

Food Insecurity in Children but Not in Their Mothers Is Associated with Altered Activities, School Absenteeism, and Stunting^{1,2}

Jennifer Bernal,^{3*} Edward A. Frongillo,⁴ Héctor A. Herrera,³ and Juan A. Rivera⁵

³Department of Biologic and Biochemical Processes, Universidad Simón Bolívar, Caracas, Venezuela; ⁴Department of Health Promotion, Education, and Behavior, University of South Carolina, Columbia, SC; and ⁵Nutrition and Health Research Division, National Public Health Institute, Cuernavaca, Mexico

Abstract

Household food insecurity has substantial detrimental effects on children, but little is known about the mechanisms through which these effects occur. This study investigated some possible mechanisms by examining associations of food insecurity reported by children and mothers with daily activities, school absenteeism, and stunting. We conducted a cross-sectional study in a nonprobabilistic sample of 131 mother-child pairs from a poor peri-urban area in Miranda State, Venezuela. We assessed food insecurity in children by using an instrument developed through a naturalistic approach that had 10 items for food insecurity and 9 items for management strategies. To obtain mothers' reports of food insecurity, a previously validated 12-item instrument was used. Children's daily activities, school absenteeism, and stunting were measured. Chi-square tests for contingency tables and logistic and multiple regression analyses were used to test associations of food insecurity with outcomes. There was no association between mothers' reports of food-insecurity and any child outcome. Children's reports of food insecurity were associated with higher odds of doing passive home chores (OR: 1.17; 95% CI: 1.02, 1.32), cooking at home (OR: 1.21; 95% CI: 1.05, 1.38), taking care of siblings (OR: 1.15; 95% CI: 1.01, 1.31), and doing labor (OR: 1.22; 95% CI: 1.04, 1.42) and lower odds of playing video games (OR: 0.86; 95% CI: 0.76, 0.98) (all $P < 0.03$). Children's reports of management strategies were associated with 5 of 7 work activities measured. Labor in food-insecure children was the main activity that explained school absenteeism. Food insecurity reported by children can be assessed by pediatricians, school personnel, and other practitioners by using a simple instrument to identify food-insecure children and to respond to mitigate their food insecurity and its consequences. *J. Nutr.* 144: 1619–1626, 2014.

Introduction

Food insecurity is a worldwide concern, with 842 million persons regularly not getting enough food in socially acceptable ways to conduct an active life (1,2). Food insecurity is prevalent even in middle- and high-income countries such as the United States (3) and Venezuela (4). For ~25 y, food insecurity has been studied from the perspective of households, mainly through the eyes of women who have been assumed to manage food resources for the family (5–10). Food insecurity in elders, a vulnerable population, has also been studied (11,12). Children have been studied as a population vulnerable to food insecurity in the past 10 y (13–19). Globally, 171 million children are stunted (20), 67 million remain out of school (21), and 264 million are employed, including 168 million in the worst forms of child labor and below the minimum age allowed for work (22).

Child labor is work that deprives children of their childhood, their potential, and their dignity and that is harmful to physical and mental development (22). Child labor is work that is mentally, physically, socially, or morally dangerous and harmful to children and interferes with their schooling by depriving them of the opportunity to attend school, obliging them to leave school prematurely, or requiring them to attempt to combine school attendance with excessively long and heavy work. Not all work done by children should be classified as child labor. Children's or adolescents' participation in work that does not affect their health and personal development or interfere with their schooling is generally regarded as being positive (22). Today, ~30% of African children and 11% of Asian children spend >15 h/wk in hidden child labor. Girls are more involved in housework and boys more in family business work (23). In Latin America, ~5.7 million children aged 5–14 y do labor (24). In Venezuela, 5% of boys and 2% of girls between 10 and 17 y both attend school and do labor, and another 4% of children in these ages do not attend school and do labor (24).

Talking with children directly is essential to understanding child experiences of food insecurity (14–19). Children's experiences

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* To whom correspondence should be addressed. E-mail: jbernal@usb.ve.

with food insecurity occur in 3 subdomains of awareness—cognitive, emotional, and physical—and 3 subdomains of taking responsibility—participation in adult strategies, initiation of strategies, and generation of resources (16,17). Cognitive awareness means that children know food is scarce and the ways in which their family manages food problems. Emotional awareness means they experience feelings such as worry, sadness, or anger that are related to food insecurity. Physical awareness is physical feelings such as hunger, pain, tiredness, and weakness that are related to lack of sufficient food. Participation means going along with adult strategies for managing scarce food resources. Initiation of strategies means the child acts to stretch existing food resources. Generation of resources is taking action to obtain additional food or money for buying food. Three quantitative studies that we conducted in low-income populations in South Carolina (25), California (26), and Venezuela (15) demonstrate that children frequently experience each of these subdomains of food insecurity.

