

## **Development and Validation of a Child Report Assessment of Child Food Insecurity and Comparison to Parent Report Assessment**

MARYAH STELLA FRAM,<sup>1</sup> EDWARD A. FRONGILLO,<sup>2</sup> CARRIE L.  
DRAPER,<sup>3</sup> and ELIZA M. FISHBEIN<sup>2</sup>

<sup>1</sup>*College of Social Work, University of South Carolina, Columbia, South Carolina, USA*

<sup>2</sup>*Department of Health Promotion, Education, and Behavior, Arnold School of Public Health,  
University of South Carolina, Columbia, South Carolina, USA*

<sup>3</sup>*USC Center for Research in Nutrition and Health Disparities, Columbia, South Carolina, USA*

*Child food insecurity (CFI) is typically assessed using parental report of child experiences, which works well for assessing food insecurity but may be inadequate for assessing children's experiences of the household food environment. This study used mixed methods to develop and validate a child report assessment of CFI, comparing the accuracy of child versus parent report. Children reported their food insecurity with high accuracy in 4 of 6 domains; parent reports were inaccurate, missing nearly half of the children experiencing hunger. Parent report may accurately reflect household food insecurity, but child report should be used to assess children's food-related needs.*

**KEYWORDS** *food insecurity, child, assessment*

Household food insecurity is associated with deficits in children's physical, psychosocial, and educational development.<sup>1</sup> These associations are evident not only in the small proportion of households in which parents report that children do not always have enough to eat but among food insecure households more generally. This suggests that the mechanisms through which children are harmed by household food insecurity extend beyond child hunger—or at least beyond child hunger of which parents are aware.

---

This study was supported by a grant from the Southern Rural Development Center and the Economic Research Service through the USDA's RIDGE program.

Address correspondence to Maryah Stella Fram, MSW, PhD, College of Social Work, University of South Carolina, Columbia, SC 29208, USA. E-mail: fram@mailbox.sc.edu

Recent qualitative research reveals that children have worries, stresses, fears, discomforts, and food management strategies of their own.<sup>2,3</sup> These child experiences are distinct from parental experiences, reflecting children's different household roles and status, their developmental level, and the unique opportunities and constraints that children have in observing, understanding, and responding to family processes and problems. Accurately identifying and assessing the full range of child experiences of food insecurity is essential to the development, targeting, and implementation of effective health, nutrition, and child development policies, practices, and programs.

Most research on child food insecurity has relied on parent reporting on the household food environment to establish whether or not the household experiences low or very low food security.<sup>1</sup> This approach works well for assessing food insecurity at the household level but is problematic when extended to assessing children's experiences of food insecurity for 2 main reasons. First, because parents and children experience food insecurity in different ways, a parent's perspective on what happens in the household is not necessarily inclusive of the most salient aspects of what the child feels, sees, thinks, and does. Second, children, in general, are in the best position to report accurately and reliably on their own experiences.<sup>4,5</sup> As much as a parent may want to try to understand what a child is going through, that parent cannot have complete information about the child's internal processes. For these reasons, reliance on parental report may not result in accurate assessment of child food insecurity and hunger.

To address this concern, we have developed, refined, and field-tested a child report survey tool designed to quickly and easily assess child food insecurity. Before describing the present study, we provide additional background on assessment of children's food insecurity, focusing on both the substantive and pragmatic concerns relating to parent versus child report as a basis for assessment.

## BACKGROUND AND STUDY AIMS

Children, in general, are in the best position to report accurately and reliably on their own experiences.<sup>4,5</sup> For instance, children's reports of their own experience are used for assessment and treatment planning related to children's health-related quality of life,<sup>4</sup> exposure to intimate partner violence,<sup>6</sup> and experiences of pain.<sup>4</sup> Child reports are the "gold standard"<sup>4</sup> for child assessment and are only moderately correlated with parental proxy reports. In part, this is because no person can have complete information about someone else's experiences or internal processes.<sup>7</sup> In addition, parental attributes and self-interest can compromise the accuracy of reporting. Parents' mental health and cultural expectations have been found to bias their perceptions of their children's behaviors,<sup>8</sup> and parents underreport

socially undesirable experiences such as bullying<sup>9</sup> and child exposure to domestic violence.<sup>6</sup> The discordance between child and parent reports has serious practice implications. For instance, because parents tend to underestimate their children's levels of pain, reliance on parental proxy reporting is associated with children receiving less optimal treatment.<sup>4</sup>

Given that children generally best report their own experiences, there have been 2 main reasons for relying on parent report to assess child food insecurity. First, foundational research on food insecurity centered on interviews with mothers in food insecure households, and those mothers indicated that they managed the household food environment for other family members and that they did so in ways that protected children from most food-related hardships.<sup>10</sup> This suggests that there should be little need to ask children about their experiences of food insecurity because (1) the mother knows about all of her child's experiences (because she is managing those experiences) and (2) children's experiences are extremely rare (because mothers are protecting children). Second, the mother perspective fits well with the conceptualization of food insecurity as a household-level phenomenon.<sup>1</sup> If food insecurity is a product of resource dynamics for a household overall, resulting in a uniform household-level experience, then the mother who has responsibility for managing that experience is in the best position to report on it.

