

**Development and validation of a child-report assessment of
childhood food insecurity and comparison to parent-report
assessment**

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Household food insecurity is associated with deficits in children's physical, psychosocial, and educational development (National Research Council, 2006). 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 idea is supported by recent qualitative research revealing that children have worries, stresses, fears, discomforts, and food management strategies of their own (Fram et al., 2011). 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 about 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. 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 two main reasons. First, because parents and children experience food insecurity in different ways, a parent 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 (Sheffler, Hanley, Bagley, Molitor & James, 2009; Varni, Limbers, & Burwinkle, 2007). As much as a parent may

want and try to understand what a child is going through, that parent cannot have complete information about the child's internal processes. For these reasons, the reliance on parental report is a barrier to accurate assessment of childhood food insecurity and hunger.

To address this barrier, our research team has 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 childhood 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 (Sheffler, Hanley, Bagley, Molitor & James, 2009; Varni, Limbers, & Burwinkle, 2007). For instance, children's reports are used to assess and plan interventive responses to their health-related quality of life (Sheffler et al., 2009), exposure to intimate partner violence (Hungerford, Ogle, & Clements, 2010), and experiences of pain (Sheffler et al., 2009). Child reports are the "gold standard" (Sheffler et al., 2009) for child assessment, and are only moderately correlated with parental proxy reports. In part, this is because parents cannot have complete information about their children's experiences or internal processes (Grych, Seid & Fyncham, 1992). In addition, parental attributes and self-interest sometimes compromise the accuracy of reporting. Parent mental health and cultural expectations have been found to bias perceptions of child behavior (Najman et al., 2001), and parents under-report socially undesirable experiences such as bullying (Holt, Kantor & Finkelhor, 2009) and child exposure to domestic violence (Hungerford et al., 2010). 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 can prevent children from receiving optimal treatment (Sheffler et al., 2009).

There have been two main reasons for relying on parent report to assess childhood food insecurity. First, foundational research on household food insecurity centered on interviews with mothers in food-insecure households, and those mothers reported 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 (Radimer, 1992). From this mother perspective, there should be no need to ask children directly since the mother would know about all child experiences (because they are managing those experiences), and child experiences would be extremely rare (because mothers are protecting them). Second, the mother perspective fits well with the conceptualization of food security as a household-level construct (National Research Council, 2006). In the ways that food security occurs for a household, there should be a single household-level experience to assess, and, if the mother has responsibility for managing that experience, she is in the best position to report on it. The idea that child report could be different from parent report implies that either 1) food insecurity happens at the individual as well as the household level, and/or 2) the parent or child is reporting inaccurately. If there is reporting inaccuracy, according to this mother perspective, we might expect that parents will likely be more accurate both because of their greater cognitive maturity and their more complete and nuanced understanding of the household economy.

Despite these reasons for preferring parent report of household food-security status, an emerging body of qualitative research examines children's experiences of food insecurity directly. Connell, Lofton, Yadrick, and Rehner (2005) 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 four domains of food insecurity commonly cited in the adult food-insecurity literature (i.e., quality of food, quantity of food, psychological effects, and social effects). Specifically, children reported reduced eating, feelings of shame and fear, and using social networks to obtain food. Work by Fram et al. (2011) 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. 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. Connell, Nord, Lofton, and Yadrick (2004) 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 (Connell et al., 2004). 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 childhood 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 measuring childhood 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 (e.g., “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 cut-backs 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 conceptualization and description of their experiences related to food insecurity.

Toward this end, the present study draws on the results of our team’s recent in-depth interviews with children to develop, refine, and validate a child-report assessment of childhood 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 study took place in two stages. First, an initial set of items was developed based on prior research and was then refined through cognitive interviews with a small, diverse sample of children. Second, the refined items were field-tested with a larger sample of children, and validated through comparison of item responses to data collected through in-depth interviews with each child. To support additional analysis, 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 this project by drafting 30 items to capture children's experiences within two domains (awareness and responsibility), comprised of 6 sub-domains of childhood food insecurity: cognitive awareness, emotional awareness, physical awareness, participation in parent food management strategies, initiation of child food management strategies, and resource generation (Fram et al., 2011). Each item was a statement derived directly from interviews conducted with children in our prior study. The survey instructions asked children to respond based on 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 twenty-four 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). A flyer was hung at two food pantries in two neighboring South Carolina counties to recruit participants. 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. Revisions to the items were made throughout the cognitive testing process. Each revised statement was retested with at least two additional children.

