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ORIGINAL RESEARCH

A pilot examination of the inter-rater reliability of the 18-item Household Food Security Module between cohabiting mothers and fathers

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Abstract

Food insecurity, defined as the inability to access sufficient food for an active, healthy life, affects 11.1% of the US population and is primarily assessed using the United States Department of Agriculture's (USDA) 18-item Household Food Security Survey Module (HFSSM). The HFSSM is a self-report measure presumed to represent all household members, but it is unknown if cohabiting parents report food security differently. This pilot study aimed to determine (i) the inter-rater reliability of the HFSSM; (ii) the direction of any difference between responses to the HFSSM; and (iii) the item-level response similarities and differences among mothers and fathers of young children. Twenty-five pairs of low-income, food-insecure cohabiting parents of 2.5- to 10-year-old children participated in cognitive interviews assessing their level of food security using the USDA's HFSSM and completed related questionnaires. Intraclass correlations were computed to compare the responses of each dyad on the HFSSM overall and by item. Results revealed that overall report of food security was significantly but weakly correlated ($r = .40$, $p = .02$) within dyads. The majority of fathers (60%) reported higher food security scores on the HFSSM than their respective female partners. Furthermore, item-level intraclass correlations revealed that some HFSSM questions had poor reliability between cohabiting parents. This research identifies that a potential shortcoming of the HFSSM is the under-reporting of food insecurity by fathers compared with mothers within the household. These findings have implications for the utility of this measure used in national monitoring of the nation's food security.

Keywords

assessment, food security, gender, household, low-income population, parents

Implications

Practice: The process used for national assessment of household food security should consider potential differences in report by gender.

Policy: New or complementary tools may need to be developed to properly capture household food security rates.

Research: Future research should consider investigating the differential roles of members in a household in a similar analysis using a larger, nationally representative dataset.

INTRODUCTION

National data indicate that food insecurity affects approximately one out of seven US households with children and is associated with diabetes, depression, heart disease, and anxiety [1–4]. Food security is defined as access to enough food for an active, healthy life [3] and is measured in the USA using the United States Department of Agriculture's (USDA) 18-item Household Food Security Survey Module (HFSSM) [5]. This measure assesses the subjective food security experience of a household based on a single respondent [5].

In 2018, 13.9% of all households with children, 8.3% of American two-parent households, 15.9% of single man-headed households, and 27.8% of single woman-headed households were classified as food insecure [4]. Gender differences in the prevalence of food insecurity have been hypothesized to be due to the gender wage gap and differences in employment status by gender [6,7]. However, recent research suggests that there may be gender differences in responses to the HFSSM by either comparison of similar households or comparisons within household [8–10]. Although the HFSSM has been extensively validated, it originated from the Radimer–Cornell Index, which was developed using quotations from food-insecure mothers garnered through focus groups [11,12]. The HFSSM was only later generalized to men. In other fields of study, gender has been related to differences in responses to self-report questions, including mental health symptoms like depression and loneliness [13,14]. Therefore, it is unknown whether reported differences are due to gender differences in responses to the HFSSM, or actual gender differences in food security.

The HFSSM is a self-report measure completed by a single respondent, but the responses are presumed to accurately represent all household members. Policymakers rely on this measure to index how food security is changing over time and as a

result of policy or programmatic changes. If the measure for household food security using the HFSSM differs by gender, it is important to understand the root of these discrepancies. It could be necessary to adjust the measure or interpret the results differently based on respondent gender, or add a complementary measure that could compensate for shortcomings in the HFSSM. Furthermore, understanding gender differences might allow for improved services to men, who are typically underserved by the food insecurity safety net and related nutrition education efforts. Because food insecurity is more common in households with children [4], especially younger children, the ability to compare responses to the HFSSM by dual parents sharing the same household with their child would allow for the ability to determine gender perception differences of household food security within a high-risk population. Therefore, the main objectives of this pilot study were to investigate (i) inter-rater reliability of the HFSSM among cohabiting mothers and fathers of young children; (ii) the direction of any difference between mothers and fathers responses to the HFSSM; and (iii) the item level response similarities and differences of parents reporting food security within a household.