There is substantial evidence, however, that although food insecurity certainly involves household-level resource dynamics, it is not experienced uniformly among household members.<sup>11–13</sup> Moreover, qualitative study indicates that although mothers may believe that they are managing the household food environment and protecting children from food hardships, children have their own experiences and make their own efforts to manage the food environment, at times working proactively to prevent parents from knowing about their experiences.<sup>2,3</sup>

Because children have unique experiences of food insecurity, it is useful that children also appear able to provide accurate reports of those experiences. Connell et al.<sup>14</sup> interviewed 32 children, aged 11 to 16, asking them to talk about “kids they know” whose families have “almost run out of food.” They found that children could report on household food insecurity, including the 4 domains of food insecurity commonly cited in the adult food insecurity literature (ie, quality of food, quantity of food, psychological effects, and social effects). Work by Fram et al.<sup>2</sup> also found that children could independently report food insecurity in their household, including additional domains such as heightened vigilance, anxiety and sadness about parental hardships, and taking on responsibility for solving adult problems. This qualitative research further found that child reports often differed from the reports of the parent or primary caregiver. For example, Fram et al.<sup>2</sup> found that children employed food-saving strategies such as eating less and eating away from home; parents were not always aware of these strategies.

One effort has also been made to formally assess youth food insecurity through self-report in survey research. Connell et al.<sup>15</sup> developed a child report survey that adapted selected items from the Household Food Security Survey module (HFSSM) for use with children between the ages of 12 and 17. Testing of this measure (Child Food Security Survey Module, CFSSM) indicated acceptable reliability as well as face and internal validity.<sup>15</sup> Cognitive interviewing found that children understood what was being asked and that their responses were consistent with researcher intent. The CFSSM is an important step toward the accurate and direct measurement of child food insecurity, but development of the CFSSM accepted, a priori, that the domains and indicators of adult food insecurity would provide an adequate basis for assessing child food insecurity. In effect, the CFSSM assumes that children and adults have the same experiences and simply need to be asked about those experiences using different language. This raises concerns about validity. The HFSSM was developed based on interviews with adults and it reflects adult concerns, problems, and ways of thinking. For instance, questions are conditioned on money (eg, "Did you ever skip meals or cut the size of your meals because there wasn't enough money for food?"). Children, who do not typically generate money or purchase food, may make sense of the same food cutbacks through a different lens; for instance, cutting back their own portions because there wasn't enough food for everyone to eat their fill or to make sure that parents or a sibling had something to eat. Reliable and accurate measurement of child food insecurity requires that the full range of children's experiences and perspectives be tapped; this means beginning with children's own conceptualizations and descriptions of their experiences related to food insecurity.

Toward this end, the present study drew on the results of prior in-depth interviews with children to develop, refine, and validate a child report assessment of child food insecurity. Specifically, we aimed to determine the (1) accuracy of assessment items asked of children, (2) accuracy of assessment items asked of parents, and (3) agreement between items asked of children and substantively similar items asked of parents.

## METHODS

This mixed-methods study took place in central South Carolina in 2 stages. First, an initial set of items tapping child food insecurity was developed based on prior research. These initial items were then refined through cognitive interviews with a diverse sample of children ( $n = 24$ ). Second, the refined items were field-tested with a larger sample of children ( $n = 87$ ) and validated through comparison of survey item responses to definitive classifications of child food security status based on in-depth interviews conducted with each child. To support comparison of parent versus child report

approaches, parents of field-test children were also surveyed about their household food security status and some basic economic and demographic characteristics.

## Stage 1—Initial Measure Development and Refinement

### PRELIMINARY ITEMS

We began by drafting 30 items to capture children's experiences within 2 domains (awareness and responsibility), comprised of 6 subdomains of child food insecurity: cognitive awareness, emotional awareness, physical awareness, participation in parent food management strategies, initiation of child food management strategies, and resource generation.<sup>2</sup> These subdomains were established in our previous study,<sup>2</sup> through inductive analysis of in-depth interviews with 30 children living in households at risk for food insecurity. "Awareness" domains reflect the child's direct experiences of cognitions (eg, food is running out, there is not enough money for food, there are limited foods to eat until next month's food stamp benefit is available), emotions (eg, worry, anger, anxiety), and physical feelings (eg, hunger, tiredness, stomach pains) related to food scarcity and/or the inadequacy of available food resources. "Responsibility" domains reflect things that children do that indicate they are experiencing food insecurity. "Participation" refers to a child's active and cooperative involvement in adult-initiated strategies for coping with food hardships. "Initiation" reflects a child's own initiation of strategies to make scarce food resources last (eg, cutting back on portions). "Resource generation" refers to a child's efforts to contribute food or money for food to augment household food resources at times of scarcity. Preliminary items were developed to tap each subdomain; each item was a statement derived directly from interviews conducted with children in our prior study. Survey instructions asked children to respond to whether each statement was *often true*, *sometimes true*, or *never true* based on their experiences within the last month.

