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FOOD INSUFFICIENCY AND CHILDREN
WITH SPECIAL HEALTH CARE NEEDS

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ABSTRACT

Objectives. The purpose of this study is to examine the prevalence of food insufficiency, a more severe form of food insecurity, across levels of special health care needs among a nationally representative sample of children in the United States. The study also investigates whether medical home access serves as a possible protective mechanism against food hardship.

Study Design. Analysis of nationally representative cross-sectional data.

Methods. The data used are the 2016 National Survey of Children's Health, a cross-sectional nationally representative sample of US children (N=48,709). Descriptive analyses and logistic regression are used to estimate food insufficiency and its correlates by complexity of children's special health care needs.

Results. Analysis showed that children with more complex special health care needs experienced roughly twice the rate of food insufficiency compared to children with no special health care needs or children with less complex health care needs. Multivariate analysis indicated that children with more complex health care needs face an increased risk of food insufficiency net of demographic and economic characteristics. Interaction models revealed that medical home access protects children with medical complexity from food insufficiency.

Conclusions. These findings document significantly elevated risk of food insufficiency among families with a child facing more complex special health care needs. Interventions in health care settings could include referrals to resources already in place to combat hunger such as food bank agencies and other resources that might help at-risk families obtain assistance through programs such as the Supplemental Nutrition Assistance Program (SNAP) and Women, Infants, and Children (WIC).

Keywords. Food insufficiency, food insecurity, special health care needs, medical complexity

Introduction

Food insecurity continues to be a problem faced by many American families. In 2016, 16.5 % of US households with children lacked consistent access to adequate amounts of food.¹ Extensive prior research has established an association between food scarcity and poor child health outcomes and diminished well-being², but less research has examined the patterns of food-hardship among children with special health care needs (CSHCN). This is an important oversight, given that recent estimates show that nearly 20% (14.2 million) of US children ages 0 to 17 were classified as having a special health care need in 2016.³

Children are considered to have a special health care need if they have a “have or are at increased risk for a chronic physical, developmental, behavioral, or emotional condition and who also require health and related service of a type or amount beyond that required by children generally”.⁴ These children often require more health services such as emergency room visits, medical procedures or hospital stays than non-CSHCN children.⁵ This concentrated need for health services may create added financial strain for many families raising CSHCN, putting them at increased risk of food hardship. Indeed, studies have shown that caring for children across the spectrum of CSHCN is associated with increased family financial hardship often due to a reduction in parental employment as they stay home to care for their children, and higher out-of-pocket medical expenses.⁶ Further, the likelihood of these hardships are proportionate to the complexity of their child’s health care needs.⁷

The population of CSHCN are heterogeneous in the severity and complexity of their health care needs.⁸ Health conditions for CSHCN run along a spectrum marked by increasing complexities, characterized by the presence or absence of functional limitations, the need for prescription medication, as well as the need for a host of special therapies or other services.⁸ In 2016, 30.9% of CSHCN had a less complex condition that was managed solely with prescription medication (e.g., asthma or allergies), while the remaining CSHCN had more complex health care needs (e.g., autism, developmental delays, depression or anxiety) which require a range of additional services. Children identified as having more complex health care needs often have several chronic conditions, as well as functional limitations.⁷ For example, more than 43.5 percent of CSHCN had conditions that required additional services (i.e., medical, mental health,

speech therapy) alone or along with the need for prescription medication, while over a quarter of CSHCN (25.6 %) had a functional limitation.³ These challenges may have an impact on the ability of families to remain food sufficient, yet few studies have examined this question.

This is an important omission because research has shown that financial hardships often occur among families raising children with special health care needs.⁹ This may be due to factors such as increased out-of-pocket expenses for special foods¹⁰⁻¹², equipment⁹ or medications.¹³ One exception is a recent study by Rose-Jacobs and colleagues (2016) which examined the relationship between food insecurity and the presence or absence of children with special health care needs among an urban-based sample of young children (ages 2 and under) from low-income households. Results from this study found that CSHCN were at an increased risk of food insecurity net of sociodemographic characteristics and participation in the social safety net.¹⁴ Another study using young children in Oregon, found that families of CSHCN were at higher risk of food insecurity compared to families with no CSHCN.¹⁵ While valuable, these studies are unable to provide national estimates of food hardship among children with and without special health care needs or estimates by the complexity of those needs, nor are they able to identify possible factors beyond income that might serve to protect children from food hardship.