Major item revisions. The cognitive interviewing process informed multiple, incremental revisions of the initial items. These revisions included: adding two new items; slightly rewording 13 items, changing the response options, and extending the time-frame for children to consider in their responses. For example, the original measure only had one item tapping "participation", and children understood that item to have narrower meaning than was intended, so an additional item was added. We adjusted language on statements that children seemed to

interpret differently than we intended, and changed words/phrases that children did not understand. 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”.

The original response option instructions read, “for each statement, please indicate whether the statement was OFTEN true, SOMETIMES true, or NEVER true...” Multiple children did not understand the distinction of something occurring “often” versus “sometimes”. Therefore, the revised instruction read, “for each statement, please 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 two main reasons. First, children naturally talked about and recalled their food experiences in terms of the past year, grounding food-related events in the context of seasons 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. Second, the one-year time-frame allowed children to make meaningful distinction about whether events happened one or two times, versus many times – particularly for experiences that by definition can only happen once each month (e.g. “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 also provides better consistency between the child assessment and the 18-item HFSSM currently utilized by the USDA to determine the prevalence of food insecurity in the US, 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 one hundred child/adult dyads from separate families participated in the field testing of the revised set of items (see Table 1 for demographic characteristics of the field test sample). Participants were recruited using informational flyers posted at community-based organizations (e.g., food pantries, Boys & Girls Clubs), and word of mouth from participants and researchers. Informed consent from each participating adult and informed assent from each participating child were obtained. Children responded to the newly developed items, and caregivers were asked to fill out a survey including the full 18-item HFSSM and a few additional demographic questions. Subsequent to completing the newly developed items, each child was interviewed in-depth about his/her food-related experiences.

Caregiver questionnaire. The caregiver questionnaire included the 18-item HFSSM currently utilized by the USDA to determine the prevalence of food insecurity in the US, plus 8 items pertaining to family demographics and 4 items pertaining to the participating child's academic performance and overall well-being. Each caregiver was asked by the researcher whether they felt comfortable reading and filling out the survey themselves. Out of the 100 caregiver participants, two caregivers requested that a researcher read the questions aloud; for these two participants, the interviewer read the survey aloud, and filled in the appropriate responses for the participant. The other 98 caregiver participants read and filled out the survey themselves. Each participant received a \$10 gift card as an incentive.

Child questionnaire. One-hundred child participants completed the revised items plus answered four demographic questions (age, gender, race, and ethnicity). 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 in order to help ensure that a child's responses were not biased by a family member's presence. In some instances this was not possible (e.g.,

families living in motel rooms). Informed assent was then obtained from the participating 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/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. The nine who did not participate in the interview were: 6 because the researcher ran out of time that day and the family did not choose to schedule an additional time for the interview, 1 because the caregiver declined to allow their child to participate, and 2 because the caregivers did not return the consent form to allow their child to participate. The interview included 12 open-ended questions developed to solicit the child's experiences related to the 6 sub-domains of childhood food insecurity. Each child received a \$10 gift card for participating in the interview. Interviews were audio tape recorded. 4 child interviews revealed a substantial lack of understanding of the questions; these children (2 age 6 y, 2 age 7 y) and their parents were excluded from the sample for analysis. The final field test sample for comparative had a total of 87 parent/child dyads.