### COGNITIVE INTERVIEWING

To refine the initial items, cognitive interviews were conducted with 24 children. Participants ranged in age from 6 to 17 years old and varied in gender (10 female and 14 male) and race/ethnicity (15 African American, 8 Caucasian, 1 Hispanic/Latino). Sample children were recruited using fliers posted at 2 local food pantries. Informed consent from a caregiver and informed assent from the participating child were obtained. Participants received a \$20 gift card at the end of their interview in appreciation for their time. Interviews were conducted in participants' homes. During the cognitive interview, the interviewer read the survey instructions to the child

and then used concurrent probing with the items. The children were read one item out loud, asked to respond, and then asked probing questions to ascertain how they understood the question and why they responded as they did. When probed, children were asked to define and give examples of certain terms and phrases such as “hungry” or “foods that are good for you,” rephrase items in their own words, and describe what they were thinking when responding to the item. Probing ensured that the contexts of reports of hunger, worry, etc, were fully explored so that each item could be assessed for its ability to differentiate experiences related to food insecurity from other potential “causes” of experiences (eg, feeling hungry because dinner is served a little later than usual, worrying about whether or not the child’s favorite treat would be purchased at the grocery store). Once the interviewer had a full picture of the child’s cognitions related to one item, the interview proceeded to the next item and repeated the question/response/probing process. Items were revised in response to interviews, and each revised statement was retested with at least 2 additional children in the cognitive interview sample.

#### ITEM REVISIONS

Language was adjusted on statements that children interpreted differently than we intended, and several words/phrases that children did not understand were changed. A few examples include changing “foods are *cheap*” to “foods do not cost much”; “*good* foods” to “food to make a meal”; and “*stretch* food” to “only use a little bit of food at a time.” In addition, a new item was added to tap the dimension of participation because children understood the single original item to have narrower meaning than was intended, so some relevant experiences were not being captured.

Revisions were also made in response to children’s understandings related to frequency and time. The original response options for each items were “often true,” “sometimes true,” and “never true.” Multiple children did not understand the distinction between something occurring “often” versus “sometimes.” Therefore, the revised response instruction asked children to “say whether this happened to you MANY times, 1 or 2 times, or NEVER.”

Finally, we extended the time frame for children to consider in their responses from in the last month to in the last year (12 months). This was done for 2 main reasons. First, throughout the interviews, the children naturally talked about and recalled their food experiences in terms of the past year, grounding food-related events in the context of seasons, holidays, and the flow of the school year. In contrast, children struggled when pushed to respond based on the last month, expressing uncertainty about whether an event was a little more or a little less than a month ago, suggesting that the one-month time frame would introduce unnecessary error. Second, the one-year time frame allowed children to make meaningful distinction about

whether events happened 1 or 2 times versus many times—particularly for experiences that by definition can only happen once each month (eg, “we almost run out of food by the end of the month”). In addition to the improved results in cognitive interviews using 12 months, this change provides better consistency between the child assessment and the 18-item HFSSM currently utilized by the US Department of Agriculture (USDA) to determine the prevalence of food insecurity in the United States, which asks adult respondents to answer questions based on their household’s experiences in the past 12 months.

## Stage 2—Field Testing

A total of 100 child–adult dyads from separate families participated in the field testing of the revised set of items. Participants were recruited using informational flyers posted at community-based organizations (eg, food pantries, Boys and Girls Clubs), and through word of mouth from participants and researchers. We aimed to recruit a sample that had a substantial proportion of food insecure families.

### CAREGIVER QUESTIONNAIRE

The caregiver questionnaire included the 18-item HFSSM, 8 items pertaining to family demographics, and 4 items pertaining to the participating child’s academic performance and overall well-being. Prior to administering the survey, informed consent was obtained from each adult participant. The participants were asked whether they would like to read and fill out the survey themselves (98) or would prefer that the researcher read the items aloud (2). Each participant received a \$10 gift card as an incentive.

### CHILD QUESTIONNAIRE

One hundred child participants completed the newly developed items as well as 4 demographic questions (age, gender, race, and ethnicity). Questionnaires and interviews were administered in the child’s home in all but a few cases (a few children were interviewed in a private room at the Boys and Girls Club and one child was interviewed in a private space at the local public library). Prior to conducting the questionnaire, informed consent was obtained from a caregiver for each participating child. The caregiver was then asked to leave the room to help ensure that a child’s responses were not biased by a family member’s presence. In some instances this was not possible (eg, families living in motel rooms) and the process proceeded with the parent in the room. Informed assent was obtained from each child. The researcher read aloud the instructions to the questionnaire and then read each item and the response options and marked the child’s

responses accordingly. Aside from occasional minor clarifying questions, no other dialogue took place between the researcher and child during the completion of the survey. Each child received a \$10 gift card in appreciation for his or her time completing the questionnaire.