The medical home may be one mechanism that serves to help families avoid food insecurity.¹⁶ The medical home is a system of primary health care that was developed for all children, but has been especially promoted as a system to help families of CSHCN. In short, a core component of the medical home centers on the importance of providing continuous and comprehensive care from the child's birth to young adulthood. An important feature of the medical home is cooperation and communication between the family and the health care provider to help them effectively coordinate care with specialists and community agencies.¹⁷ While the majority of research on medical homes centers on CSHCN, studies find that medical homes are associated with many positive outcomes among all children such as a reduction in unmet need for health care¹⁸ improved family functioning¹⁹; and among families of CSHCN, a reduction in financial hardship.²⁰ Recent research suggests over the last decade, the health care experiences of all children in the United States have become more aligned with the concept of a medical home model, and that this is true for both children with and without special health care

needs.²¹ No study has yet considered whether the medical home may have added protective value against the risk of food insecurity.

This study asks several complementary research questions: (1) How do rates of food insufficiency for children vary by CSHCN status? (2) Do any differences in the rates of food insufficiency among children with different levels of special health care needs persist after adjustment for sociodemographic factors typically associated with both food insufficiency and special health care needs? (3) Do medical homes offer additional protection from food insufficiency, and does this vary along the spectrum of special health care needs?

Methods

The data used in this study are from the 2016 National Survey of Children's Health (NSCH) conducted by the US Census Bureau and the Maternal and Child Health Bureau (MCHB). The US Department of Agriculture provided additional support in efforts to measure food sufficiency among children. The 2016 NSCH surveyed a representative sample of children ages 0 to 17 living in the United States (50,212 children). Participants were selected from households with children in each of the 50 states and the District of Columbia who lives in housing units. The survey was self-administered and completed (via web or by paper) by a parent or caregiver knowledgeable about the health and health care of one randomly selected child. Each record contains information on the child and the household in which the child resides. The data are weighted to represent the population of noninstitutionalized children ages 0-17 in the United States. More information on the 2016 NSCH design is provided in its methodology report.²²

All analyses were performed with Stata 14.1 statistical software to obtain variance estimates that account for the impact of complex survey design. The analytic sample is restricted to those children with valid information on dependent and independent variables. The resulting sample size is N= 48,709. The data are publically available so this research is considered exempt from the university Institutional Review Board.

Food Insufficiency. The dependent variable is a dichotomous measure indicating *food insufficiency*. Respondents were asked whether, during the past year, they were able to afford the food that they needed. Responses included: 1) We could always afford to eat good nutritious meals;

2) We could always afford enough to eat but not always the food we should eat; 3) Sometimes we could not afford enough to eat, and; 4) Often we could not afford enough to eat. Following prior research²³, a child is considered *food insufficient* if the respondent indicated that the family either ‘sometimes’ or ‘often’ did not get enough food to eat. Prior research has shown that this indicator captures food hardship²⁴⁻²⁵, and reduced nutrient intake.²⁶⁻²⁷ Food insufficiency differs from *food insecurity*, a commonly used measure based on the 18-item Core Food Insecurity Module developed by the USDA. While both conditions are primarily due to a lack of economic resources, food insecurity suggests a limited availability or the uncertain availability of food, whereas food insufficiency refers to limited access of food in the household or an insufficient intake of food.²⁸ Food insecurity covers a broader aspect of food scarcity, while food insufficiency is more severe and has sometimes been used as a synonym for hunger.²⁹

Children with Special Health Care Needs. To identify children with special health care needs, the NSCH uses a validated 5-item screening tool. To meet the criteria as having a special health care need, the respondent must indicate that the child experience at least one of the five health consequences due to some type of ongoing health condition for which the child 1) needs prescription medication; 2) needs special services or therapies; 3) has a routine use of medical services; 4) needs mental or behavioral counseling or treatment; and 5) has a functional limitation.

To understand if food insufficiency varies across the range of special health care needs, a three-category variable is created that incorporates a measure of complexity: 1) child has no special health care need, 2) child has a less complex health care need, and 3) child has a more complex health care need. Although there is no consensus on defining a more or less complex health care need among CSHCN with secondary survey-based data, a variety of approaches have been used.⁷ Some studies use categorical methodologies based on diagnostic codes of disease and administrative data, while others use diagnosis-independent approaches based on the CSHCN screener.³⁰ It is the latter classification that is used here. More specifically, a child with a need that is not a functional limitation but is managed with prescription medication only is classified as having a *less complex need*; whereas all remaining CSHCN are classified as having a *more complex need*.