Table 1. Field-test sample demographics

Variable	Percent or Mean(SD)
Race/ethnicity	
<i>White</i>	22.34
<i>African-American</i>	76.60
<i>Other</i>	1.06
<i>Hispanic</i>	1.06
Household income	
< \$10,000	36.17
\$10,000-\$29,999	42.55
\$30,000-\$49,999	6.38

<i>\$50,000 and more</i>	14.89
Parent education	
<i><High School</i>	13.83
<i>HS Diploma/GED</i>	32.98
<i>Some college/tech school</i>	27.66
<i>BA degree</i>	19.15
<i>Graduate/professional degree</i>	6.38
Household size (# people)	3.77(1.53)
Household structure	
<i>Single-mother</i>	54.74
<i>Single-father</i>	2.11
<i>Two-parent</i>	35.79
<i>Other</i>	7.37
Geographic type	
<i>Large city</i>	32.98
<i>Small city</i>	32.98
<i>Suburb</i>	11.70
<i>Small town</i>	7.45
<i>Rural</i>	14.89
Food resource participation	
<i>SNAP</i>	61.70
<i>WIC</i>	11.70
<i>School lunch/breakfast</i>	64.89
<i>Food pantry</i>	47.87
<i>Soup kitchen</i>	1.06
Household food security status	
<i>Food secure (0 affirmations)</i>	18.37
<i>Average affirmations (0-18)</i>	6.03(4.88)

Note: n's vary from 94-98 depending on missingness

Analysis

Accuracy of the items (aims 1 and 2) was established through the construction of definitive classification using child interview data, and comparison of definitive classification to child responses to different items and combinations of related items. The general idea underlying this approach is that a definitive measure of a phenomenon relies on first principles, reflecting the fundamentally theoretical structure of that phenomenon. Definitive measures are generally logistically difficult and/or time-consuming to obtain, so that the development of a reference measure becomes necessary for wide-spread use. A reference measure directly and closely relates to the phenomena, and the accuracy of the reference measure is demonstrated by

comparison to a definitive measure (Frongillo, 1999). Definitive measures have previously been developed and used to establish accuracy of reference measures of growth faltering (Frongillo et al., 1990), and household or adult food security (Frongillo et al., 1997; Wolfe et al., 1998; Frongillo and Nanama, 2006). The development of a definitive measure is based on principles of patterns recognition, use of multiple raters, and achieving consensus.

In this study, in-depth interviews with children were used as the basis for definitive classification of children as experiencing or not experiencing each sub-domain of food insecurity. Child interviews were semi-structured, focusing on key topics identified in previous research (Fram et al., 2011), and included ample probing to clarify the context and meaning of child responses. Each interview was listened to and coded by three 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 six sub-domains of childhood food insecurity (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 (Swets, 1988). Sensitivity refers to the ability of an indicator (i.e., an item or set of items) to affirm food insecurity when it does occur. Specificity refers to the ability of an indicator to affirm no food security when it 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

>0.75-0.8 being good, and >0.9 being excellent. Figure 1 shows the calculations for each of these.

Definitive classification	Indicator	
	No	Yes
No	a	b
Yes	c	d

- Sensitivity = $d / (c + d)$
- Specificity = $a / (a + b)$
- Area under receiver operating characteristic (ROC) curve
 - Plots sensitivity versus 1-specificity for all possible cut-points
 - Ranges from 0.5 (chance) to 1.0 (perfect accuracy), with > 0.75-0.8 good and >0.9 excellent

Swets. Science, 1988

The child survey items were grouped based on the sub-domain they were developed to tap. Each item was assessed for fit with other related items, and fit with the definitive measure. Items that performed poorly, or that were redundant with other items within the sub-domains were eliminated. Remaining items were used to form composite indicators for each sub-domain, with affirmation of any one or more items coded as an affirmation of the sub-domain. 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 sub-domain. Because the HFSSM was not designed to tap children’s emotional awareness nor 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.”).

A measure of agreement between child and adult items was calculated and assessed based on the resulting Kappa value (range 0 to 1), with a kappa < 0.4 indicating poor agreement (Fleiss, 1981).

Results

Definitive measure. The coding of interview data indicated that the six sub-domains of child food insecurity were prevalent in the field-test sample, ranging from 0.23 (resource generation) to 0.66 (cognitive awareness) (see Table 2, column 7).

Accuracy of child items. The child indicators had sensitivities (expressed as a percentage) ranging from 65.00 (resource generation) to 91.49 (emotional awareness). Specificities ranged from 51.03 (participation) to 84.48 (physical awareness). Column 5 in Table 2 shows ROC curve areas for four of the six sub-domains being in the “good” range (cognitive, emotional, physical, and initiation). The comparison of columns 6 and 7 shows that the child indicators slightly under-reported prevalence of cognitive awareness, and slightly over-reported prevalence in the other five dimensions (except for resource generation which had a bigger difference in prevalence).

