Food Insecurity and Health Care Use
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abstract

BACKGROUND AND OBJECTIVES: Fifteen percent of US children live in households with inadequate food. Children who are food insecure often experience worse physical, emotional, and developmental health outcomes. Authors of previous studies have not examined the quality and cost implications of food insecurity in children.

METHODS: This is a retrospective study of 7959 nationally representative US children (aged 1–17 years) in the 2016 Medical Expenditure Panel Survey. Households with food insecurity were identified by ≥3 positive responses to the 30-day, 10-item US Food Security Survey. Main outcomes were annual health expenditures and quality of care indicators: emergency department (ED) and inpatient use, primary care and specialist visits, routine medical and dental care, patient experience measures, and school absenteeism. Logistic and 2-part regression models were constructed to estimate outcomes conditional on sociodemographic and medical covariates.

RESULTS: Children in households with food insecurity were more often publicly insured and had special needs compared with all other children. In multivariable logistic regression, household food insecurity was associated with significantly higher adjusted odds of an ED (adjusted odds ratio [aOR] = 1.37) or primary care treatment visit (aOR = 1.24) during the year. Household food insecurity was associated with significantly higher school absenteeism (aOR = 1.74) and lower access to care for routine (aOR = 0.55) or illness (aOR = 0.57) care. There were no differences in annual health expenditures, hospitalizations, or receipt of routine medical or dental care.

CONCLUSIONS: Household food insecurity is associated with higher ED use and school absenteeism and lower access to care; however, it was not associated with higher annual health expenditures in children.

WHAT’S KNOWN ON THIS SUBJECT: Fifteen percent of US children experience food insecurity. Children who are food insecure are less likely to attain healthy growth and development. The relationship between food insecurity, health care service use, quality of care, and expenditures is not well established in children.

WHAT THIS STUDY ADDS: Using national US survey data, we found that household food insecurity was associated with higher emergency department use and school absenteeism and lower access to care quality among children; however, there were no differences in annual health expenditures.

Food insecurity is characterized by the lack of reliable access to sufficient food to support an active and healthy life. Authors of previous research demonstrate that children living in households with food insecurity are at risk for worse physical, emotional, and developmental outcomes. Public assistance programs such as the Supplemental Nutrition Assistance Program and the Special Supplemental Nutrition Program for Women, Infants, and Children have helped mitigate the potentially harmful impacts of food insecurity for millions of children. Yet, despite these and other important investments, the rates of food insecurity among US children remain high. At present, it is estimated that ~15% of US children live in households with inadequate access to food.

In recent years, a growing number of clinical organizations as well as health insurers have prioritized addressing social determinants of health including food insecurity. This has involved initiatives aimed at reducing food insecurity through enhanced screenings, more robust referral to community-based organizations, or in some cases, directly providing food support in the clinical setting. These programs often take place within value-based payment arrangements whereby clinical organizations have financial incentives for improving quality of care and reducing health expenditures. Such investments are often predicated on beliefs that improvements in unmet social needs will lead to improvements in quality of care and reductions in health expenditures. Higher health expenditures have been observed among adults with food insecurity, however this relationship has not been well established in children. Authors of previous studies examining the association between food insecurity and health care use have generated conflicting results, and none have examined differences in clinical quality. Better understanding the differences in pediatric health expenditures and quality of care on the basis of food security will allow for more informed evaluation of interventions to help moderate food insecurity.

Accordingly, our objective was to examine associations between household food insecurity, health expenditures, and quality of care received by US children. Specifically, we used a nationally representative survey to examine the associations between household-level food insecurity; pediatric health expenditures; and quality of care indicators, including acute care (eg, emergency department [ED] and inpatient) use, attainment of recommended routine care, patient experience of care quality measures, and school absenteeism.

**METHODS**

**Study Design**

We conducted an observational study using a nationally representative sample of insured noninstitutionalized US children (ages 1–17 years) appearing in the 2016 Medical Expenditure Panel Survey (MEPS).

**Data Source**

MEPS is a longitudinal survey of US households conducted annually by the Agency for Healthcare Research and Quality. MEPS uses complex survey design to allow nationally representative comparisons when applying survey weights. Households were surveyed multiple times during the study period, and for each household and/or sample, there was a designated primary survey respondent. In our sample, the primary survey respondent was almost exclusively (>97%) the parent or grandparent of the index child. MEPS contains information about sociodemographics, health needs, income, insurance enrollment, and health care service use and expenditures. Health care use data are self-reported and supplemented with information collected from a sample of health care providers. When expenditure data are missing, the MEPS uses weighted hot deck statistical imputation methods, incorporating sampling weights and sociodemographic predictors, to impute missing or unavailable expenditure data. It has been previously estimated that among all health care events, approximately one-third of expenditures (ranging from 30% for inpatient to 38.9% for outpatient) require full imputation. Imputed values for race, ethnicity, and income were also used in this analysis. All imputations were obtained from the MEPS database and we did not conduct any additional imputations for missing or unavailable data.