Additional sensitivity analyses further divide CSHCN with more complex needs into categories based on the type of need and the existence of a functional limitation: 1) children with no functional limitations requiring *service use only*, 2) children with no functional limitations requiring *service use with prescription medication*, and 3) children with a *functional limitation alone or in combination with service use and/or prescription medication*.

Medical Home Model of Health Care. The NSCH includes a composite measure of medical home status based on five components that were derived from fourteen survey items. These five items include: 1) having a personal doctor or nurse; 2) having a usual source of sick care; 3) having family-centered care; 4) experiencing problems getting needed referrals, and; 5) having effective care coordination when needed. A child is considered to have a medical home if the survey respondent reports that the child has adequate care on components 1 through 3, and adequate referrals or care coordination (components 4 and 5) for children who need it. Medical home access is indicated by a dichotomous variable.

The regression models control for the child characteristics of race/ethnicity, gender, age, and insurance coverage. Race/ethnicity of the child is measured as non-Hispanic white, non-Hispanic black, non-Hispanic other race, and Hispanic (any race). Insurance coverage is measured as a three category variable indicating the child has 1) private insurance; 2) public insurance only, or a combination of public and private insurance; and 3) the child is uninsured. The economic status of the household is measured by federal poverty level (FPL) represented by four categories: <100%, 100%-199%, 200%-399%, and \geq 400%. Also included are the total number of adults in the households, and a measure of parent/caregiver employment (employed at least 50 weeks in the last year).

Statistical Analysis. Weighted descriptive statistics for sociodemographic characteristics, medical home access, and food insufficiency across three levels of health needs status; no need, CSHCN with less complex need, and CSHCN with more complex needs are presented. Logistic regression analyses were used to examine the joint effects of special health care needs and medical home access on food insufficiency, adjusting for children's race/ethnicity, age, gender, FPL, parental employment and child insurance.

RESULTS

Among US children ages 0 to 17, 19.5% may be classified as having a special health care need. Roughly 1 in sixteen (6%) US children have less complex special health care needs that are managed solely with prescription medication, while almost one in 7 (13.5%) have more complex special health care needs. Descriptive characteristics for US children are presented in Table 1, by three categories of CSHCN; no needs, less complex needs, and more complex needs. Clear differences in the prevalence of food insufficiency are found across CSHCN status. Over thirteen percent (13.3%) of US children with more complex needs were living in households considered food insufficient compared with roughly 6% of children with no special health care needs or children with less complex needs. Further, children with more complex needs were less likely to have health care consistent with a medical home (38.5%), and more likely to use public health insurance (52.5%) than either children with no special health care need or children with less complex health care needs.

The results from both the unadjusted and adjusted logistic regression models of food insufficiency on CSHCN status are presented in Table 2. The regression results are displayed as odds ratios (ORs) and 95% confidence intervals (CIs). Several findings are notable. First, children with more complex health care needs are at significantly higher risk of experiencing food insufficiency than either children with no special health care needs or children with less complex needs. This was found in both the unadjusted (Model 1) and adjusted models (Model 2). For example, the adjusted odds of food insufficiency among children with more complex health care needs is 1.92 times that of children with no special health care needs and 2.01 times (OR=1.92/.95, $p < .001$) that of children with less complex special health care needs. No statistically significant difference in the odds of food insufficiency was found between children with less complex needs and children with no special health care needs.

Second, the presence of a medical home is associated with a 25% reduction in the likelihood of food insufficiency, net of child and family characteristics (Model 2). Model 3 includes an interaction term between medical home access and CSHCN status, to understand whether there may be a moderating effect of medical home access on the association between CSHCN status and food insufficiency. The coefficient for the interaction term represents the

additional protective effect of a medical home against food insufficiency for each category of special health care needs status. An adjusted Wald test showed that the overall interaction between CSHCN status and medical home access was statistically significant ($F= 3.79, p < .023$). To understand whether the impact of medical home access is significant at each level of CSHCN status, the effect of medical home status at each level of CSHCN status was tested using Stata's *contrast* command. The results show that while there is no statistically significant effect of medical home access on food insufficiency among children without special health care needs ($OR = .87, p < .236$), medical home status serves as a protective factor among some CSHCN. Among children with less complex health care needs, the impact of having a medical home versus not is $OR=.55$ and is only marginally statistically significant ($.87 \times .63 = .55, p < .072$). However, among children with more complex health care needs the impact of having a medical home versus not is $OR=.49$ ($.87 \times .55 = .48, p < .000$), demonstrating that medical home access serves to protect children with more complex special health care needs from food insufficiency net of other individual and household characteristics.