Household food insecurity has substantial detrimental effects on children, resulting in behavior problems, disrupted social interactions, compromised school performance (27,28), poor dietary intake and lower physical activity (26), and poor health (29). Although several mechanisms have been postulated to explain why and how food insecurity is detrimental for children, including altered parenting (30–32), hunger, distress, adverse family and social interactions, worry and anxiety, and feelings of deprivation and alienation (28), there is little information demonstrating which mechanisms are important.

We postulated that altered child daily activity resulting from food insecurity is an important mechanism linking child food insecurity with its detrimental effects on behavior, social interactions, and schooling, but, to our knowledge, no study has been conducted to investigate this potential mechanism. Therefore, this study aimed to investigate the association of child food insecurity with 3 sets of outcomes in children in Venezuela: daily activities, schooling, and stunting. We also compared how mothers' vs. children's reports of food insecurity were associated with these outcomes. To assess food insecurity from children directly, we developed 2 instruments: 1 based on indications of experiences of food insecurity by children and the other based on strategies to responses to food insecurity by the children. The instruments were developed from our qualitative data (17).

Participants and Methods

Conceptual framework. Our conceptual framework was that child food insecurity leads to alterations in child daily activities, which, in turn, leads to differences in child behavior, social interactions, and schooling. Child food insecurity leads to differences in child behavior, social interactions, and schooling through both altered daily activities (i.e., indirect effect) and other pathways (i.e., direct effects in this study).

Study setting. The study protocol was reviewed and approved by the Bioethics Committee of the Universidad Simón Bolívar. Consent was obtained from the director of the school and the parents and verbal consent was obtained from the children. All data collection was conducted in Spanish.

The study was conducted in a poor, peri-urban community in Miranda State, Venezuela. This community is heterogeneous, with uncertain access to health and educational facilities, and includes both urban areas and rural areas with agriculture. This community is close to Caracas, the capital of the country, but has deficiencies in access to school feeding programs, domestic water, and sanitation services.

Venezuela is a middle-income country that is multiethnic, is dependent on the exportation of oil, has tropical weather, is located in the northern part of South America, and has as part of its coast the Caribbean Sea. In

2011, ~65,000 children (1%) aged 7–12 y were not attending school nationally, and 10% of households lived without basic services such as water and in small spaces. In 2012, 32% of the total population was poor (4).

Development of food-insecurity instruments for children. The process of development and refinement of the instruments to assess food insecurity and the strategies used by children was based on the methodologic guide of the Food and Nutrition Technical Assistance Project (FANTA) (33). Initially, 50 items were developed from our qualitative data (17), which were then refined after cognitive interviews with 4 girls and 4 boys, aged 10–15 y. This process led us to develop 2 instruments for use in children, 1 to assess experiences of food insecurity with 10 items and the other to assess strategies to relieve food insecurity with 9 items.

The authors and 4 professionals with expertise in food security, design of measuring instruments, and population studies reviewed the items and provided suggestions. We conducted cognitive interviews on the 50 items with the 8 children to ensure comprehension of the items. We also tested options for the item responses (always, frequent, sometimes, and never) and the period of time that children can recall easily. The response “frequent” was almost never selected by children, but children were able to distinguish always, sometimes, and never during the month-long study. Therefore, we chose a response set with these 3 responses. From the first instrument, which contained 50 items and which we examined through the cognitive interviews and review by 4 experts, we selected 28 items to test in a community other than the main study community (sample $n = 118$; mean age: 11.76 ± 1.71 y; range: 9–16 y; equally gender distributed). From the data collected, we used factor analysis and reliability tests to select the most appropriate items. Two instruments emerged, 10 items on food insecurity and 9 items on strategies, which were used in the sample of 131 children for this study.