**Food Security Definition**

We measured household-level estimates of food security using the 30-day, 10-item US Adult Food Security Survey used by the US Department of Agriculture. The survey is used to assess the general food needs of the household as a group over the preceding 30 days by the primary survey respondent using adult-oriented questions. The survey is not intended to describe the needs of individual household members or distinguish between child-specific food needs. Authors of validation studies suggest acceptable statistical reliability when it is tested in households with children (Cronbach’s α = 0.79) and comparability with longer versions of the survey. However, lower reliability in distinguishing between less severe forms of food insecurity has been noted with this instrument. To mitigate this limitation, and to be consistent with previous use of the data set, we selected a conservative definition of...
≥3 positive responses corresponding to low or very low household food security and classified all other children as those living in households with <3 positive responses. Sensitivity analysis was conducted, including households with marginal food security (1 or 2 positive responses).

**Annual Expenditure and Service Use**

Primary outcomes were the presence of any clinical service use (inpatient, ED, specialist, and primary care visits) and total health expenditures during the calendar year. We distinguished between primary care preventive and treatment visits on the basis of the recorded type of visit and diagnosis code for the visit. Annual health expenditures were defined as the sum of all insurance-paid and household out-of-pocket expenditures in 2016 US dollars. Expenditures did not include government agency services or social services unless these were billed to the insurer and/or household. We excluded expenditures related to preventive services (eg, immunizations and primary care prevention visits) because the objective was to focus on expenses for which reductions would be unlikely to compromise quality of care. Sensitivity analysis was conducted by using all annual expenditures.

**Clinical Quality Indicators**

We measured receipt of routine primary care medical (annual) and dental (semiannual) visits, patient experience of care quality measures, and school absenteeism due to illness. We used patient experience of care quality measures from the Clinician and Group Consumer Assessment of Healthcare Providers and Systems Survey adapted for MEPS to measure satisfaction with health care services. The Clinician and Group Consumer Assessment of Healthcare Providers and Systems Survey is a validated and widely used survey instrument in which parents rate their experience with their child’s health care. This instrument has statistical reliability (>0.70) for profiling quality of care at the physician practice level. We measured the overall ratings of health care services and 4 questions within the domain of access and availability of care: routine care, specialty care, necessary care, and illness care dichotomized by using the top score for each question. For analyzing school absenteeism, we limited the cohort to school-aged children (≥5 years).

**Medical and Sociodemographic Covariates**

Sociodemographic characteristics included the child’s age, sex, household size, geographic region, and insurance status (private versus public). Government-sponsored health insurance programs such as Medicaid and the Children’s Health Insurance Program are denoted as public. Children <1 year of age were excluded because the main and secondary outcomes were annualized measures of service use and quality. For quantifying patient-level clinical risk, we identified children with special health care needs (CSHCNs), defined as children having or being at increased risk for chronic health conditions and requiring greater than usual use of health care services, using the validated CSHCN screening instrument adapted for MEPS.

**Sociodemographic Covariates**

We conceptually mapped domains of sociodemographic risk to available data variables, including: (1) race and/or ethnicity, (2) public insurance, (3) non-English language, (4) household income, (5) single-parent households, (6) parental education levels, (7) poor or fair mental health in ≥1 parent, (8) parental unemployment, and (9) transportation barriers. We estimated non-English primary language households using the language used to administer the MEPS to the primary survey respondent. We calculated household income as percentage of the federal poverty level. To measure medically-related transportation barriers, we constructed an index combining 2 variables: travel ≥31 minutes to usual source of care and absence of usual source of care due to transportation problems. For modeling dental service use, we included presence of dental insurance as a covariate.

**Statistical Analysis**

We used descriptive statistics to summarize differences in covariates and outcomes between children who are food insecure versus all other children. We conducted bivariable tests of statistical significance using the Pearson χ² test for nonparametric survey estimates and the adjusted Wald test for parametric survey estimates. Expenditure data were highly skewed. As such, we modeled expenditures using a 2-part γ regression with log link, conditional on food security and other covariates. To model all other outcome variables, we used logistic regression to generate adjusted odds ratios (aORs). Stata version 14.1 (Stata Corp, College Station, TX) was used in all analyses. Specifically, we used the Stata svy command with robust variance estimators to account for clustering and applied survey weights to all analyses to allow for nationally representative comparisons. We used P < .05 as the threshold for statistical significance. The Institutional Review Board at Boston Medical Center approved this study by exemption.