Table 2. Accuracy of child items

Domain	Item(s)	Sens	Spec	ROC area	Prev (items)	Prev (defin.)
Cognitive	C1: We can't get the food we want because there is not enough money	82.14	75.86	.79	.62	.66
Emotional	C18: I worry about how hard it is for my parents to get enough food for us. C19: I worry about not having enough to eat.	91.49	69.23	.80	.64	.55
Physical	C12: I feel hungry because there is not enough food to eat. C14: I get really tired because there is not enough food to eat.	89.29	84.48	.87	.40	.33

Participation	C23: I act ok when we don't have enough money to buy the foods I want.	77.08	51.03	.64	.65	.58
Initiation	C28: I try not to eat a lot so that our food will last.	82.50	79.07	.81	.51	.48
Generation	C31: I bring home food so that there is enough for everyone to eat. C32: I work to earn money so that we can have enough food	65.00	68.18	.67	.40	.23

Accuracy of parent items. Table 3 shows the sensitivity, specificity, ROC curve area, and prevalence comparisons for the two parent report items from the HFSSM that relate to child food insecurity sub-domains. The ROC curve area was poor for each, and the comparison of prevalence shows that parent items under-report child experiences, with parents under-reporting the experience of hunger by half.

Table 3. Accuracy of parent items.

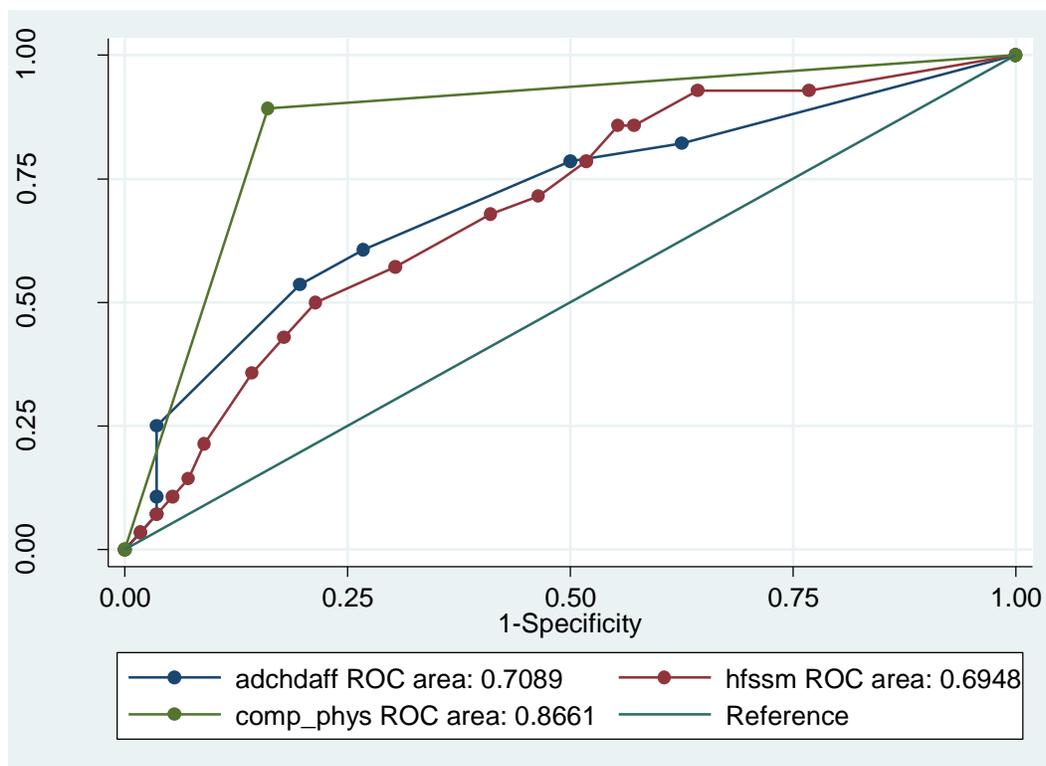
Domain	Item(s)	Sens	Spec	ROC area	Prev (item)	Prev (defin.)
Cognitive	P11: We couldn't feed our children a balanced meal, because we couldn't afford that.	60.71	58.62	.60	.54	.66
Emotional						.55
Physical	P15: In the last 12 months, was your child or children ever hungry, but you just couldn't afford more food?	35.71	94.64	.65	.15	.33
Participation						.58
Initiation						.48
Generation						.23