Study sample. Data collection was performed during the school year from April to July 2009. Seasonality was not an issue in data collection because the weather is stable, with mean temperatures from 20° to 32°C all year. The needed sample size was calculated by using Epi-Info, version 3.5.1 (34), with a 30% expected frequency of food insecurity, a minimum important difference of 20%, and a confidence level of 99% (type I error). The sample size needed for adequate statistical power was estimated to be 103 mother-child pairs. An additional 25% was added to compensate for anticipated lack of response to the invitation to participate, which gave a total of 129 mother-child pairs. A total of 545 children (7–17 y old) from 2 schools and their legal guardians were invited to participate in the study. Recruitment was performed by using personal letters signed by the researchers and the directors of the schools, which were given to the children and who also were encouraged to participate through the school billboard. Of this total, 334 (61%) of parents did not provide informed consent or refused participation. All of the 211 children of parents who gave consent were interviewed and measured, but 80 mothers of these children did not attend the day of their interview and could not be reached by telephone. The most common reason for mothers not participating was that they were working or too busy.

In total, 131 mother-child pairs completed the study. The mean age of the children was 12.5 ± 2.18 y (range: 7–17 y) and of the mothers was 42.4 ± 9.79 y (range: 21–69 y). Of the children, 48.9% were boys. All of the children were attending public schools, meaning that families did not have enough income to pay for private school, which is considered to be higher quality. Sixty of these 131 mothers were interviewed by telephone. Personal interviews of both children and mothers were conducted in person by 2 trained nutritionists and the lead author. The legal guardian interviewed was in 91% of cases the mother, with a mean age of 42 y; other guardians were the father or the grandparents, with a similar mean age. Henceforth, all of these adults are referred to as “mothers.” We verified with the teacher, the mother, and the child that no 2 children in the sample shared the same mother or lived in the same household.

Assessment of food insecurity in children and mothers. The 2 instruments that were developed and refined for assessing food insecurity

and strategies in children and a previously developed instrument for Venezuelan mothers (10) were administered in the sample of 131 child-mother pairs (Table 1). The possible responses on the 2 instruments for children were as follows: never (assigned 0 points), sometimes (1 point), and always (2 points). Responses across the 10 items for food insecurity and 9 items for strategies were summed to form scales. Higher values on the scales meant more frequent indications of food insecurity or engaging in strategies.

We constructed 4 ordinal categories (i.e., food secure and mild, moderate, and severe food insecurity) that considered the specific meaning of items for the assessment of food insecurity in children (33). The food-secure category corresponded to children with no affirmative responses to any of the 10 items. The mild food-insecurity category corresponded to children with 1–3 points; most of these children affirmed ≥ 1 of items 1–3 that refer to variety and preferences. The moderate category corresponded to children with 4–7 points; most of these children affirmed ≥ 2 of items 4–6 that refer to psychological and physical access to food. The severe category corresponded to children with ≥ 8 points; most of these children affirmed ≥ 2 of items 7–10 that are linked with instability, long periods of lack of food, and hunger episodes. For the instrument that captures the strategies to alleviate food insecurity in children with 9 items, we summed the number of affirmative responses answered for the period of 30 d for comparability with other data collected.

The possible responses in the 12-item instrument for food insecurity from mothers were as follows: never (0 points), rarely (1 point), usually

(2 points), and always (3 points). If a household responded never to all questions, it had zero points, indicating food security. If it had between 0 and 12 points, the household had mild food insecurity; if it had between 13 and 24 points, the household had moderate food insecurity; and if it had ≥ 25 points, the household had severe food insecurity. These response options and cutoffs were based on previous work done to adapt this instrument in Venezuela, and the instrument was shown to be valid (10).

Assessment of child activities and schooling. Children do work activities that include chores in the household related to food responsibilities, such as raising crops, shopping, and cooking; active and passive chores; care of siblings; or doing labor (for which the child receives remuneration). A checklist of activities carried out by children was created in advance on the basis of the prior qualitative interviews and additional observations. This checklist was used to elicit reports of children's activities: walking to and from school; playing during recess; physical education; sports; planting and watering crops in the field; caring for siblings; washing dishes, cleaning, sweeping, ironing, cooking and washing; buying food; running errands or doing labor; playing video games; watching television; doing computer work; and sleeping in the afternoon. Children could report additional activities. The children could choose 6 options of frequency: every day, 3–4 times/wk, once a week, once every 15 d, once a month, or never. These options were categorized as dichotomous variables for analysis, with 0 representing never, once a month, or once every 15 d, and 1 representing every day, 3–4 times/wk, or once a week.