Additional analyses were conducted to determine if a particular type of more complex special health care need (i.e., functional limitations, service use with or without medication use) or the number of affirmative answers to the CSHCN screener was associated an elevated risk of food insufficiency among a reduced sample containing only children with more complex special health care needs. No statistically significant differences in the likelihood of food hardship were found between types of more complex health care needs, nor in the number of needs after adjusting for demographic and economic characteristics.

DISCUSSION

Access to quality food is essential for the growth and development of all children, and yet nearly one in fourteen children (6.9%) live in families that often or sometimes cannot afford to enough to eat. The results of this study show that the burden of food insufficiency is not distributed evenly, children with complex special health care needs face an increased risk. More than thirteen percent (13.3%) of US children with a more complex special health care need live in families struggling with food hardship compared to roughly six percent of children that have no special health care needs or a less complex health care need that is managed by prescription medication

only. Multivariate results suggest that net of sociodemographic characteristics, children with medical complexity face twice the odds of food insufficiency compared to children with no special health care needs or those with less complex needs.

Findings also suggest a protective effect of medical home access for children with more complex special health care needs. Indeed, the risk of food insufficiency is cut in half for children with more complex special health care needs if they have access to a medical home model of care. Given that fewer than 40% of children with more complex special health care needs have access to a medical home, this is cause for concern. The results presented here support the expansion of the medical home, particularly for children dealing with medical complexities. If efforts are continued to support the implementation of the medical home for CSHCN, a stated objective Healthy People 2020, it may help reduce food insufficiency and promote better long-term outcomes particularly for children facing more complex special health care needs. Interventions in health care settings could include referrals to resources already in place to combat hunger such as food bank agencies and other resources that might help at-risk families obtain assistance through programs such as the Supplemental Nutrition Assistance Program (SNAP) and Women, Infants, and Children (WIC).

This study has some limitations. First, the data are cross-sectional and do not demonstrate causality between the complexity of children's health care needs and the food insufficiency of the child's household. However, the goal of this study is to understand patterns of food hardship by the complexity of children's special health care needs using national data. Longitudinal data measuring changes not only in food sufficiency but in child's health are needed. Second, the questions on food sufficiency are not person-specific but rather apply to the whole household. It may be that food sufficiency varies across household members. Nonetheless, given that the food insufficiency measure used here is measuring the most severe forms of food hardship, the estimates are likely underestimating the challenges many families are facing. This study confirms the value of adding questions about food sufficiency to existing national surveys of children's health.

TABLE 1. Weighted Descriptive Statistics for Study Variables for US Children (ages birth to 17) by Complexity of Special Health Care Needs : 2016 National Survey of Children's Health

