	3.1	.93	-1.2	.54	chbal
7	1,461	4,332	-1.61	.04	.94	-2.5	.96	-.7	.59	cutskip
4	2,295	4,324	-3.06	.04	1.15	7.0	1.30	3.5	.43	chfewfd
3	2,314	4,324	-3.09	.04	.93	-3.6	.88	-1.5	.52	balmeal
2	2,694	4,324	-3.71	.04	.95	-2.6	1.04	.4	.45	fnotlast
1	3,582	4,326	-5.29	.05	1.14	6.1	1.90	3.1	.22	worried
MEAN	1,068	4,328	0	.07	.99	.1	1.23	-.3		
S.D.	1,023	4	2.69	.04	.09	2.8	1.22	1.6		

Source: Prepared by USDA, ERS, based on data from the U.S. Bureau of the Census, Current Population Survey, Food Security Supplement, April 1995.

Appendix table 3—Bigsteps household and item summaries for households with children: Only specifically child-referenced items scaled

SUMMARY OF 2,588 MEASURED (NONEXTREME) HHLDS

	RAW SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	2.0	8.0	-0.94	1.02	0.89	-0.6	0.72	-0.1
S.D.	1.3	.1	1.73	.12	1.28	1.1	1.92	.3
MAX.	7.0	8.0	4.33	1.70	8.39	5.2	9.90	2.9
MIN.	1.0	6.0	-2.46	.73	.08	-1.5	.03	-.4

REAL RMSE	1.24	ADJ. SD	1.21	SEPARATION	.97	HHLD RELIABILITY .48
MODEL RMSE	1.03	ADJ. SD	1.40	SEPARATION	1.36	HHLD RELIABILITY .65
S.E. OF HHLD MEAN	.03					
WITH 14,326 EXTREME HHLDS =	16,914			HHLDS MEAN	-3.05	S.D. 1.15
REAL RMSE	1.22	ADJ. SD	0	SEPARATION	0	HHLD RELIABILITY 0
MODEL RMSE	1.19	ADJ. SD	0	SEPARATION	0	HHLD RELIABILITY 0

MAXIMUM EXTREME SCORE: 10 HHLDS
MINIMUM EXTREME SCORE: 14,316 HHLDS
VALID RESPONSES: 100.0%

SUMMARY OF 8 MEASURED ITEMS

	RAW SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	661.6	2,587.1	1.25	0.07	0.94	-1.8	4.22	2.2
S.D	759.7	.5	2.50	.04	.20	3.4	3.47	2.5
MAX	2,291.0	2,588.0	4.70	.15	1.33	2.1	9.90	4.7
MIN	25.0	2,586.0	-3.27	.04	.72	-8.1	.56	-2.8

REAL RMSE	0.09	ADJ. SD	2.50	SEPARATION	28.59	ITEM RELIABILITY 1.00
MODEL RMSE	.08	ADJ. SD	2.50	SEPARATION	30.72	ITEM RELIABILITY 1.00
S.E. OF ITEM MEAN	.94					

DELETED: 10 ITEMS

Note: Mean and standard deviation of item scores were specified equal to those of the child-specific items in the full 18-item model.

Source: Prepared by USDA, ERS, based on data from the U.S. Bureau of the Census, Current Population Survey, Food Security Supplement, April 1995.

Appendix table 4—Bigsteps item statistics for households with children: Only specifically child-referenced items scaled

ITEMS STATISTICS: MEASURE ORDER

ENTRY NUMBER	RAW SCORE	COUNT	MEASURE	ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTBIS CORR.	ITEMS
18	25	2,588	4.70	0.15	1.33	2.0	9.90	1.7	0.15	chwhlday
16	83	2,586	3.44	.10	.75	-2.7	.56	-.5	.43	chskipf
15	131	2,587	2.87	.08	.77	-3.1	3.65	2.2	.47	chskip
17	253	2,588	1.98	.06	1.00	0	3.91	4.6	.45	chhungry
14	286	2,587	1.80	.06	1.03	.6	2.89	3.9	.44	chcut
6	775	2,587	.05	.04	.72	-8.1	.72	-2.8	.53	chenuf
5	1,449	2,586	-1.55	.04	.85	-5.0	2.24	3.9	.27	chbal
4	2,291	2,588	-3.27	.04	1.08	2.1	9.90	4.7	-.03	chfewfd
MEAN	662	2,587	1.25	.07	.94	-1.8	4.22	2.2		
S.D.	760	0	2.50	.04	.20	3.4	3.47	2.5		

Note: Mean and standard deviation of item scores were specified equal to those of the child-specific items in the full 18-item model.

Source: Prepared by USDA, ERS, based on data from the U.S. Bureau of the Census, Current Population Survey, Food Security Supplement, April 1995.