TABLE 1 Affirmative responses to items on food insecurity and strategies in 131 mother-child pairs¹

Food insecurity reported by children	n (%)	Strategies reported by children	n (%)	Food insecurity reported by mothers	n (%)
1. Do you settle for the food you have because there is nothing more?	90 (68.8)	1. Have you used your own money to buy food?	62 (47.3)	1. Lack of money in the household to buy food	63 (48.1)
2. Would you like to eat more food but there is nothing else in your house?	76 (58.0)	2. Have you not eaten so that another child can eat?	56 (42.8)	2. Less essential food for the children is bought because the money is not enough	59 (45.0)
3. Do you have to eat the same food because there is no other?	57 (43.5)	3. Does anyone (mom or dad) eat less so you can eat more?	46 (35.1)	3. A member of the household eats less than he/she desires due to lack of money in the household to buy food	18 (13.7)
4. Have you worried because you have nothing to eat?	48 (36.7)	4. Do you store food for times when you have nothing to eat?	40 (32.1)	4. The number of usual meals in the household decreases because of lack of money to buy food	32 (24.4)
5. Has it occurred that the refrigerator is empty and you have nothing to eat?	42 (32.0)	5. Have you not eaten so that an adult can eat?	38 (29.0)	5. The number of meals for some adults decreases due to lack of money to buy food	20 (15.3)
6. Have you gone to sleep hungry for lack of food?	24 (18.3)	6. Have you ever asked for food "on loan" or bought "on credit"?	25 (19.1)	6. An adult eats less during the main meal because there is not enough food for everyone	16 (12.2)
7. When the groceries are finished in your house, do you spend several days without food?	18 (13.7)	7. Do you visit anyone (grandparents, uncles or aunts, neighbors) so he/she can give you food?	25 (19.1)	7. The number of meals for some children decreases due to lack of money to buy food	8 (6.1)
8. Have you skipped any meal (breakfast, lunch, or dinner) for lack of food?	18 (13.7)	8. Have you searched for mangos, plantains, or eggs outside the house because there is nothing else to eat?	24 (18.3)	8. A child eats less during the main meal because there is not enough food for everyone	10 (7.6)
9. Have you gone to school without eating for lack of food in your house?	17 (13.0)	9. Do you run errands for others to obtain money to eat?	16 (12.2)	9. An adult complains of hunger due to lack of food in the household	12 (9.2)
10. Have you spent a day without eating for lack of food?	16 (12.2)			10. A child complains of hunger due to lack of food in the household	9 (6.9)
				11. An adult goes to sleep hungry because there is not enough money for food	8 (6.1)
				12. A child goes to sleep hungry because there is not enough money for food	4 (3.1)

¹ Items for food insecurity and strategies reported by children used a 3-point response set, and items for food insecurity reported by mothers used a 4-point response set.

Information related to schooling was answered by children and linked with the food-insecurity categories. Children could say if they missed school in the last 30 d, or repeated any school year, with positive and negative statements. Missing a school day meant that the child should have attended school but did not. Repeating a school year meant any school year that was failed, as reported by the children.

Assessment of anthropometric measurements in children. Measurements of weight and height of the children were taken by a standardized anthropometrist and the first author according to the guidelines of the International Biological Program (35). To determine weight, an XACTA portable digital scale was used; to measure height, a GPM stadiometer with 0.1-mm precision was used. For the construction of the indicator of stunting, we used the height-for-age Z-score categorized by using AnthroPlus (Siher-Hegner GPMT) (36), with < -2 SDs indicating stunting. None of the children in the sample had a Z-score > 2 SDs.

Statistical analysis. The SPSS version 15 software package (37) was used to carry out the statistical analysis, with $P < 0.05$ considered to be significant. The 3 instruments that assess food insecurity and strategies from children and their mothers were examined with Cronbach's α reliability coefficient to confirm their internal consistency (38). Associations between the ordinal categories of child food insecurity and child outcomes were examined with a test for trend. Associations between the continuous scales to evaluate agreement in ranking children or mother-child pairs were assessed with Spearman correlation coefficients (ρ). Associations between continuous scales for the 3 instruments and child outcomes (i.e., activities, schooling, and stunting) were examined with logistic regression to take advantage of all of the information in the scales. Controlling for child age did not alter the estimated associations. To examine further the paths from food insecurity to absenteeism through child work activities, we used recursive path analysis in which activities were regressed on child food insecurity by using linear regression and absenteeism was regressed on child food insecurity and work activities by using logistic regression. The estimate of the direct path from child food insecurity to absenteeism was given by its regression coefficient, and the estimates of indirect paths were calculated by multiplying the coefficient for child food insecurity to an activity with the coefficient for an activity to absenteeism (39).