Variable	No SHCN (N=38,008), % or Mean , (95%CI)		Less Complex ^a SHCN (N=3,744), % or Mean , (95%CI)		More Complex ^b SHCN (N=7,433), % or Mean , (95%CI)	
Food Insufficient	5.8 ^d	(5.2 - 6.3)	6.2	(4.4 - 8.1)	13.3	(11.3 - 15.4)
Child has a medical home	50.7 ^d	(49.7 - 51.7)	54.6	(50.8 - 58.1)	38.5	(36.1 - 40.9)
Child is male	49.3	(48.1 - 50.5)	55.2	(51.6 - 58.6)	59.0 ^d	(56.4 - 61.5)
Children's race/ethnicity						
Non-Hispanic white	52.4	(51.2 - 53.5)	55.4	(51.5 - 59.0)	52.1	(49.5 - 54.6)
Non-Hispanic black	11.7	(10.9 - 12.5)	15.7	(12.8 - 18.8)	15.6	(13.6 - 17.8)
Hispanic (any race)	24.7	(23.4 - 25.9)	19.9	(16.3 - 24.)	23.4	(20.7 - 26.2)
Non-Hispanic Asian	5.1	(4.6 - 5.5)	3.1	(2.26 - 4.15)	2.2	(1.73 - 2.72)
Non-Hispanic Other	6.1	(5.7 - 6.6)	6.0	(4.86 - 7.48)	6.7	(5.62 - 8.02)
Child age (years)	8.2	(8.0 - 8.3)	10.5	(10.2 - 10.7)	10.1	(9.9 - 10.3)
Child insurance status						
Private health insurance	60.5	(59.3 - 61.7)	58.7	(54.9 - 62.3)	43.9	(41.5 - 46.2)
Public health insurance	33.2	(32.3 - 34.4)	37.5	(33.8 - 41.2)	52.5	(50.0 - 54.9)
Uninsured	6.3	(5.6 - 7.0)	3.9	(2.73 - 5.43)	3.6	(2.74 - 4.75)
Family Poverty Level						
< 100% FPL	19.6	(18.5 - 20.8)	23.4	(19.5 - 27.6)	26.2	(23.8 - 28.6)
100% - 199% FPL	22.0	(20.9 - 23.0)	19.6	(16.9 - 22.5)	23.4	(21.0 - 25.9)
200% - 399% FPL	27.6	(26.6 - 28.5)	25.7	(22.9 - 28.6)	25.1	(23.0 - 27.3)
≥ 400% FPL	30.8	(29.9 - 31.7)	31.3	(28.6 - 34.1)	25.3	(23.6 - 27.1)
Parent employed 50 weeks in last year ^c	91.2	(90.3 - 91.8)	88.2	(85.4 - 90.5)	80.5	(78.1 - 82.6)
Total number of adults in HH	1.9	(1.9 - 1.9)	2.0	(1.9 - 2.0)	1.9	(1.8 - 1.9)
Distribution in US	80.5	(79.7 - 81.2)	6.0	(5.6 - 6.5)	13.5	(12.9 - 14.2)

Note: FPL = federal poverty level. CSHCN = children with special health care needs. SHCN= special health care needs.

All differences between CSHCN groups are statistically significant to the p<.05 level unless otherwise indicated.

a. Less complex health care needs are managed by prescription medication only.

b. More complex health care needs involve functional limitations, or are managed with special services or by prescription

c. Defined as any primary caregiver employed 50 of the last 52 weeks.

d. Not statistically different from 'less complex health care needs'.

TABLE 2. Multivariate logistic regression predicting food insufficiency by CSHCN status (N=48,709)

	Model 1		Model 2		Model 3	
	OR	95%CI	OR	95%CI	OR	95%CI
CSHCN Status						
Less Complex	1.05	(.74 - 1.4)	0.95	(.65 - 1.3)	1.11	(.65 - 1.8)
More Complex (ref= Not CSHCN)	2.49 ^a	(2.0 - 3.0) ***	1.92 ^a	(1.5 - 2.3) ***	2.05	(1.5 - 2.7) ***
Child has a medical home						
X Less Complex			0.75	(.61 - .90) **	0.87	(.69 - 1.0)
X More Complex					0.63	(.31 - 1.2)
					0.56	(.35 - .86) **
Child is male (ref= female)						
			1.04	(.86 - 1.2)	1.04	(.86 - 1.2)
Children's race/ethnicity (ref=Non-Hispanic white)						
Non-Hispanic black			1.18	(.90 - 1.5)	1.19	(.90 - 1.5)
Hispanic (any race)			0.84	(.65 - 1.0)	0.84	(.65 - 1.0)
Non-Hispanic Asian			0.69	(.37 - 1.2)	0.70	(.38 - 1.3)
Non-Hispanic Other			1.53	(1.0 - 2.1) *	1.54	(1.1 - 2.1) *
Child age (years)						
Child age (years)			0.94	(.88 - 1.0)	0.94	(.88 - 1.0)
Child age (years) squared			1.00	(1.0 - 1.0) *	1.00	(1.0 - 1.0) *
Child insurance status (ref= Private insurance)						
Public health insurance			1.86	(1.3 - 2.4) ***	1.87	(1.4 - 2.4) ***
Uninsured			2.40	(1.5 - 3.6) ***	2.46	(1.6 - 3.7) ***
Family Poverty Level (ref=<= 100% FPL)						
100% -199% FPL			0.66	(.52 - .82) ***	0.66	(.53 - .82) ***
200% -399% FPL			0.27	(.19 - .36) ***	0.27	(.19 - .36) ***
≥ 400% FPL			0.07	(.04 - .11) ***	0.07	(.04 - .11) ***
Parent employed 50 weeks in last year						
			0.72	(.57 - .89) **	0.72	(.57 - .89) **
Total number of adults in HH						
			0.87	(.76 - .99) *	0.87	(.76 - .99) *

*** p<.001; ** p<.01; *p<.05

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