#### CHILD INTERVIEW

After completion of the questionnaire, the researcher conducted in-depth interviews with 91 of the 100 sample children. Nine children did not participate in the follow-up interview because there was not enough time on the day of the survey and the family chose not to schedule an additional time (6 children), the caregiver declined to allow the child to participate (1 child), and the caregivers did not return the consent form to allow their children to participate (2 children). Child interviews were semistructured, including 12 open-ended questions tapping the 6 subdomains of child food insecurity identified in our previous research<sup>2</sup> and ample probing to clarify the context and meaning of child responses. Probing ensured that the contexts of reports of hunger, worry, etc. were fully explored so that for each subdomain, experiences related to food insecurity were differentiated from other potential causes of experiences.

Each child received a \$10 gift card for participating in the interview. Interviews were audio-recorded. Four of the 91 child interviews revealed a substantial lack of understanding of the questions; these children (2 age 6 years, 2 age 7 years) and they were excluded from the sample for analysis. The final field-test sample for comparative child–parent analysis had a total of 87 parent–child dyads (Table 1).

#### Analysis

Aims 1 and 2 of this study were to assess the accuracy of child-reported items and the accuracy of parent-reported items. Accuracy of a measure refers to the agreement between that measure and the “true” value of the thing being measured. Our strategy for assessing accuracy was to compare child and parent reports from the respective survey items to a definitive classification of the child’s true experiences of food insecurity. A definitive classification or measure involves observing a phenomenon with respect to the first principles that reflect the underlying theoretical structure of that phenomenon.<sup>16</sup> In general, the large-scale use of a definitive measurement approach is prohibitive due to logistical challenges and the time it takes to obtain each measurement, so the development of reference or field measures is critical to being able to measure a phenomenon efficiently. Our analytical approach of developing and using a definitive classification to establish accuracy has been used successfully for validating measures of growth faltering<sup>17</sup> and household or adult food security.<sup>18–20</sup>



In this study, in-depth interviews with children were used as the basis for definitive classification of children as experiencing or not experiencing each of 6 subdomains that comprise child food insecurity.<sup>2</sup> The process for developing a definitive measure uses principles of pattern recognition, independent coding by multiple raters, and achievement of rater consensus.<sup>16</sup> For this study, each interview was listened to and coded by 3 independent raters using a common coding form. Pattern identification was established using a test set of interviews. All remaining interviews were then coded, and when there were initial coding disagreements, consensus was reached through team discussion. The resulting definitive classification scored each child as positive or negative for each of 6 subdomains of child food insecurity (ie, cognitive awareness, emotional awareness, physical awareness, participation, initiation, and resource generation).

Accuracy of child and adult items was calculated in terms of sensitivity, specificity, and area under the receiver operating characteristic (ROC) curve.<sup>21</sup> *Sensitivity* refers to the ability of an indicator (ie, an item or set of items) to affirm food insecurity when food insecurity truly does occur. *Specificity* refers to the ability of an indicator to affirm no food security when food insecurity truly does not occur. Area under the ROC curve quantifies the overall ability of an indicator to correctly affirm food insecurity compared to chance, ranging from 0.5 (chance) to 1.0 (perfect accuracy), with >0.75 being good and >0.9 being excellent. It is calculated by plotting sensitivity versus 1? specificity for all possible cut points of the indicator and taking the area under the resulting curve.

The child survey items were grouped based on the subdomain they were developed to tap. Each item was assessed for fit with other related items and fit with the definitive classification. Items that were inaccurate or redundant with other items within the subdomains were eliminated. Remaining items were used to form composite indicators for each subdomain, with affirmation of any one or more items coded as an affirmation of the subdomain. An item was considered to be affirmed if the response was either "1 or 2 times" or "many times." ROC curves were calculated, comparing each composite indicator of child items to the definitive classification.

Adult items were assessed for substantive similarity to each child subdomain. Because the HFSSM was not designed to tap children's emotional awareness or their participation in household food management, the only items that could be compared were an item related to child physical awareness ("In the last 12 months, was your child or children ever hungry, but you just couldn't afford more food?") and an item describing the household condition about which children were asked to report as an indicator of cognitive awareness ("We couldn't feed our children a balanced meal, because we couldn't afford that.").

Agreement between child and adult items was assessed using kappa (range 0 to 1). Kappa < 0.4 indicates poor agreement.<sup>22</sup>

## RESULTS

### Definitive Measure

The coding of interview data indicated that the 6 subdomains of child food insecurity were prevalent in the field-test sample, ranging from 0.23 (resource generation) to 0.64 (cognitive awareness; see Table 2, column 7).

### Accuracy of Child Items

The child indicators had sensitivities (expressed as a percentage) ranging from 65.0 (resource generation) to 91.5 (emotional awareness). Specificities ranged from 51.4 (participation) to 81.0 (physical awareness). Column 5 in Table 2 shows that ROC curve areas for 4 of the 6 subdomains were in the “good” range (cognitive, emotional, physical, and initiation). A comparison of columns 6 and 7 shows that the child indicators accurately reported prevalence of cognitive awareness and somewhat overreported prevalence in the other 5 dimensions (except for resource generation, which had a larger difference in prevalence).