Results

The study children were enrolled from grades 2–9 in public schools; 37% of their families were below the poverty line (insufficient to cover minimum needs), and 13% of these did not earn the minimum food basket wage. From the children's reports of food insecurity, 16% of children were classified as secure, 37% as mildly food insecure, 34% as moderately food insecure, and 13% as severely food insecure; the mean \pm SD scale score was 3.62 ± 2.84 . Of the children who were classified as food insecure, 38% were classified as poor using the standard poverty line. The mean \pm SD score on the continuous scale for children's reports of strategies was 2.80 ± 2.59 . From the mothers' reports of food insecurity, 38.2% were secure, 56.5% were mildly food insecure, 4.6% were moderately food insecure, and 0.8% were severely food insecure; the mean \pm SD score on the scale was 2.76 ± 4.71 . The 3 instruments (food insecurity from children, strategies from children, and food insecurity from mothers) had reliability coefficients (Cronbach's α) of 0.76, 0.74, and 0.90, respectively. Affirmative responses for each item in the 3 instruments show how frequently children and mothers reported indications of food insecurity and the strategies to alleviate it (Table 1).

The food-insecurity and strategies scales of the children were strongly correlated with each other ($\rho = 0.72$, $P < 0.001$). The food-insecurity and strategies scales of the children were weakly correlated with the food-insecurity scale of their mothers ($\rho = 0.22$, $P = 0.010$, and $\rho = 0.20$, $P = 0.02$, respectively). The weak

association between the child and mothers' food-insecurity scales was confirmed by testing the association of pairs of child and mother items with similar meaning; in all cases, the associations were weak and not significant ($P > 0.05$) (data not shown).

The frequency of several work activities performed by children was higher with greater severity of food insecurity reported by children (Table 2). Performing passive home chores (P -trend = 0.04) and cooking (P -trend < 0.01) were more frequent in a dose-response manner across the 4 categories of food insecurity. There was a similar trend for performing active home chores, taking care of siblings, and doing labor. Only 1 child reported doing labor in the food-secure group compared with 23 food-insecure children who were involved in labor, which represented 18% of all children studied (NS). The prevalence of doing labor was twice as high in the 12–17-y-old children as it was in the 7–11-y-old children.

Children also performed activities that represented recreation, leisure, resting, and playing time. Child food insecurity was associated with working on the computer less frequently (P -trend = 0.03) and tended to be associated with playing video games less frequently (P -trend = 0.06) and taking a nap more frequently (P -trend = 0.07) (Table 2). One activity reported by almost all children, independent of food-insecurity status, was watching television.

In our sample, 9 of 10 children who reported being absent at school in the last 30 d were food insecure. Children who were mildly food insecure were absent from school twice as much as the food-secure group of children, and those who were moderately and severely food insecure were absent from school 3 times more than the secure group of children (P -trend = 0.03; Table 2). Higher prevalence of stunting was associated with food insecurity (P -trend = 0.01). In the food-secure children, none were stunted, but in the moderately and severely food-insecure children $> 20\%$ were stunted.

By using the continuous scales, we compared work activities with children's reports of food insecurity, children's reports of strategies, and the mothers' reports (Table 3). Children's reports of food insecurity were associated with higher odds of doing passive home chores (OR: 1.17), cooking at home (OR: 1.21), taking care of siblings (OR: 1.15), and doing labor (OR: 1.22) (all $P < 0.03$). These ORs are for a 1-point difference in the scale; for an OR of 1.2, for example, a 5-point difference in the scale (~ 2 SDs) corresponds to an OR of 2.5. Children's reports of strategies were associated with 5 of the 7 work activities measured (Table 3). Mothers' reports of food insecurity were not associated with any of the activities. For the daily activities that represent recreation, leisure, and resting time for the children, children's reports of food insecurity were associated with lower odds of playing video games (OR: 0.86; $P = 0.03$; Table 3). Both child food insecurity and strategies tended to be associated with higher odds of watching television by children and taking a nap ($P = 0.07$). Mothers' reports of food insecurity were not associated with any of the activities.