Assessment of the agreement between parent and child items yielded only one item match that reached a level of statistical significance. This match compared child response 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 57.45%, expected agreement was 49.52%, and the resulting Kappa of 0.16 was below 0.4, suggesting 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 sub-domain of physical awareness (i.e., hunger). Hunger was chosen both because it is the sub-domain of child food insecurity that the HFSSM most directly taps and it is currently of great policy interest. Figure 1 has four lines showing the accuracy of three different assessments for identifying children with physical awareness of food insecurity: the blue diagonal line shows the

accuracy of “chance”, the red line shows the accuracy of the full 18-item HFSSM, the green line shows the accuracy of the HFSSM child items only, and the blue line shows the accuracy of the composite physical awareness items asked of children in this study. The child physical awareness composite indicator has an ROC curve area of 0.88, meaning good-to-excellent accuracy. The ROC curve areas for the two parent-report measures are about 0.70, meaning poor accuracy.

Figure 1. Comparing parent- versus child-report of child physical awareness



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 wellbeing. Toward that end, the aims of this study were to determine the accuracy of items asked of children that we developed and refined based on our prior qualitative research (Fram et

al., 2011), the accuracy of items asked of parents, and the agreement between items asked of children and substantively similar items asked of parents. In four out of the six sub-domains we set out to assess through child report, accuracy was good (ROC curve area ≥ 0.79). 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 88.5% of children who truly were physically aware, and 82.7% of children who truly were not physically aware, with an overall area under the ROC curve of 0.86. In contrast, the accuracy of parent report of child physical awareness was poor. While the parent-report item identified 94% of children who truly were not experiencing physical awareness, this item only identified 34.6% of children who truly were experiencing physical awareness. This reflects both considerable inaccuracy (ROC curve area of 0.64) and under-reporting of childhood hunger based on parental report.

We also found good accuracy of child-report items indicating cognitive and emotional awareness and initiation. One parent-report item from the HFSSM is conceptually similar enough to "cognitive awareness" to assess accuracy; while the ROC curve area for the child-report items was 0.79, the ROC curve area for the parent-report item was only 0.58 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 0.79 as well, but since 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 sub-domain

even if it were attempted, since emotional awareness is an inherently internal experience (Grych et al, 1992) .

Two sub-domains had lower accuracy of child report. “Participation” and “resource generation” items did not distinguish well food-secure from food-insecure children in these sub-domains; 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 address 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/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 (e.g., 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 (e.g., asking to purchase

additional fast-food drive-through items and bringing them home so that a sibling would have the food he/she most preferred, using allowance money to buy an extra treat).

Given the differences in accuracy between child- and parent-report items, it is not surprising that 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 both the unique child and parent perspectives on and experiences of food scarcity and a common set of perspectives on conditions within the household.

Given the results discussed above, we examined well the USDA full 18-item HFSSM, the HFSSM child items only, and our child self-report items performed overall for the purpose of identifying children who are experiencing physical awareness of food insecurity (e.g., hunger). Each of these assessments can have high sensitivity to children's hunger experiences, i.e., all three lines in Figure 1 achieve approximately 90% sensitivity at some cut point. But, 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 achieves 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 correctly identified. In contrast, the child-report items achieve a good balance of sensitivity and specificity, accurately classifying 86% of children.

While we found that child-report is more accurate than parent-report of children's experiences, we also found that 4 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 check whether other young children were less accurate reporters, we ran all accuracy analyses stratifying for child age, and young children were no less accurate than were older children (analysis not shown). This suggests that most 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.

