Child Health-Related Quality of Life and Household Food Security

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Objective: To examine the association of household food insecurity with child self- or proxy-reported health-related quality of life (HRQOL).


Participants: Three hundred ninety-nine children who live in 36 counties of the Delta region of Arkansas, Louisiana, and Mississippi.

Main Outcome Measures: Household food insecurity status was measured using the US Household Food Security Scale. Child HRQOL was measured by the Pediatric Quality of Life Inventory, QL version 4.0.

Analysis: Summary statistics, linear and logistic regressions, incorporating survey weights, performed with SUDAAN version 8.

Results: Household food insecurity was significantly associated with total child HRQOL (P < .05) and physical function (P < .05), adjusted for child age, ethnicity, gender, and family income. Children aged 3 through 8 years in food insecure households were reported by parents to have lower physical function (P = .001), while children aged 12 through 17 years reported lower psychosocial function (P = .007). Black males in food insecure households reported lower physical function (P < .05) and lower total HRQOL (P < .05).

Conclusions: Children who live in food insecure households have poorer HRQOL. The effect on physical or psychosocial function may differ by age, ethnicity, and gender. Food security should be considered an important risk factor for child health.

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Household food insecurity is defined by national experts as limited or uncertain availability of nutritionally adequate and safe foods, and limited or uncertain ability to acquire acceptable foods in socially acceptable ways. As measured by the US Household Food Security Module, food security is considered a marker of the adequacy and stability of a household’s food supply over the preceding 12 months for active healthy living of all household members.1,2 The most recent national data in 2002 indicate that 11.1% of all households (12.1 million) were food insecure.3 Sixteen percent of households with children were food insecure at some time during the preceding year. The prevalence of food insecurity is higher in African American (22%) and Hispanic households (21.7%) than in households of other racial groups. The prevalence is even higher in households with family incomes below the federal poverty line (38.1%).

Earlier national surveys measured food insufficiency, a single question that assessed the quantity of food available at the household level, but not the quality, uncertainty, or psychological components as measured by the Food Security Scale.4 Food insufficiency or other brief measures of hunger have been found to be related to low nutrient intake and poor self-reported health status in adults.5-9 Similar associations have been found in adults (particularly women) when food security is measured by the US Household Food Security Scale.10-12

Independent of demographic characteristics, children in food insufficient households have lower general health status and more negative symptoms when compared with children in food sufficient households.13,14 In a study of more than 11000 children participating in the National Health and Nutrition Examination Survey III (NHANES III, 1988-1994), children in food insufficient households (measured by 1 question) were more...
likely to have poor/fair general health status (also measured by a single question), and were more likely to report stomach aches, headaches, and colds, after adjusting for poverty, past health risk, and other family and environmental characteristics. Food insufficiency and hunger have also been associated with mental health problems and academic difficulties among school-aged children. To our knowledge, no research has been published using the US Food Security Household Scale with measures of child health status.

People who live in poverty, those from specific ethnic groups such as African Americans or Hispanics, or those of a lower educational level are known to be at increased risk for physical and mental health problems. Similarly, families who live in rural areas where access to medical care may be limited are at increased health risk. Thus, it is important to consider these factors when examining the association between food insecurity with child health.

Measures of general health and functional status, or health-related quality of life (HRQOL) are increasingly used to assess child health function in general populations or in relation to specific conditions like childhood obesity or other chronic conditions. This multidimensional construct includes physical, emotional, social, and school functioning and allows measurement of function that transcends the presence of symptoms or specific conditions. To our knowledge, HRQOL measures have not been previously used to evaluate the association of household food insecurity with the health and functional status of children.

In prior research with residents of the Lower Mississippi Delta, we have demonstrated that HRQOL is lower among adults from food insecure households than food secure households. Further, residents of this region have twice the rate of household food insecurity compared with the US population and higher self-reported rates of obesity, hypertension, and diabetes mellitus than national estimates. In this article we address the association of food insecurity and child HRQOL (CHRQOL) among children and adolescents in this economically depressed region of the country. We hypothesize that youth from food insecure households will have lower HRQOL than other youth after controlling for social and demographic characteristics known to influence child well-being.