### Accuracy of Parent Items

For the 2 parent report items from the HFSSM that relate to child food insecurity subdomains, the ROC curve area was poor (Table 3). A comparison of prevalence showed that parent items underreported child experiences, with parents underreporting the experience of hunger by half.

Assessment of the agreement between parent and child items yielded only one item match that reached a level of statistical significance. This match compared children’s responses to the item, “We almost run out of food by the end of the month” with parent response to the item “The food that we bought just didn’t last, and we didn’t have money to buy more.” Observed agreement was 58.8%, expected agreement was 49.7%, and the resulting kappa of 0.18 was below 0.4, meaning poor agreement.

### Additional Analysis

An additional analysis was run to quantify the accuracy of the child report versus parent report approach overall for identifying children experiencing the subdomain of physical awareness (ie, hunger). Hunger was chosen because it is both the subdomain of child food insecurity that the HFSSM

**TABLE 1** Demographic Characteristics of Respondents in the Field-Test Sample<sup>a</sup>

| Variable                          | Percentage or mean (SD) |
|-----------------------------------|-------------------------|
| Race/ethnicity                    |                         |
| White                             | 23.26                   |
| African American                  | 74.42                   |
| Other                             | 1.16                    |
| Hispanic                          | 1.16                    |
| Household income                  |                         |
| <\$10 000                         | 34.88                   |
| \$10 000–\$29 999                 | 41.86                   |
| \$30 000–\$49 999                 | 6.98                    |
| \$50 000 or more                  | 16.28                   |
| Parent education                  |                         |
| <High school                      | 15.12                   |
| High school diploma/GED           | 31.40                   |
| Some college/tech school          | 27.91                   |
| BA degree                         | 18.60                   |
| Graduate/professional degree      | 6.98                    |
| Household size (number of people) | 3.89 (1.54)             |
| Household structure               |                         |
| Single mother                     | 51.72                   |
| Single father                     | 2.30                    |
| Two-parent                        | 37.93                   |
| Other                             | 8.05                    |
| Geographic type                   |                         |
| Large city                        | 33.72                   |
| Small city                        | 31.40                   |
| Suburb                            | 11.63                   |
| Small town                        | 8.14                    |
| Rural                             | 15.12                   |
| Food resource participation       |                         |
| SNAP                              | 59.77                   |
| WIC                               | 11.49                   |
| School lunch/breakfast            | 66.67                   |
| Food pantry                       | 49.43                   |
| Soup kitchen                      | 1.16                    |
| Household food security status    |                         |
| Food secure (0 affirmations)      | 18.39                   |
| Average affirmations (0–18)       | 6.09 (4.88)             |

<sup>a</sup>The sample size varies between 86 and 87 depending on number of reports. SNAP indicates Supplemental Nutrition Assistance Program; WIC, Special Supplemental Nutrition Program for Women, Infants and Children.

most directly taps and currently of policy interest. Figure 1 has 4 lines showing the accuracy of 3 different assessments for identifying children with physical awareness of food insecurity: the bottom, straight diagonal line shows the accuracy of “chance,” the next lowest line (diamond markers) shows the accuracy of the full 18-item HFSSM, the middle line (circle markers) shows the accuracy of the HFSSM child items only, and the top line (square markers) shows the accuracy of the composite physical awareness

**TABLE 2** Accuracy of Indicators of the Domains of Child Food Insecurity in Comparison to the Definitive Classification From the Qualitative Interviews<sup>a</sup>

| Subdomains    | Item(s) constituting indicator  | Sensitivity (%) | Specificity (%) | ROC area | Prevalence (items) | Prevalence (defn.) |
|---------------|---|-----------------|-----------------|----------|--------------------|--------------------|
| Cognitive     | C1: We can't get the food we want because there is not enough money   | 82.1            | 71.0            | 0.77     | 0.63               | 0.64               |
| Emotional     | C18: I worry about how hard it is for my parents to get enough food for us<br>C19: I worry about not having enough to eat       | 91.5            | 64.1            | 0.78     | 0.67               | 0.55               |
| Physical      | C12: I feel hungry because there is not enough food to eat<br>C14: I get really tired because there is not enough food to eat   | 89.3            | 81.0            | 0.85     | 0.43               | 0.33               |
| Participation | C23: I act ok when we don't have enough money to buy the foods I want   | 77.1            | 51.4            | 0.64     | 0.66               | 0.56               |
| Initiation    | C28: I try not to eat a lot so that our food will last  | 82.5            | 77.8            | 0.80     | 0.51               | 0.47               |
| Generation    | C31: I bring home food so that there is enough for everyone to eat<br>C32: I work to earn money so that we can have enough food | 65.0            | 66.7            | 0.66     | 0.41               | 0.23               |