Conclusion

Our findings demonstrate that 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 did 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. Whatever the cause(s) of the differences between parent and child report, when the goal of assessment is to improve child

wellbeing 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.

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Appendix A – Final version of child assessment tool

Children’s Food Experiences Study

Child Survey

Thank you for taking this survey! Below are some statements that children have made about their food situation. For each statement, please say whether this happened to you **MANY times**, **1 or 2 times**, or **NEVER** in the **last year (12 months)**. Please circle the answer that best fits your situation.

1. We can’t get the food we want because there is not enough money.	Many times	1 or 2 times	Never
2. We eat the same kinds of foods over and over again because those foods do not cost much.	Many times	1 or 2 times	Never
3. The food to make a meal runs out, and we don’t have money to buy more.	Many times	1 or 2 times	Never
4. We almost run out of food by the end of the month.	Many times	1 or 2 times	Never
5. We run out of the foods that are good for you, and we don’t have money to buy more.	Many times	1 or 2 times	Never
6. I check on the foods that we have in our house so that I can tell when food is running low.	Many times	1 or 2 times	Never
7. Adults in my house worry about having enough food.	Many times	1 or 2 times	Never
8. Adults in my house get angry or upset because we are running out of food.	Many times	1 or 2 times	Never
9. It feels scary at home when we are running out of food.	Many times	1 or 2 times	Never
10. Adults in my house sometimes don’t eat enough because we are running out of food.	Many times	1 or 2 times	Never
11. I sometimes don’t get enough to eat because we are running out of food.	Many times	1 or 2 times	Never
12. I feel hungry, because there is not enough food to eat.	Many times	1 or 2 times	Never
13. My stomach hurts or cramps, because there is not enough food to eat.	Many times	1 or 2 times	Never
14. I get really tired, because there is not enough food to eat.	Many times	1 or 2 times	Never
15. I try to just go to sleep, because there is not enough food to eat.			

	Many times	1 or 2 times	Never
16. I feel sad or mad when we don't have the money to buy the foods I like.	Many times	1 or 2 times	Never
17. I feel embarrassed about some of the things we have to do to get enough food in my family.	Many times	1 or 2 times	Never
18. I worry about how hard it is for my parents to get enough food for us.	Many times	1 or 2 times	Never
19. I worry about not having enough to eat.	Many times	1 or 2 times	Never
20. I feel embarrassed because we don't have enough food.	Many times	1 or 2 times	Never
21. I feel sad or mad when there isn't enough food to eat.	Many times	1 or 2 times	Never
22. We are running out of food, and there's nothing I can do about it.	Many times	1 or 2 times	Never
23. I act ok when we don't have enough money to buy the foods I want.	Many times	1 or 2 times	Never
24. We try to only use a little bit of food at a time to make it last.	Many times	1 or 2 times	Never
25. I don't ask for the food I like when we don't have enough money to buy it.	Many times	1 or 2 times	Never
26. I try to not eat a lot, so that there is food when I want to eat again.	Many times	1 or 2 times	Never
27. I tell other kids in my house to eat less so that our food will last.	Many times	1 or 2 times	Never
28. I try not to eat a lot so that our food will last.	Many times	1 or 2 times	Never
29. I try to eat away from home, like at a friend's house, because food is low at my house.	Many times	1 or 2 times	Never
30. I give money to my parents so that we can have enough food.	Many times	1 or 2 times	Never
31. I bring food home so that there is enough for everyone to eat.	Many times	1 or 2 times	Never
32. I work to earn money so that we can have enough food.	Many times	1 or 2 times	Never

Appendix B – Adult survey

Children’s Food Experiences Study*Parent/Adult Survey*

*****If you are part of a 2 person headed household, please have the adult who is MOST familiar with the food situation within the household complete this survey.*****

Thank you for participating in this study! The first set of questions in this survey asks for your perspective on the food situation in your household. Please circle the number next to the answer that you feel BEST describes your situation.

1. Which of these statements best describes the food eaten in your household in the last 12 months?

1. Enough of the kinds of food we want to eat
2. Enough but not always the kinds of food we want to eat
3. Sometimes not enough to eat
4. Often not enough to eat

Below are several statements that people have made about their food situation. For these statements, please indicate whether the statement was OFTEN true, SOMETIMES true, or NEVER true for you or your household in the last 12 months.