DATA COLLECTION

We conducted a cross-sectional telephone survey of a representative sample of the population aged 3 years and older in 36 Delta counties of Arkansas, Louisiana, and Mississippi between January 1, 2000, and June 30, 2000. This research was reviewed and approved by the institutional review board of each partner university and Westat. A 2-stage stratified cluster sampling plan was used to assign the 36 Delta Nutrition Intervention Research Initiative counties to 9 strata according to population size, percentage of population who were black, and percentage of persons living below the federal poverty level. Eighteen counties (2 counties from each stratum) were selected with probability proportional to size to represent that stratum in the telephone survey. List-assisted random digit-dialing method was used to select a random sample of telephone numbers from the eligible blocks of numbers in these counties. Of the 3455 eligible households, 1293 households (37.4%) refused to participate. This participation rate reflects the increasing difficulty in recruiting participants in scientific surveys, particularly in low-income minority populations.

A computer-assisted telephone interview was conducted to determine the eligibility of the household. An eligible household was one that had at least one member aged 18 years or older; the telephone number was not for business use only; and the household was located in 1 of the 18 Delta sample counties. During this initial interview, information on age, sex, ethnicity of household members, and the presence of children in the household was determined. All members of the household were enumerated and 1 adult per household was selected randomly using the Kish tables. One child was selected from single-child households and randomly selected from households with more than 1 child. A second nonscheduled telephone call was made to households who agreed to participate to collect information regarding dietary intake, height and weight, and CHQQL. Approximately 1 to 2 weeks later, the adult in the household who had completed the dietary interview was interviewed again with questions including the food security status of the household.

Data on 485 children aged 3 to 17 years were collected in the first follow-up interview, and 465 completed the next interview (adult-reported household food security). Three hundred ninety-nine children had complete data for all study variables needed to compute food security and CHQQL, and these constituted the final sample for these analyses.

ASSESSMENT OF FOOD SECURITY

Food security status was evaluated using the US Household Food Security Scale. The responses to this 18-item food security survey module were used to classify households into 3 categories of food security status:

- Food secure: households that show no or minimal evidence of food insecurity.
- Food insecure without hunger: food insecurity is evident in the household concerns and in adjustments to household food management including reduced-quality diets. Little or no reduction in the household members’ food intake was reported.
- Food insecure with hunger: the food intake for adults and children in the household has been reduced to the extent that they have repeatedly experienced the physical sensations of hunger.

Because of limited observations, the latter 2 categories were combined, resulting in food secure and food insecure groups.

PEDIATRIC HRQOL

The Pediatric Quality of Life Initiative (Peds QL) version 4.0 was used to assess CHQQL. The Peds QL consists of 23 items with 5 response selections that range from “never” to “almost always.” The Peds QL has a total score and 2 subscale scores—physical and psychosocial function. The psychosocial subscale has questions that assess the domains of emotional, social, and school function. Scores were transformed to a 0 to 100 scale so that higher scores indicate better health-related QOL. The Peds QL has 4 different versions; Parent Report for Toddlers (aged 3-4 years); Parent Report for Young Children (aged 5-8 years); Child Report with parent assistance as needed (aged 9-11 years); and Teen Report (aged 12-17 years). The reliability and validity of the Peds QL has been demonstrated in both...
healthy children and children with physical illness who range in age from 2 to 18 years.30

CATEGORIZATION OF VARIABLES

Total income for the previous 12 months was self-reported in increments of $5000 or $10 000 ranging from less than $5000 to $50 000 or more. For the present analyses, income was stratified into the following 3 categories: $0 to $14 999, $15 000 to $29 999, and greater than $30 000. Child age was categorized into 3 groups: 3 to 8 years; 9 to 11 years; and 12 to 17 years. Ethnicity was categorized as white and black of non-Hispanic origin.

ANALYSIS

A household base weight equal to the inverse of the probability of selection was assigned to each sampled telephone number. Data were adjusted to compensate for telephone numbers with unknown residential status or eligibility, the number of residential telephone numbers in the household, and nonresponse to the screening interview. To account for nonresponse in the second interview, the weight of the nonparticipant was distributed to the participants within adjustment cells defined by age, race, and sex. Finally, estimates were calibrated to 1990 US Census Bureau37 estimates of the total households by state. All analyses were done using SUDAAN version 8.0 (Research Triangle Institute, Research Triangle Park, NC). Continuous variables were compared using t test comparing the weighted means. The association of CHRQOL with household food security status was determined for the entire sample, and stratified by the child’s age, gender, ethnic groups, and family income. Linear regression analyses were conducted with CHRQOL physical, psychosocial, and total scores as the dependent variable and food security status as the independent variable. Covariates included were the child’s age, race, gender, and family income, all variables that may be associated with food security or CHRQOL. Race was retained in these analyses as African Americans in this region have traditions and culture, which stem from the history of slavery and discrimination, that may result in differences in diets, access to safe and healthy food, and lifestyle.38 These differences between ethnic groups, independent of education or income, may directly or indirectly influence health status.