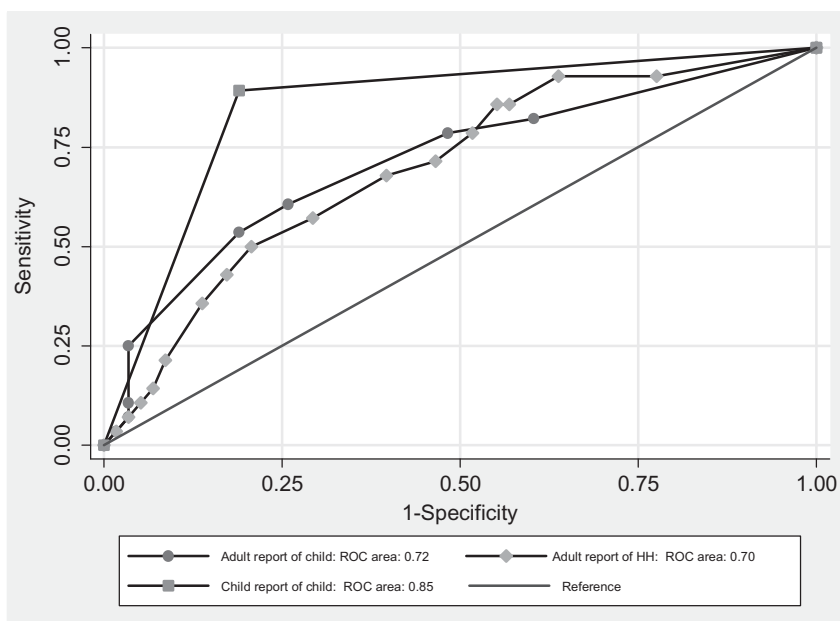
<sup>a</sup>Sensitivity, specificity, and ROC area refer to the sensitivity, specificity, and area under the ROC curve for the comparison of the indicator with the definitive classification of each subdomain, respectively. Prevalence (items) refers to the prevalence of the subdomain estimated by the indicator, and Prevalence (defn.) refers to the prevalence of the subdomain from the definitive classification. ROC indicates receiver operating characteristics.

**TABLE 3** Accuracy of Items Reported by Parents in Comparison to the Definitive Classification From the Qualitative Interviews<sup>a</sup>

| Subdomain <sup>b</sup> | Item  | Sensitivity (%) | Specificity (%) | ROC area | Prevalence (item) | Prevalence (defin.) |
|------------------------|---|-----------------|-----------------|----------|-------------------|---------------------|
| Cognitive              | P11: We couldn't feed our children a balanced meal, because we couldn't afford that                         | 60.7            | 61.3            | 0.61     | 0.53              | 0.66                |
| Physical               | P15: In the last 12 months, was your child or children ever hungry, but you just couldn't afford more food? | 35.7            | 94.8            | 0.65     | 0.15              | 0.33                |

<sup>a</sup>ROC indicates receiver operating characteristics.

<sup>b</sup>The other 4 subdomains (ie, emotional awareness, participation, initiation, and resource generation) are not included because the adult questionnaire had no items to measure these subdomains, so no comparison was possible. See notes for Table 2 for definitions of the reported statistics.

**FIGURE 1** Comparing parent versus child report of child physical awareness and adult report of household with definitive classification of child physical awareness.

items asked of children in this study. The children's physical awareness composite indicator had an ROC curve area of 0.85, meaning good to excellent accuracy. The ROC curve areas for the 2 parent report measures were 0.70–0.72, meaning poor accuracy.

## DISCUSSION

Accurate assessment of child food insecurity is crucial, both for supporting effective practice with children and families and for informing policies and programs aimed at improving child well-being. Toward that end, the aims of this study were to determine the accuracy of items asked of children, the accuracy of items asked of parents, and the agreement between items asked of children and substantively similar items asked of parents. In 4 out of the 6 subdomains of child food insecurity, accuracy was good (ROC curve area  $\geq 0.75$ ). The accuracy of indicators from child report was substantially greater than the poor accuracy of indicators from parent report of children's experiences.

Accurate assessment of physical awareness is particularly important in the context of national and international concern about child hunger, malnutrition, and the related negative health consequences. The child items indicating physical awareness identified 89.3% of children who truly were physically aware and 81% of children who truly were not physically aware, with an overall area under the ROC curve of 0.85. In contrast, the accuracy of parent report of child physical awareness was poor. Though the parent report item identified 94.8% of children who truly were not experiencing physical awareness, this item only identified 35.7% of children who truly were experiencing physical awareness. This reflects both considerable inaccuracy (ROC curve area of 0.65) and underreporting of child hunger based on parental report.