Children's reports of food insecurity and of strategies were both associated with higher odds of school absenteeism (OR: 1.16) and stunting (OR: 1.26) (all $P < 0.04$; Table 3). Mothers' reports of food insecurity were not associated with these outcomes. For the path analysis examining activities as a mediator between food insecurity and school absenteeism, the direct effect of food insecurity was 0.09 and the indirect effect through child labor, cooking, and taking care of siblings together was 0.05, meaning that the paths through these 3 activities accounted for 34% of the total effect of food insecurity on school absenteeism. Child labor alone accounted for 19% of the total effect.

TABLE 2 Activities and outcomes of children classified according to food insecurity reported by children¹

	Food secure		Food insecure		Total (n = 131)	P-trend
	0 points (n = 21)	1–3 points (n = 48)	4–7 points (n = 45)	≥8 points (n = 17)		
	n (%)		n (%)			
Activities						
Raising food crops	1 (4.8)	10 (20.8)	8 (17.8)	3 (17.6)	22 (16.8)	0.43
Food shopping	8 (38.1)	28 (58.3)	22 (48.9)	10 (58.8)	68 (51.9)	0.41
Passive home chores	5 (23.8)	18 (37.5)	25 (55.6)	10 (58.8)	58 (44.2)	0.04
Active home chores	13 (61.9)	40 (83.3)	38 (84.4)	14 (82.4)	105 (80.1)	0.15
Cooking at home	5 (23.8)	28 (58.3)	29 (64.4)	13 (76.5)	75 (57.2)	< 0.01
Taking care of siblings	9 (42.9)	24 (50.0)	25 (55.6)	13 (76.5)	71 (54.2)	0.18
Doing labor	1 (4.8)	7 (14.6)	11 (24.4)	5 (29.4)	24 (18.3)	0.14
Playing during school times	18 (85.7)	41 (85.4)	35 (77.8)	12 (70.6)	106 (80.9)	0.49
Walking to school	12 (57.1)	32 (66.7)	32 (71.1)	14 (82.4)	90 (68.7)	0.39
Doing sports in school	21 (100)	45 (93.8)	41 (91.1)	17 (100)	124 (94.6)	0.34
Doing sports outside of school	17 (81.0)	33 (68.8)	29 (64.4)	13 (76.5)	92 (70.2)	0.52
Watching television	19 (90.5)	45 (93.8)	45 (100)	17 (100)	126 (96.1)	0.17
Playing video games	12 (57.1)	21 (43.8)	23 (51.1)	3 (17.6)	59 (45.0)	0.06
Working on computer	15 (71.4)	17 (35.4)	17 (37.8)	8 (47.1)	57 (43.5)	0.03
Taking a nap	6 (28.6)	14 (29.2)	24 (53.3)	6 (35.3)	50 (38.1)	0.07
Outcomes						
School absenteeism	3 (14.3)	16 (33.3)	21 (46.7)	9 (52.9)	49 (37.4)	0.03
Repeating a school year	4 (19.0)	11 (22.9)	10 (22.2)	5 (29.4)	30 (22.9)	0.90
Stunting (height-for-age Z score < -2 SDs)	0 (0)	2 (4.2)	9 (20.0)	4 (23.4)	15 (14.4)	0.01

¹ P values were obtained by a test for trend across the 4 ordinal categories of food insecurity for each activity or outcome.

Discussion

Children who reported experiencing food insecurity had alterations in their daily activities as well as a higher prevalence of absenteeism and stunting than children who were food secure.

Food-insecure children reported passive and active actions and taking on responsibilities usually associated with those of adults.

Child labor was 1 of the activities reported by children who were food insecure. Our previous qualitative work showed that child labor occurs because of lack of income in the home, which

TABLE 3 Associations between children's activities and outcomes with food insecurity reported by children, strategies reported by children, and food insecurity reported by mothers¹