RESULTS

Demographic and food security status of the children and families are described in Table 1. Most children were black, and genders were equally represented. More than 25% had a family income less than $15 000, and less than half had a family income greater than $30 000. Twenty-five percent of the households with children were food insecure.

The CHRQOL by household food security status is given in Table 2. Children in food insecure households scored significantly lower on physical (P = .006) and psychosocial function (P = .017) and on total CHRQOL (P = .005) than children in food secure households.

The CHRQOL by household food security status for 3 child age groups is listed in Table 3. The youngest children (aged 3-8 years) in food insecure households scored significantly lower in physical functioning (P = .001). In contrast, the teenagers (aged 12-17 years) in food insecure households scored lower in psychosocial functioning (P = .007). The youngest children (P = .022) and teenagers (P = .03) in food insecure households were lower in the total health-related QOL. Among children in the middle-age group (aged 9-11 years), neither physical or psychosocial function nor total CHRQOL scores differed by food security status.

The CHRQOL of male children is given separately for black and white participants by household food security status in Table 4. Black males, but not white males, in food insecure households scored significantly lower on physical function (P < .05) and total CHRQOL (P < .05). Black males in food insecure households scored lower in psychosocial function that approached statistical significance (P = .07). In separate analyses, black females, but not white females, in food insecure households scored somewhat lower in psychosocial (P = .08) and total CHRQOL (P = .06). (Data not shown.) When comparing CHRQOL within 3 income categories, there were no differences between food secure and food insecure household status in the child’s physical function, psychosocial function, or total CHRQOL.

The results of the linear regression of CHRQOL on household food insecurity status, controlling for the child’s age, gender, and race, and household income, is given in Table 5. Independent of the demographic variables, food insecurity status was significantly associated with total CHRQOL and physical function (P ≤ .05). The association of food insecurity with psychosocial function approached significance (P = .06).

COMMENT

In this representative sample of children from the Delta region of Arkansas, Louisiana, and Mississippi, household food insecurity status was associated with lower reported physical and psychosocial function and lower total CHRQOL. Food insecurity status was associated with poorer physical function and lower total CHRQOL independent of the child’s gender, ethnicity, and age, and household income. The youngest children (aged 3-8 years) in food insecure households were reported by their par-

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Table 1. Characteristics of Children and Their Families

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No. (%) of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>192 (48.1)</td>
</tr>
<tr>
<td>Female</td>
<td>207 (51.8)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>232 (58.1)</td>
</tr>
<tr>
<td>White</td>
<td>167 (41.8)</td>
</tr>
<tr>
<td>Age group, y</td>
<td></td>
</tr>
<tr>
<td>3-8</td>
<td>149 (37.3)</td>
</tr>
<tr>
<td>9-11</td>
<td>67 (16.8)</td>
</tr>
<tr>
<td>12-17</td>
<td>183 (45.9)</td>
</tr>
<tr>
<td>Annual income, $</td>
<td></td>
</tr>
<tr>
<td>≤ 14 999</td>
<td>105 (26.3)</td>
</tr>
<tr>
<td>15 000-29 999</td>
<td>109 (27.3)</td>
</tr>
<tr>
<td>≥ 30 000</td>
<td>185 (46.4)</td>
</tr>
<tr>
<td>Food security</td>
<td></td>
</tr>
<tr>
<td>Secure</td>
<td>297 (74.4)</td>
</tr>
<tr>
<td>Insecure</td>
<td>102 (25.6)</td>
</tr>
</tbody>
</table>
ents to have lower physical functioning while the teenagers reported lower psychosocial functioning. Black males in food insecure households had lower physical function and lower total CHRQOL.

On average, children from food insecure households scored about 4 units below children from food secure households on scales of the Peds QL. This difference approximates the difference between healthy children and acute and chronically ill children on scales as reported by the developer of the Peds QL. The Peds QL total scores of children from food insecure families in this sample were somewhat lower than a sample of healthy children and similar to scores of children with types 1 and 2 diabetes mellitus and certain chronic conditions. Scores from this sample from food insecure households were higher than those for children with cancer and obesity.

This study advances the understanding of the association of food insecurity and child health in several important ways. To our knowledge, this is the first report to use the US Household Food Security Scale to categorize household food insecurity status while assessing child health status. We used a well-validated measure to document CHRQOL across the age span. In addition, the association was examined in multiple subgroups and consistent differences were found between age groups and gender. The direction of effects is consistent, with the food insecure groups scoring lower in the CHRQOL measure in almost all comparisons, even when differences between food secure and insecure groups were not statistically significant. Finally, the sample was randomly collected and is reasonably representative of the population from which it was drawn.