METHODS

This exploratory study was part of a larger mixed-methods investigation of the reliability of the 18-item HFSSM [10]. A qualitative analysis of this project was previously published [10]. This protocol was approved by the authors' institutional review board.

Participants

Twenty-five pairs of low-income, food-insecure, cohabiting parents (n = 50) of children ages 2.5–10 years old were recruited to participate in separate, one-on-one cognitive interviews. The target age range of the children was selected for several reasons. These reasons include the age appropriateness of the child to eat the same foods as the rest of the family thereby sharing household food resources, the continued reliance on parents for food access and choice, and to avoid the timeframe of adolescence when children become employable and more independent in the ability to obtain and choose food. Recruitment occurred primarily at food pantries and mobile food pantry sites as well as Head Start centers in a Northeastern US state. Low income was defined as eligibility for the Supplemental Nutrition Assistance Program (SNAP); the Special Supplemental Nutrition Assistance Program for Women Infants and Children (WIC); Head Start, Medicaid, or the Child Health Insurance Program (CHIP). Cohabitation status and relation to the child as a parent was screened and confirmed during recruitment. Food security status was ascertained prior to participation in interviews by at least one parent per household responding affirmatively to one of the first three items on the HFSSM.

Outcome measures

Food security status was assessed using the United States Department of Agriculture's 18-item US Household Food Security Survey Module [5]. Each parent was assigned a score based on their perceived household food security status; thus, this score could vary between parents within a household. A household that had never experienced food insecurity received a score of 0, whereas those with the highest severity of food insecurity received a score of 18 [5]. Demographic information (race, ethnicity, nutrition assistance program participation) was also obtained through a separate questionnaire.

Procedure

After obtaining written informed consent, trained interviewers conducted interviews and read aloud all questionnaires to the participants. Mothers and fathers were interviewed separately in private rooms. Each parent was provided with a $20 gift card for participation.

Analysis

Intraclass correlations (ICCs) were calculated to compare self-report measures within paired dyads of mothers and fathers. An ICC coefficient reflects how closely matched dyads resemble each other and references linked pairs, not two groups overall (i.e., couples, not just mothers and fathers). The following cut points were used to interpret the ICCs: score of <.4 is poor, .40–.59 is fair, .60–.74 is good, and .75–1.00 is excellent [15]. Statistical significance was set at $p < .05$. However, attention was given to items with p-values up to .10 because in exploratory studies such as this, results with p-value of .10 could become significant in a larger sample [16,17]. For the second aim, a Wilcoxon Signed Rank test was used because of the small sample size, to test whether the mean of the difference in the scores equals zero. Finally, ICCs were also used to investigate item-level response variations within cohabiting couples on the HFSSM. For this analysis, ICCs were conducted on individual items on the HFSSM, with significance again set at $p < .05$, and attention given to any approaching significance $p < .10$. In the final analysis, three items were excluded as the skip patterns resulted in insufficient responses.

RESULTS

The majority of the sample was white, had an education level of some college or technical school or less, with one-third identifying as Hispanic or Latino (Table 1). Mothers reported marginal food security, whereas fathers were mostly food secure and marginally food secure. The ICC between mothers' and

Table 1 | Household food security and demographic variables of low-income parents (n = 50) [10]

Household participation	*N*	%
SNAP	18	72
WIC	12	48
Head Start	12	48
Medicaid	22	88
Parent	Mother	Father
	Mean (*SD*)	Mean (*SD*)
Age (years)	35.4 (8.4)	40.2 (9.4)
	n (%)	*n* (%)
Race		
White	15 (60)	14 (56)
Black or African American	3 (12)	5 (20)
Asian	1 (4)	1 (4)
America Indian/Alaska Native	0 (0)	1 (4)
Native Hawaiian/ Pacific Islander	0 (0)	0 (0)
Other	6 (24)	4 (16)
Ethnicity (Hispanic or Latino)	5 (20)	8 (32)
Education		
Less than high school	2 (8)	6 (24)
High school diploma or GED	7 (28)	7 (28)
Some college or technical school	7 (28)	7 (28)
Associate's degree	3 (12)	0 (0)
Bachelor's degree or more	6 (24)	5 (20)
Categorical report of food security	*n* (%)	*n* (%)
0—high food security	7 (28)	12 (48)
1—marginal food security	14 (56)	10 (40)
2—low food security	4 (16)	3 (12)
3—very low food security	0 (0)	0 (0)
	Mean (*SD*)	Mean (*SD*)
Household food security score (0–18)	4.3 (2.6)	3.3 (2.6)

SNAP Supplemental Nutrition Assistance Program; *WIC* Supplemental Nutrition Assistance Program for Women, Infants, and Children.

fathers' household food security scores was statistically significant (ICC = .40, p = .02).