**RESULTS**

**Study Population**

The study cohort included 7959 nationally representative noninstitutionalized US children. Thirteen percent resided in...
households with food insecurity (representative of 8.6 million US children) (Table 1).

**Characteristics of Children in Food-Insecure Households**

Children in households with food insecurity were more often African American (18.2% vs 13.6%) and Hispanic (34.1% vs 23.0%) and less often white (37.4% vs 51.5%) when compared with all other children. Higher rates of public insurance (71.3% vs 34.6%) and special health care needs (29.0% vs 20.0%) were noted among children in food-insecure households when compared with all other children (P < .001 for both; Table 2). Overall, 23% of publicly insured children lived in a household with food insecurity as compared with 7% of privately insured children. Children in households with food insecurity were more likely to be poor, and their parents were more likely to be non-English speaking, single, have fair or poor mental health, be unemployed, and lack a high school degree.

**Multivariable Regression Analysis**

In multivariable analysis, when adjusting for differences in medical and sociodemographic factors, children in households with food insecurity experienced modestly higher odds of experiencing an ED (aOR = 1.37; 95% confidence interval [CI]: 1.03–1.82; P = .03) or primary care treatment visit (aOR = 1.24; 95% CI: 1.00–1.54; P = .04) during the year (Table 3). There was no significant difference on the basis of household food security for inpatient hospitalizations or specialist visits. Children in households with food insecurity more often missed school because of illness (aOR = 1.74; 95% CI: 1.32–2.29; P < .001) and reported lower ease when accessing routine care (aOR = 0.55; 95% CI: 0.38–0.82; P = .003) or illness (aOR = 0.57; 95% CI: 0.34–0.97; P = .04) care. We found no statistically significant difference (P = .62) in regression-adjusted annual health expenditures between children in food-insecure households ($1419; 95% CI: $1091–$1749) and all other children ($1316; 95% CI: $1172–$1461). No statistically meaningful differences in overall rating of health care services or attainment of recommend routine primary medical or dental care were observed.

**TABLE 1** Positive Household-Level Responses to 30-Day, 10-Item US Adult Food Security Survey

<table>
<thead>
<tr>
<th>Positive Responses</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>78.5</td>
</tr>
<tr>
<td>1</td>
<td>5.1</td>
</tr>
<tr>
<td>2</td>
<td>3.5</td>
</tr>
<tr>
<td>3 or more&lt;sup&gt;a&lt;/sup&gt;</td>
<td>12.9&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>


<sup>a</sup> Denotes food insecurity.