2. “We worried whether our food would run out before we got money to buy more.”

1. Often true
2. Sometimes true
3. Never true

3. “The food that we bought just didn’t last, and we didn’t have money to get more.”

1. Often true
2. Sometimes true
3. Never true

4. “We couldn’t afford to eat balanced meals.”

1. Often true
2. Sometimes true
3. Never true

5. In the last 12 months, did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?

1. Yes
2. No

IF "YES" ABOVE: How often did this happen?

1. Almost every month
2. Some months but not every month
3. Only 1 or 2 months

6. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?

1. Yes
2. No

7. In the last 12 months, were you every hungry but didn't eat because there wasn't enough money for food?

1. Yes
2. No

8. In the last 12 months, did you lose weight because there wasn't enough money for food?

1. Yes
2. No

9. In the last 12 months, did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food?

1. Yes
2. No

IF YES ABOVE: How often did this happen?

1. Almost every month
2. Some months but not every month
3. Only 1 or 2 months

The following are statements that people have made about the food situation of their children. For these statements, please indicate whether the statement was OFTEN true, SOMETIMES true, or NEVER true in the last 12 months for your child or children living in the household who are under 18 years old.

10. "We relied on only a few kinds of low-cost food to feed our child or children because we were running out of money to buy food."
 1. Often true
 2. Sometimes true
 3. Never true

11. "We couldn't feed our child or children a balanced meal, because we couldn't afford that."
 1. Often true
 2. Sometimes true
 3. Never true

12. "Our child or children were not eating enough because we just couldn't afford enough food."
 1. Often true
 2. Sometimes true
 3. Never true

13. In the last 12 months did you ever cut the size of your child's or children's meals because there wasn't enough money for food?
 1. Yes
 2. No

14. In the last 12 months, did your child or children ever skip meals because there wasn't enough money for food?

1. Yes
2. No

IF YES ABOVE: How often did this happen?

1. Almost every month
2. Some months but not every month
3. Only 1 or 2 months

15. In the last 12 months, was your child or children ever hungry, but you just couldn't afford more food?

1. Yes
2. No

16. In the last 12 months, did your child or children ever not eat for a whole day because there wasn't enough money for food?

1. Yes
2. No

The next few questions ask about the health and well-being of the child who is participating in the Children's Food Experiences Study. For each question please circle the number next to the answer that, from your perspective, BEST describes this child.

17. In general, my child's health is . . .

1. Excellent
2. Very good
3. Good
4. Fair
5. Poor

18. Thinking about your child's grades during this school year: Overall, across all subjects my child takes at school, (he/she) gets . . .
1. Mostly A's
 2. Mostly B's
 3. Mostly C's
 4. Mostly D's
 5. Mostly F's
 6. My child's school does not give letter grades
19. Overall, my child's work at school is . . .
1. Excellent
 2. Above average
 3. Average
 4. Below average, or
 5. Failing
20. Thinking about how my child behaves and relates to other children and adults, I would say that in general my child behaves . . .
1. Better than other children (his/her) age
 2. As well as other children (his/her) age
 3. Slightly less well than other children (his/her) age
 4. Much less well than other children (his/her) age

The final questions ask more generally about you and your household. Please fill in the blanks or circle the number next to the answer that BEST describes you and your household.

21. How many people live in your household?

_____ Adults (please write in the number of adults)

_____ Children (under the age of 18) (please write in the number of children)

How old are the children who live in your household? (please write in the age of each child below)

Child #1 age: _____ yrs.

Child #2 age: _____ yrs.

Child #3 age: _____ yrs.

Child #4 age: _____ yrs.

Child #5 age: _____ yrs.