Mean household food security scores were not statistically, significantly different (Z = −1.804, p = .071) between mothers and fathers within households. The majority of fathers (n = 15, 60%) reported a lower (i.e., better) food security score than mothers.

To examine the consistency within couples at the item level of the HFSSM, ICCs were conducted on each of the 18 items individually. Table 2 includes the household-referenced items (HH1-4), the adult-referenced numbers (AD1-5), and the child-referenced numbers (CH1-5). This study identified items HH2, HH3, AD2, AD4, CH3, and CH5 as questions that performed inconsistently between cohabiting parents (i.e., ICCs were nonsignificant).

DISCUSSION

Although overall HFSSM scores were significantly associated between cohabiting parents within a household, the strength of the association was only "fair" and resulted in differential classification of food security status between parents [15]. This is particularly problematic for research assuming that food security is a "household-level" variable, shared by all members, and so should be a source of inquiry. The current findings also suggest that fathers report less impaired levels of food security when compared with mothers in the same households, perhaps because admitting food insecurity could be perceived as emasculating similar to how men view other help-seeking health behaviors [18].

Several questions of the HFSSM were flagged for low reliability because of differences between mothers and fathers. Specifically, item HH2 contains the word "worry," which may vary in report by gender [10]. Perhaps most similarly, reports of depression and loneliness have been found to differ consistently by gender [13,14]. The situation of food running out and a family not having money to buy more food is a paradigmatic example of food insecurity [4], and what one considers as money (Supplemental Nutrition Assistance Program benefits versus cash) might vary by gender. It is also

Table 2 | Item-level analysis comparing mothers' (n = 25) and fathers' (n = 25) responses to the USDA's 18-item household food security measure

Item number	Question	ICC	CI	p
HH1	Which of these statements best describes the food eaten in your household in the last 12 months: enough of the kinds of food (I/we) want to eat; enough, but not always the *kinds* of food (I/we) want; sometimes *not enough* to eat; or *often* not enough to eat?	0.66	0.21 to 0.85	.007
HH2	The first statement is "(I/We) worried whether (my/our) food would run out before (I/we) got money to buy more." Was that *often* true, *sometimes* true, or *never* true for (you/your household) in the last 12 months?	0.33	−0.51 to 0.71	.164[a]
HH3	"The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more." Was that *often*, *sometimes*, or *never* true for (you/your household) in the last 12 months?	0.24	−0.73 to 0.67	.253[a]
HH4	"(I/we) couldn't afford to eat balanced meals." Was that *often*, *sometimes*, or *never* true for (you/your household) in the last 12 months?	0.54	−0.07 to 0.80	.036
AD1	In the last 12 months, since last (name of current month), did (you/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?	0.46	−0.24 to 0.76	.072
AD2	In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?	−0.08	−1.4 to 0.53	.567[a]
AD3	In the last 12 months, were you ever hungry but didn't eat because there wasn't enough money for food?	0.46	−0.23 to 0.76	.071
AD4	In the last 12 months, did you lose weight because there wasn't enough money for food?	0.42	−0.34 to 0.75	.100[a]
AD5	In the last 12 months, did (you/you or other adults in your household) ever not eat for a whole day because there wasn't enough money for food?	0.88	0.67 to 0.95	.000
CH1	"(I/we) relied on only a few kinds of low-cost food to feed (my/our) child/the children) because (I was/we were) running out of money to buy food."	0.73	0.38 to 0.89	.001
CH2	"(I/We) couldn't feed (my/our) child/the children) a balanced meal, because (I/we) couldn't afford that."	0.51	−0.12 to 0.78	.045
CH3	"(My/Our child was/The children were) not eating enough because (I/we) just couldn't afford enough food."	−0.03	−1.34 to 0.55	.530[a]
CH4	In the last 12 months, since (current month) of last year, did you ever cut the size of (your child's/any of the children's) meals because there wasn't enough money for food?	0.67	0.23 to 0.86	.006
CH5	In the last 12 months, did (CHILD'S NAME/any of the children) ever skip meals because there wasn't enough money for food?	−0.15	−1.83 to 0.53	.620[a]