**TABLE 2** Demographics and Health Care Use and Quality

<table>
<thead>
<tr>
<th>Sociodemographic and Medical Covariates</th>
<th>Food Insecure</th>
<th>All Other</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean</td>
<td>9.5</td>
<td>9.0</td>
<td>.03</td>
</tr>
<tr>
<td>Male sex, %</td>
<td>51.1</td>
<td>51.1</td>
<td>.98</td>
</tr>
<tr>
<td>Race and/or ethnicity, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>37.4</td>
<td>51.5</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>African American</td>
<td>18.2</td>
<td>13.6</td>
<td>—</td>
</tr>
<tr>
<td>Hispanic</td>
<td>34.1</td>
<td>23.0</td>
<td>—</td>
</tr>
<tr>
<td>Asian American</td>
<td>1.1</td>
<td>5.5</td>
<td>—</td>
</tr>
<tr>
<td>Other or multiple</td>
<td>9.3</td>
<td>6.3</td>
<td>—</td>
</tr>
<tr>
<td>English not primary language, %</td>
<td>19.0</td>
<td>10.4</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Census region</td>
<td></td>
<td></td>
<td>.16</td>
</tr>
<tr>
<td>Northeast</td>
<td>11.5</td>
<td>17.0</td>
<td>—</td>
</tr>
<tr>
<td>South</td>
<td>21.6</td>
<td>21.3</td>
<td>—</td>
</tr>
<tr>
<td>Midwest</td>
<td>41.2</td>
<td>37.9</td>
<td>—</td>
</tr>
<tr>
<td>West</td>
<td>25.7</td>
<td>23.8</td>
<td>—</td>
</tr>
<tr>
<td>Public insurance, %</td>
<td>71.3</td>
<td>34.6</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>CHSHN, %</td>
<td>29.0</td>
<td>20.0</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Household size, average</td>
<td>4.4</td>
<td>4.3</td>
<td>.15</td>
</tr>
<tr>
<td>Household income ≤100% of FPL</td>
<td>36.1</td>
<td>14.9</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Transportation barrier, %</td>
<td>7.8</td>
<td>6.2</td>
<td>.21</td>
</tr>
<tr>
<td>Single parent in household, %</td>
<td>47.5</td>
<td>24.8</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Parent without high school degree, %</td>
<td>30.1</td>
<td>14.3</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Parent unemployed, %</td>
<td>8.2</td>
<td>3.8</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Parent with fair or poor mental health, %</td>
<td>31.1</td>
<td>11.0</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Health care use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual health expenditure, $</td>
<td>1568</td>
<td>1360</td>
<td>.97</td>
</tr>
<tr>
<td>Any ED visit, %</td>
<td>16.0</td>
<td>11.3</td>
<td>.01</td>
</tr>
<tr>
<td>Any hospitalization, %</td>
<td>2.1</td>
<td>1.5</td>
<td>.24</td>
</tr>
<tr>
<td>Any primary care treatment visit, %</td>
<td>33.0</td>
<td>35.0</td>
<td>.36</td>
</tr>
<tr>
<td>Any specialist visit, %</td>
<td>20.0</td>
<td>20.0</td>
<td>.98</td>
</tr>
<tr>
<td>Quality of care indicators</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any school absence for illness, %</td>
<td>70.2</td>
<td>61.5</td>
<td>.002</td>
</tr>
<tr>
<td>Annual primary care preventive visit, %</td>
<td>42.7</td>
<td>50.0</td>
<td>.003</td>
</tr>
<tr>
<td>Biannual dental visit, %</td>
<td>16.1</td>
<td>21.3</td>
<td>.002</td>
</tr>
<tr>
<td>Experience of care ratings, % top score</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>53.9</td>
<td>48.6</td>
<td>.10</td>
</tr>
<tr>
<td>Ease of specialist referral</td>
<td>55.3</td>
<td>68.2</td>
<td>.005</td>
</tr>
<tr>
<td>Routine appointment when wanted</td>
<td>72.9</td>
<td>84.1</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Illness care when wanted</td>
<td>84.2</td>
<td>90.5</td>
<td>.04</td>
</tr>
<tr>
<td>Ease of getting necessary care</td>
<td>74.2</td>
<td>85.7</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Bivariable tests of statistical significance were conducted by using the Pearson χ² test for nonparametric survey estimates and the adjusted Wald test for parametric survey estimates. FPL, federal poverty level; —, not applicable.

<sup>a</sup> To measure medically related transportation barriers, we constructed an index combining 2 variables: (1) travel ≥31 min to usual source of care and (2) absence of usual source of care due to transportation problems.

<sup>b</sup> Denotes ≥1 parent with the indicated risk factor.
Sensitivity Analysis

We first examined the effect of stratifying the sample into 3 groups: food insecurity (≥3 positive responses) versus marginal food security (1 or 2 positive responses) versus all other children (0 positive responses). The full results are presented in Supplemental Table 4. Removing children with marginal food security from the comparator modestly impacted the results. Ease of necessary care (aOR = 0.50) was significantly lower for children who are food insecure (versus all other children); however, the previously observed increase in primary care treatment visits was no longer significant (P = .06). Children in marginally food-secure households experienced statistically higher odds of ED use and school absenteeism and lower access to care for routine, illness, and necessary care when compared with all other children. There were no statistically meaningful differences when comparing children in marginal food-secure households versus children in food-insecure households across all study outcomes. Annual health expenditures were statistically similar across all 3 groups of children.

DISCUSSION

We found in this nationally representative sample of US children that household food insecurity is concentrated among low-income household, publicly insured, and racial and/or ethnic minority children. Children living in households with food insecurity had modestly higher use of ED care and higher school absenteeism rates, and their parents experienced more frequent difficulty when trying to access care. However, despite these differences, household food security does not appear to have large impacts on hospitalization rates or annual health expenditures in children.