### Table 2. Health-Related Quality of Life of Children by Household Food Security Status

<table>
<thead>
<tr>
<th>Variable</th>
<th>Food Secure (n = 297)</th>
<th>Food Insecure (n = 102)</th>
<th>Mean Difference (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical functioning</td>
<td>90.9 (0.6)</td>
<td>86.9 (1.5)</td>
<td>4.0 (1.17 to 6.79)</td>
<td>.006</td>
</tr>
<tr>
<td>Psychosocial functioning</td>
<td>80.8 (0.7)</td>
<td>76.7 (1.6)</td>
<td>4.1 (0.78 to 7.56)</td>
<td>.02</td>
</tr>
<tr>
<td>Total score</td>
<td>84.4 (0.6)</td>
<td>80.3 (1.4)</td>
<td>4.1 (1.29 to 6.99)</td>
<td>.005</td>
</tr>
</tbody>
</table>

### Table 3. Health-Related Quality of Life by Age of Children and Household Food Security Status

<table>
<thead>
<tr>
<th>Variable</th>
<th>Food Secure (n = 297)</th>
<th>Food Insecure (n = 102)</th>
<th>Mean Difference (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical functioning</td>
<td>94.4 (0.6) [111]</td>
<td>88.3 (1.7) [38]</td>
<td>6.1 (2.55 to 9.67)</td>
<td>.001</td>
</tr>
<tr>
<td>Psychosocial functioning</td>
<td>83.6 (0.9) [111]</td>
<td>79.6 (2.3) [38]</td>
<td>4.0 (−1.17 to 9.10)</td>
<td>.13</td>
</tr>
<tr>
<td>Total score</td>
<td>79.1 (1.1) [135]</td>
<td>71.8 (2.3) [48]</td>
<td>7.3 (2.07 to 12.50)</td>
<td>.007</td>
</tr>
</tbody>
</table>

### Table 4. Health-Related Quality of Life of Male Children by Ethnicity and Household Food Security Status

<table>
<thead>
<tr>
<th>Variable</th>
<th>Black Food Secure (n = 68)</th>
<th>Black Food Insecure (n = 44)</th>
<th>Mean Difference (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical functioning</td>
<td>92.3 (1.1)</td>
<td>87.9 (1.8)</td>
<td>4.4 (0.47 to 8.19)</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>Psychosocial functioning</td>
<td>81.0 (1.3)</td>
<td>76.5 (2.1)</td>
<td>4.5 (-0.32 to 9.39)</td>
<td>.05</td>
</tr>
<tr>
<td>Total score</td>
<td>85.0 (1.1)</td>
<td>80.5 (1.8)</td>
<td>4.5 (0.68 to 8.48)</td>
<td>.05</td>
</tr>
</tbody>
</table>

Abbreviation: CI, confidence interval.

*Data are given as mean (SE) unless otherwise indicated.

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The prevalence of food insecurity in the United States increased from 10.1% in 1999 to 11.1% in 2002, an increase of more than 1.5 million households. A recent report demonstrated that children in families whose benefits were terminated or reduced had greater likelihood of being food insecure. The loss of food stamps in this context is of particular concern as food stamps have been shown to increase the nutrient intake of children in impoverished families.

While research to date does not allow understanding as to whether food insecurity is an independent cause of negative CHRQOL, one can conclude that food insecurity is independently associated with negative CHRQOL. For this reason, researchers, clinicians, and policymakers should consider food insecurity as an important risk factor for children, particularly those who live in poverty.

### Table 5. Adjusted Health-Related Quality of Life by Household Food Security Status

<table>
<thead>
<tr>
<th>Variable</th>
<th>Food Secure</th>
<th>Food Insecure</th>
<th>Mean Difference (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical functioning</td>
<td>90.7 (0.66)</td>
<td>87.4 (1.64)</td>
<td>3.3 (0.11 to 6.39)</td>
<td>.046</td>
</tr>
<tr>
<td>Psychosocial</td>
<td>80.7 (0.80)</td>
<td>77.1 (1.64)</td>
<td>3.6 (~.04 to 7.40)</td>
<td>.06</td>
</tr>
<tr>
<td>Total score</td>
<td>84.2 (0.64)</td>
<td>80.7 (1.53)</td>
<td>3.5 (0.39 to 6.75)</td>
<td>.03</td>
</tr>
</tbody>
</table>

Abbreviation: CI, confidence interval.

Data are adjusted for the child's age, race, gender, and household income and are given as the score (SE) unless otherwise indicated.

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