	Children's reports of food insecurity		Children's reports of strategies		Mothers' reports of food insecurity	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Activities						
Raising food crops	1.09 (0.93, 1.27)	0.28	1.17 (0.99, 1.37)	0.06	1.04 (0.96, 1.13)	0.34
Food shopping	1.10 (0.97, 1.25)	0.12	1.17 (1.01, 1.34)	0.04	1.02 (0.95, 1.10)	0.51
Passive home chores	1.17 (1.02, 1.32)	0.01	1.15 (1.00, 1.33)	0.04	0.98 (0.91, 1.06)	0.74
Active home chores	1.08 (0.92, 1.27)	0.34	1.17 (0.96, 1.42)	0.11	1.02 (0.92, 1.14)	0.62
Cooking at home	1.21 (1.05, 1.38)	<0.01	1.21 (1.04, 1.41)	0.01	1.00 (0.93, 1.07)	0.99
Taking care of siblings	1.15 (1.01, 1.31)	0.03	1.24 (1.06, 1.44)	<0.01	1.04 (0.96, 1.13)	0.32
Doing labor	1.22 (1.04, 1.42)	0.01	1.31 (1.11, 1.54)	<0.01	1.05 (0.97, 1.14)	0.21
Playing during school times	0.92 (0.79, 1.07)	0.30	0.97 (0.82, 1.13)	0.68	0.98 (0.90, 1.06)	0.63
Walking to school	1.11 (0.96, 1.27)	0.13	1.14 (0.97, 1.33)	0.11	0.99 (0.92, 1.07)	0.90
Doing sports in school	0.97 (0.74, 1.26)	0.82	0.92 (0.70, 1.19)	0.52	1.08 (0.83, 1.40)	0.55
Doing sports outside of school	1.02 (0.89, 1.16)	0.77	1.08 (0.92, 1.26)	0.32	1.00 (0.92, 1.08)	0.95
Watching television	1.72 (0.95, 3.08)	0.07	2.32 (0.92, 5.88)	0.07	1.13 (0.77, 1.67)	0.52
Playing video games	0.86 (0.76, 0.98)	0.03	0.96 (0.84, 1.09)	0.55	0.95 (0.88, 1.04)	0.31
Working on computer	0.94 (0.83, 1.06)	0.36	0.95 (0.83, 1.09)	0.49	0.92 (0.84, 1.01)	0.10
Taking a nap	1.06 (0.93, 1.20)	0.35	1.15 (1.00, 1.32)	0.04	1.01 (0.94, 1.09)	0.66
Outcomes						
School absenteeism	1.16 (1.01, 1.31)	0.03	1.33 (1.14, 1.55)	<0.01	1.01 (0.94, 1.09)	0.62
Repeating a school year	1.06 (0.92, 1.22)	0.41	1.05 (0.90, 1.22)	0.54	1.03 (0.96, 1.12)	0.35
Stunting (i.e., low height-for-age Z score)	1.26 (1.04, 1.50)	0.01	1.21 (1.00, 1.46)	0.04	1.01 (0.91, 1.13)	0.78

¹ ORs (95% CIs) and P values were obtained from logistic regressions of each activity or outcome on the continuous food insecurity and strategies scales. Each OR is for a 1-point difference in the scale.

is noticed by the children (17). Another qualitative study of child food insecurity and work in the United States reported that parents took an extra job in response to food insecurity but did not report episodes of child labor (14). Labor allows children to generate income to help their parents buy food and to satisfy other needs. The children know that if the flow of income to their households increases, the food situation improves. Jobs such as polishing shoes, packing groceries at supermarkets, or shopping for others are some of the activities that occur informally at first, with piecework jobs with low pay. Later, they take on more formal jobs, where they must sacrifice their study and recreation time (15). Children who do labor are at high risk of illness, injury, and even death because of a variety of hazards, as well as from long hours of work and poor living conditions (40). In the context of family dynamics, when a child works, the family may reallocate tasks with potential redistribution of benefits and burdens to family members. Having a child engage in labor rather than going to school may result in a shift of burden to the child and away from the remaining family members. If a child is expected to be “helping his or her mother” then the mother has to absorb the effects of the child’s absence when the child labors (41). From another perspective, child labor may be beneficial by providing a child with vocational training and general workplace experience (42).

Children who were food insecure also were absent during more days of school. Although this is the first demonstration that food insecurity reported by children is associated with absenteeism at school, these results are consistent with assumptions about food sufficiency and school attendance that have justified providing food assistance in schools. Children could have a higher prevalence of school absenteeism when facing other situations such as traumatic events (43). School absenteeism could occur for other reasons that could be related to food insecurity, such as lack of parental engagement with the child’s schooling, maternal depression, household social class, conflict between parents, having special education needs, or chronic illness (44).