Our results add to the existing literature in which the complex relationship between food security and health care use in children is examined in several ways.2,3,23,35 First, we described higher use of ED services among children in food-insecure households. Previous examinations of acute care use in children who are food insecure have generated conflicting results.21–23 Authors of a similar study using national survey data (2002 National Survey of America’s Families) also described higher odds of ED use among children in low-income food-insecure households.21 We add to these results by presenting updated data (including middle-income children), accounting for additional sociodemographic factors, and revealing modestly higher use of primary care treatment visits among children in food-insecure households. Collectively, our 2 studies suggest that disparities in ED use on the basis of food security appear persistent over the past decade despite sustained investments in nutritional supports. Because children in food-insecure households may use the ED more frequently, this clinical setting may present opportunities for identifying needs and making connections to community-based services.36

Second, we uniquely examined differences in patient experience of care quality on the basis of food insecurity. Authors of previous studies have suggested that lacking a usual source of care and foregoing medical care is more common among children who are food insecure.21 We add to these results by showing that parents in food-insecure households report more difficulties accessing care when needed for routine and urgent issues. Our finding, consistent with increased use of ED services, reveals the hardship that some parents with food insecurity and other social stressors may experience when attempting to access the health care system. Innovations such as open access scheduling, colocation, telehealth, or combining clinical care with food resources11,37 may help improve access to health care for these families.

Finally, we found no difference in adjusted annual health expenditures based on food insecurity in children. These findings are different from what has been previously described in adults.17–20 There are several potential explanations for why food insecurity manifests as higher health expenditure use in adults but not
children. First, children on average use fewer health care services, and important drivers of health expenditures (inpatient, specialist, and pharmacy) (data not shown) do not appear to be impacted as much by food insecurity in children as they are in adults.17–20 Second, the adverse impacts of social stressors such as food insecurity on the well-being of developing children may not become apparent for many years (or decades), whereas in adults, who experience much higher rates of chronic illness, the consequences may be more rapid. Third, socially disadvantaged children are often reliant on social services such as school-based, government agency, and community-based care, whose costs were not included in the study. Therefore, payment policies established on the basis of adult evidence may overestimate expectations for financial savings associated with interventions aimed at ameliorating food insecurity in children. Instead, when measuring the efficacy of food security-based interventions within the context of health care delivery, we suggest that improvement targets be set toward observed disparities, including improving access and/or availability of care, reducing ED use, and enabling school attendance.38 Still, additional research is needed to determine if these disparities are amenable to delivery system intervention or are caused by more systemic effects of poverty and social disadvantage. Inclusion of nonmedical expenditures such as governmental agency and community-based supports or using longer time horizons for assessing efficacy may be more revealing in children.

The mechanism for how food insecurity impacts health care use is unclear and likely extends beyond the adverse physiologic effects of nutritional deficiency. Psychological stress associated with food insecurity negatively impacts the social, emotional, physical, and developmental health of children and young adults.2,4,35,39 Moreover, research from psychology suggests that severe scarcity causes people to experience limited “bandwidth” when processing complex decisions. As such, we hypothesize that parents in food-insecure households may find themselves experiencing more difficulties navigating the complex health care system during times of childhood illness, contributing to more reliance on acute care services.5 Future studies are encouraged to examine the intersection between food insecurity and overall economic scarcity in households as it relates to use of health care services in children.

There are several methodologic limitations to consider when interpreting these results. First, we used survey data to construct the analysis. National survey data can provide robust insights; however, they are prone to missing data and reporting bias. To mitigate this limitation when appropriate, we used MEPS-derived imputed values. However, imputation is also subject to statistical error, particularly in modeling health expenditures which have particularly high degrees of missing data. Second, we used a conservative definition for food insecurity (≥3 positive responses).40 In recent years, special attention has been called to children who are living in households with marginal food insecurity.2 Our sensitivity results suggest (noting the limitation of this survey instrument in discriminating between milder forms of food insecurity) broadly that children with marginal food security may experience similar challenges with health care access. We believe authors of studies using more robust instruments for food insecurity would be better positioned to address differences in health care use between marginally-secure and food-insecure households.27 Finally, we assessed food security of the household as a group and did not use child-specific questions. Previous research has revealed more adverse outcomes when both adult and child food insecurity are present,41 and we address this limitation through selection of a more restrictive definition of food insecurity.

Acknowledging these limitations, our results reveal disparities in quality among children in food-insecure households and inform potential financial implications of interventions.

CONCLUSIONS

We found that household food insecurity is associated with higher rates of ED use and school absenteeism and lower access to care quality in children. However, the impacts of food insecurity on hospitalization rates and overall health expenditures may be minimal. Clinical organizations, insurers, and policymakers may take note of these findings as they partner to implement delivery system interventions to address food security in socially disadvantaged children.

ACKNOWLEDGMENT

We thank Ryan Walsh, BS, for assisting with article preparation.

ABBREVIATIONS

aOR: adjusted odds ratio
CI: confidence interval
CSHCN: child with special health care needs
ED: emergency department
MEPS: Medical Expenditure Panel Survey
REFERENCES


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http://pediatrics.aappublications.org/content/144/4/e20190347

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