22. Which of the following best describes your race? (Please circle all that apply.)

1. White or Caucasian
2. Black or African American
3. Asian
4. Native Hawaiian or other Pacifica Islander
5. American Indian or Alaska Native
6. Other _____

23. Are you Hispanic/Latino? (Please circle one answer below.)

1. Yes
2. No

24. Over the past year, what is your annual household income from all sources? (Please circle one answer below.)

1. Less than \$10,000
2. Between \$10,000 and \$19,999
3. Between \$20,000 and \$29,999
4. Between \$30,000 and \$39,999
5. Between \$40,000 and \$49,999
6. Between \$50,000 and \$74,999
7. \$75,000 or higher

25. What is the highest grade or year of school you completed? (Please circle one answer below.)
1. Less than high school
 2. High school graduate or GED
 3. Some college or technical school
 4. College graduate
 5. Graduate or professional school
26. Which of the following best describes the place where you live? (Please circle one answer below.)
1. Large city
 2. Small city
 3. Suburb
 4. Small town
 5. Rural area
27. Did you or anyone in your household receive the following benefits during the **past year** (12 months)? (Please **circle all** that apply below.)
1. Food stamps (SNAP)
 2. WIC
 3. Free or reduced price school lunches
 4. Food from a food pantry
 5. Meal(s) at a soup kitchen
28. What best describes your role within your household? (Please circle one answer below.)
1. Mother in a single person headed household
 2. Father in a single person headed household
 3. Mother in a 2 person headed household

4. Father in a 2 person headed household

5. Other (please describe) _____

THANK YOU FOR COMPLETING THIS SURVEY!

Appendix C – Interview guide for child in-depth interviews

Child Interview Guide – Stage 3 Interviews

1. Could you please tell me about your favorite holiday or birthday meal.^a

How and when people eat is different for different families. I'm going to ask you a few questions to help me understand what eating is like in your family.

2. Can you tell me about what you ate yesterday (or "today" for evening interview participants)?

PROBE for breakfast/in the morning, lunch, dinner/in the evening

3. Is this how it typically goes in your family?

[IF "NO"] How was yesterday different than normal?

4. Can you please tell me about the last time you were hungry because there wasn't enough food to eat in your house?ⁱ

- a. What was going on then?
- b. Why did it happen?
- c. How did it affect you? How did you feel about it?

5. When you worry about being hungry, what sorts of things do you worry about?^a

- a. What is happening that you know you need to worry?

6. Can you tell me about the last time that you've skipped/missed a meal because there wasn't enough food to eat?

- a. What was going on then?
- b. Why did it happen?
- c. How did it affect you? How did you feel about it?

7. Has your family ever almost run out of food?

- a. **[IF "YES"]** What did the grown-ups **say** that let you know that there wasn't enough money to get more food?
- b. What did the grown-ups **do** that let you know that there wasn't enough money to get more food?

- c. Did it make any difference in your life? How?
 - i. **[IF “YES”]** How did you handle that?
- d. How did you feel about it?

Participation in food management strategies

8. Thinking about a normal week, what are the ways that your family gets food?
- a. Does anyone in your family go to the store?
[IF “YES”] What store(s)?
Who usually goes to the store?
 - b. Does anyone in your family eat at a restaurant?
[IF “YES”] What restaurants do you usually go to?
About how often do you eat out?
 - c. Does anyone in your family eat at a friend’s house or with relatives?
[IF “YES”] Can you please tell me more about that?
 - d. Does anyone in your family borrow food from friends or neighbors?
[IF “YES”] Can you please tell me more about that?
 - e. Does anyone in your family go to a food pantry – like at a church or Harvest Hope?
[IF “YES”] About how often?
Who usually goes to the food pantry?
9. Can you tell me about a time that you wanted a food that you like, but there wasn’t enough money to buy it?
- a. What was going on then?
 - b. What did you do when it happened?
 - c. How did you feel about it?
10. Sometimes families have to do things they don’t like to get food. Can you tell me about a time when you, or someone you know, had to do something that they didn’t like to get food?
11. Can you tell me about something you have done to try to help your family have enough food?

12. Can you tell me about something you have done to try to help the food that your family has last longer?

13. If you were going to make a meal tonight for supper, what would you make?

ⁱ Questions taken from: Connell, C.L., Lofton, K.L., Yadrick, K., & Rehner, T.A. (2005). Children's Experiences of Food Insecurity Can Assist in Understanding its Effect on their Well-Being. *Journal of Nutrition*, 135, 1683-1690.