Child report items also accurately indicated cognitive and emotional awareness and initiation. One parent report item from the HFSSM is conceptually similar enough to "cognitive awareness" to assess accuracy; whereas the ROC curve area for the child report items was 0.77, the ROC curve area for the parent report item was only 0.61, which is not much different than we would expect if classifying children based only on chance (ROC curve area = 0.5). For emotional awareness, the child report ROC curve area was 0.78, but because parents were asked no questions about their children's food-related worries, fears, or stresses, there is no way to compare the accuracy of child versus parent report. Given existing research on child self-report, we might expect that parent report would not be accurate on this subdomain even if it were attempted, because emotional awareness is an inherently internal experience.<sup>7</sup>

Two subdomains had lower accuracy of child report. Participation and resource generation items did not distinguish food secure from food insecure children well in these subdomains; this was demonstrated by the low ROC curve areas ( $<0.7$ ), which reflected poor specificity for participation and poor sensitivity and specificity for resource generation.

Participation was challenging to capture in survey item format throughout the item development process, primarily because the underlying concept

is both nuanced and complex. Participation refers to a child's active cooperation and involvement with a food-saving strategy that the parent initiates. Thus, for a child to participate, he or she must (1) be aware that the parent is doing something or asking that something be done due to food scarcity, (2) choose to participate in the parent's strategy, and (3) act cooperatively with that strategy, thus taking on some responsibility for the household food environment. This combination of context (food scarcity), action (cooperation), and intent (choosing to cooperate when it is possible to choose not to) was difficult to capture in survey items.

Resource generation refers to a child bringing food and/or money for food into the household resource pool. The prevalence of resource generation in our sample was relatively low (0.23), and there was substantial variety in how children generated resources (eg, giving parents money from a part-time job, giving parents money that the child was given for a birthday, bringing food home from a party or play date, completing neighborhood jobs and work in exchange for food, asking friends to borrow food), making it difficult to formulate items that would capture all instances while excluding superficially similar events that are not experiences of food insecurity (eg, asking to purchase additional fast-food drive-through items and bringing them home so that a sibling would have the food he or she most preferred, using allowance money to buy an extra treat).

Consistent with the differences in accuracy between child and parent report items, we found poor agreement between child and parent reports on substantively similar items. We compared 15 pairs of child and parent items, and only one pairing (between child and parent reports of the household running out of food before the end of the month) resulted in agreement significantly better than chance. Although statistically significant, agreement was poor, perhaps reflecting the unique child and parent perspectives on and experiences of food scarcity.

We extended the analysis to assess the overall performance of the USDA full 18-item HFSSM, the HFSSM child items only, and our child self-report items for identifying children who are experiencing physical awareness of food insecurity (eg, child hunger). Each of these measures can have high sensitivity to children's hunger experiences; that is, all 3 curves in Figure 1 achieve approximately 90% sensitivity at some cut point. However, only our child self-report items achieved high sensitivity and specificity at the same cut point. That is, the HFSSM (either the full scale or the child items) has no cut point that achieved acceptable levels of both sensitivity and specificity. For instance, to identify at least 80% of hungry children using the HFSSM requires accepting specificity below 50%. This means that to avoid missing children who are potentially in need of services requires accepting that less than half of not-hungry children will be correctly identified. In contrast, the child report items achieve a good balance of sensitivity and specificity, accurately classifying 84% of children.

Four out of 17 children below 8 years of age could not discuss their food experiences with enough clarity for us to make a definitive classification of their food security status. To determine whether other young children were less accurate reporters, we ran all accuracy analyses stratifying for children's age, and young children were no less accurate than older children (analysis not shown). This suggests that many young children can discuss their food insecurity experiences and answer survey questions about those experiences accurately but some cannot. Child report assessment of children below 8 years of age should be undertaken carefully, with dialogue to explore and confirm child responses to survey items. In a current project, we are successfully administering the assessment one-on-one with young children by doing considerable probing using art and physical objects (eg, play food) to clarify the meaning of the responses. This extent of probing may not be feasible for data collection in a surveillance system but is feasible for practitioners who may use this measure within an assessment process.

## CONCLUSION

Children are the best reporters of their own food insecurity experiences. Children as young as 6 years old were able to report on their own food-related experiences and to do so with substantially greater accuracy than their parents. This does not mean that parent reports are not the best way to assess food security at the household level; rather, it suggests that different household members have different perspectives on the household food environment and on their and other family members' experiences of it. These differences likely flow, in part, from the inherent limitations when any individual is asked to assess what and how someone else thinks and feels. In addition, these differences may be related to the different meanings and feelings that children and parents attribute to similar food experiences, depending on developmental stage, role, and the set of life experiences through which one makes sense of food hardships. These differences also may be related to an unequal distribution of food resources and food-related responsibilities among household members. Additional research should examine the dynamics within households, looking at the relationships among parental food insecurity, child food insecurity, and the resource and relational contexts that characterize family life.

Whatever the cause(s) of the differences between parent and child report, when the goal of assessment is to improve child well-being by quantifying the number of children with adverse experiences or identifying those children with such experiences, it is critical to accurately assess what children themselves are experiencing. Such assessment should be based on children's own reporting of their experiences. Assessment using the items presented in this article can be a starting point for developing intervention strategies,



helping to clarify when a child is experiencing food-related challenges and the nature of those experiences. Different interventions may be indicated for children who are experiencing different subdomains of food insecurity. For instance, whereas children who experience physical awareness may benefit from programs that augment their food resources, children who also report emotional awareness may need both mental health services and augmented food resources to reduce risk of negative outcomes. A child who is struggling in school may receive more appropriate and effective intervention if their resource-generating after-school job is identified.