School feeding programs have long been provided to vulnerable children with the aims of increasing enrollment rates and reducing absenteeism. Providing school meals can alleviate short-term hunger and increase children’s abilities to concentrate, learn, and perform specific tasks; these programs also have been linked to an increase in the enrollment of girls (45). Moreover, food assistance in high schools in underprivileged areas has a moderating effect on the association between household food insecurity and scholastic difficulties, such as poor grades and repeating a school year (46). In Venezuela, the school feeding program provided by the government nationally has an irregular distribution of food during the school year, and the program is not monitored.

Food-insecure children were much more likely to be stunted. If food insecurity is persistent over time (47), then food insecurity in this study could be a marker for social and biologic disadvantage during the period of the first 1000 d of life from conception to 24 mo of age, which is expected to have long-term consequences (48). Investments in this period can help prevent stunting and its consequences for child development and human capital formation (49). The stunting observed in this study reflects the poor conditions under which mothers and children lived in this first 1000-d period and cannot be reversed by food or other assistance after this period (48). Stunting is associated with suboptimal cognitive development, which may have long-lasting harmful consequences for human capital formation, including school performance, future earnings, low adult wages, lost productivity, and, when accompanied by excessive weight

gain later in childhood, increased risk of nutrition-related chronic disease (20,21,48). Longitudinal studies in cohorts of children in developing countries have confirmed the association between stunting and a reduction in schooling and grade failure (50). A child’s poorer school performance results in future income reductions of up to 22% on average (51), perpetuating the poverty cycle.

Food insecurity was linked to school absenteeism through work activities (primarily child labor, cooking, and taking care of siblings), accounting for approximately one-third of the association. Depending on the type of work, engaging in work activities could be beneficial or detrimental to the quality of children’s lives. For example, doing work activities such as housework and family business work for >15 h/wk was shown to hamper educational enrollment and attainment of children in a study in 16 developing countries (23).

We found that children’s reports of food insecurity and their strategies, but not mothers’ reports, were associated with both non-nutritional and nutritional outcomes. In addition, the scales from the children’s reports were poorly correlated with the scale from the mothers’ reports, which is consistent with other studies in the United States (18,19), Zimbabwe (52), and Ethiopia (53). Discordance between the reports may reflect differences in experiences or may be attributable to parental buffering, social desirability in responses, other reporting errors (18), or differences in measurement properties. In our study, the 3 scales (2 for children and 1 for mothers) were well constructed and reliable (10,54). Furthermore, children’s reports of food insecurity have been demonstrated to be accurate for 4 of 6 subdomains of child food insecurity in comparison to a definitive classification of child food insecurity, whereas mothers’ reports were inaccurate, missing nearly half of the children experiencing hunger (25). That is, parents’ reports may validly reflect household food insecurity, but children’s reports should be used when interested in the assessment of specific conditions of children.

A simple and feasible instrument to assess food insecurity reported from children such as the one from this study or that of Fram et al. (25) can be used by pediatricians, other health and nutrition practitioners, and community and school personnel to identify groups of children at high risk of food insecurity in the school-age population (26). Furthermore, Fram et al. (25) showed in the United States that their simple child-report instrument accurately identified individual children with food insecurity in comparison to a definitive classification of food insecurity. One of the challenges in identifying food-insecure children in schools is how to help schools then respond to this information (26). Therefore, in our population, absence from school could be used to identify children who are highly likely to be food insecure. The food-insecurity instrument is also potentially useful at a policy level for monitoring and surveillance as well as evaluation of social programs intended to benefit children. The instrument could generate information on food insecurity of children at low cost that would be hard or inaccurate to obtain through an interview with adults.

In conclusion, childhood is a critical time for safe and healthy human development. Children have special characteristics and needs in terms of physical, cognitive, socioemotional, and behavioral development. Children reporting food insecurity had alterations in their daily activities and a higher prevalence of school absenteeism and stunting. These children have lived with some responsibilities of adulthood since their early years, and these experiences interfere with their development.

Knowledge about what a child thinks and feels and how he or she lives and acts can help adults provide children with a means to achieve their development. Non-nutritional and nutritional

interventions that might help mitigate food insecurity and/or its effects on children include school feeding programs, scholarships and other programs that aim to keep children in school, social safety net programs, and education for parents, teachers, and health practitioners regarding the consequences of food insecurity and the need to protect children's time to engage in school and other activities that advance their development.

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