[a]Items flagged for in-depth qualitative investigation into sources of discrepancy in parent response [10].

possible that mothers more likely offer affirmative responses because they are feeding the "working" members (e.g., husband or partner) of the household by sacrificing their own food needs [19]. This strategy is commonly observed in measurement of food insecurity in countries outside of the USA, using the Coping Strategies Index [19]. Another possible explanation is social desirability, a well-documented source of bias in research, which may vary by gender, and has been documented in dietary intake reporting [20].

In the present study, items related to a more severe experience of food insecurity, with affirmation of weight loss and children skipping meals, demonstrated low inter-rater reliability. Perhaps in division of household responsibilities, fathers are less likely to perceive food insecurity, or perhaps mothers are overestimating household food security. Although fathers are doing more and more, recent data suggest that mothers still bare the heaviest share of household chores [21]. It also is possible that males experience a greater sense of shame from the social stigma of not being able to provide for their families than their female partners and are therefore less likely to admit that their families are struggling in this way. This variation in social desirability has been observed in reports of poverty and related consequences [20,22].

Given that men have lower rates of health literacy [23,24], terminology such as "balanced meals" also

might be differentially interpreted [10]. Research also has suggested that fathers are less confident and accurate in communication about their home environment, and even fathers who felt involved found it difficult to report on the household and deferred to mothers [25]. Although fathers taking on domestic roles have become more prevalent [26] with increases in cooking [27] and child feeding responsibilities [28], most research measures that were purportedly designed for "parents" were actually developed only with mothers, and this also was the case for the HFSSM's predecessor, the Radimer–Cornell Index [11,12].

Strengths of the study include that it is the first study of its kind to investigate self-report of food security between parents allowing for comparison between cohabiting mothers and fathers who share a household to report on their shared environment. Limitations of the study include that the HFSSM was administered during an interview including the standard questionnaire and additional probes as part of a larger project, which could potentially impact results. The lack of null findings in some instances may be attributed to a smaller sample size and the inability to discern these differences or to other factors that were not assessed. Furthermore, the sample was drawn from one Northeastern state and findings may not generalize to other geographical regions.

CONCLUSIONS AND TRANSLATIONAL IMPLICATIONS

The present study explores a gap in research that requires further exploration, as the role of fathers at home and at meal times has shifted and research requires tools that truly can assess "parents" [29–31]. Gaining further understanding of why and how responses to the HFSSM vary between members of the same household is important [10,32], as this measure is used in the development and assessment of changes in public policy and outreach. Often, in nationally representative studies such as NHANES, "heads of households" are interviewed, but that definition is not clearly defined or consistently interpreted and may include both mothers and fathers, for whom the HFSSM might function differently. Given that food insecurity is associated with a wide variety of negative health consequences, accurate measurement is necessary for national longitudinal monitoring. Ultimately, it could be necessary to add a new measure that could compensate for shortcomings in the HFSSM, use the measure exclusively for women and create a new validated measure for men, or perhaps simply using caution when interpreting findings using this measure in mixed-gender populations. Future research should consider investigating the different roles in a household (i.e., food preparation and grocery shopping) in a similar analysis using a larger, nationally representative dataset.

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Compliance with Ethical Standards

Conflicts of Interest: All authors declare that they have no conflicts of interest.

Authors' Contributions: All authors were involved in the preparation of this manuscript and read and approved the final version.

Human Rights: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This study was approved by the University of Connecticut-Storrs Institutional Review Board for Human Subjects.

Informed Consent: Informed consent was obtained from all individual participants included in the study.

Welfare of Animals: This article does not contain any studies with animals performed by any of the authors.

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