In addition to assessing different subdomains of child food insecurity to plan interventions, the subdomains may be differentially related to important outcomes. For instance, physical awareness may be more closely related to dietary and weight outcomes, whereas emotional awareness may be more related to behavioral outcomes and academic achievement. For other purposes, it may be best to use the items as a scale to distinguish children who experience food insecurity from those who do not. Subsequent research that includes outcome data will be important for clarifying and refining the potential different uses of this set of child food security items for different purposes, applied to children of different ages and in different household, resource, and cultural contexts. Such research will further enhance our understanding of child food insecurity and its causes and consequences.

## REFERENCES

1. National Research Council. *Food Insecurity and Hunger in the United States: An Assessment of the Measure*. Washington, DC: Committee on National Statistics, Division of Behavioral and Social Sciences and Education; 2006.
2. Fram MS, Frongillo EA, Jones SJ, et al. Children are aware of food insecurity and take responsibility for managing food resources. *J Nutr*. 2011;141:1114–1119.
3. Bernal J, Frongillo EA, Herrera H, Rivera J. Children live, feel, and respond to experiences of food insecurity that comprise their development and weight status in peri-urban Venezuela. *J Nutr*. 2012;142:1343–1349.
4. Sheffler LC, Hanley C, Bagley A, Molitor F, James MA. Comparison of self-reports and parent proxy-reports of function and quality of life of children with below-the-elbow deficiency. *J Bone Joint Surg*. 2009;91:2852–2859.
5. Varni JW, Limbers CS, Burwinkle TM. Parent proxy-report of their children's health-related quality of life: an analysis of 13,878 parents' reliability and validity across age subgroups using the PedsQL 4.0 Generic Core Scales. *Health Qual Life Outcomes*. 2007;5(1):2–10.
6. Hungerford A, Ogle RL, Clements CM. Children's exposure to intimate partner violence: relations between parent-child concordance and children's adjustment. *Violence Vict*. 2010;25:185–201.
7. Grych JH, Jouriles EN, Swank PR, McDonal R, Norwood WD. Patterns of adjustment among children of battered women. *J Consult Clin Psychol*. 2000;68:84–94.

8. Najman JM, Williams GM, Nikles J, et al. Biase influencing maternal reports of child behavior and emotional state. *Soc Psychiatry Psychiatr Epidemiol.* 2001;36:186–194.
9. Holt MK, Kantor GK, Finkelhor D. Parent/child condordance about bullying involvement and family characteristics related to bullying and peer victimization. *J Sch Violence.* 2008;8:42–63.
10. Radimer KL, Olson CM, Greene JC, Campbell CC, Habicht JP. Understanding hunger and developing indicators to assess it in women and children. *J Nutr Educ.* 1992;24(1 suppl):36S–44S.
11. Hadley C, Lindstrom D, Tessema F, Belachew T. Gender bias in the food insecurity experience of Ethiopian adolescents. *Soc Sci Med.* 2008;66:427–438.
12. Kuku O, Gundersen C, Garaksy S. Differences in food insecurity between adults and children in Zimbabwe. *Food Policy.* 2011;36:311–317.
13. Nanama S, Frongillo EA. Women's rank modifies the relationship bewteen household and women's food insecurity in complex households in northern Burkina Faso. *Food Policy.* 2012;37:217–225.
14. Connell CL, Lofton KL, Yadrick K, Rehner TA. Children's experiences of food insecurity can assist in understanding its effects on their well-being. *J Nutr.* 2005;135:1683–1690.
15. Connell CL, Nord M, Lofton KL, Yadrick K. Food security of older children can be assessed using a standardized survey instrument. *J Nutr.* 2004;134:2566–2572.
16. Frongillo EA. Validation of measures of food insecurity and hunger. *J Nutr.* 1999;129:506S–509S.
17. Frongillo EAJ, Rothe GE, Lambert JKJ. Determining growth faltering with a tracking score. *Am J Hum Biol.* 1990;2:491–501.
18. Frongillo EA, Nanama S. Development and validation of an experience based measure of household food insecurity within and across seasons in northern Burkina Faso. *J Nutr.* 2006;136:1409S–1419S.
19. Frongillo EA, Rauschenbach BS, Olson CM, Kendall A, Colmenares AG. Questionnaire-based measures are valid for the identification of rural households with hunger and food insecurity. *J Nutr.* 1997;127:699–705.
20. Wolfe WS, Olson CM, Kendall A, Frongillo EA. Hunger and food insecurity in the elderly: its nature and measurement. *J Aging Health.* 1998;10:327–350.
21. Swets JA. Measuring the accuracy of diagnosic systems. *Science.* 1988;240:1285–1293.
22. Fleiss JL. *Statistical Methods for Rates and Proportions.* New York, NY: John Wiley & Sons; 1981.