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Home quality and child health: Analysis of the Survey of Income and Program Participation

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Abstract

Housing is considered a core social determinant of health (SDH) through mechanisms such as the quality, affordability, and location of the home. However, few nationally representative studies examine these mechanisms simultaneously with child health and healthcare use. To determine the associations between home quality and child health, a series of logistic regression analyses was employed using the Survey of Income and Program Participation (SIPP). The 2014 SIPP sample is a multistage, stratified sample of 53,070 housing units from 820 sample areas designed to represent the civilian, noninstitutionalized population of the United States. The analytic sample included 12,964 children aged 2–14 years. Poor housing quality was defined as whether the home had holes in the floor, cracks in the ceiling, plumbing issues, and/or pest problems. Outcome measures included child health status, number of medical visits, and hospitalizations. The results indicated that poor housing quality was associated with poorer health (OR = 1.16, 95% CI = 1.05–1.27) and a greater number of medical visits (OR = 1.11, 95% CI = 1.03, 1.20) after controlling for number of persons per household, neighborhood safety, nonmetropolitan status, parent's ability to afford housing-related expenses, and other SDH. Future work investigating and intervening on the SDH in children could specifically include the quality and contexts in which homes are situated.

Keywords

Housing; child health; social determinants of health; health status

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Declaration of Conflicting Interests

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Ethical Approval

This study has been approved by the Nationwide Children's Hospital Institutional Review Board.

Supplemental Material

Supplemental material for this article is available online.

Introduction

Research on housing as a social determinant of health in youth has focused primarily on housing instability and homelessness (Cutts et al., 2011; Frederick et al., 2014; Institute of Medicine, 1988), but other characteristics of living conditions could be equally important. Identifying characteristics of the home environment associated with poorer childhood health and higher childhood healthcare use could point to potential investment opportunities for healthcare systems to promote health and lower costs (Fowler and Farrell, 2017; Krieger and Higgins, 2002; Leventhal and Newman, 2010). However, few studies have examined how multiple indicators of the home environment alter child health.

Significant justification exists for protecting the health of children and averting preventable healthcare visits for illness and injury. For example, research has documented the adverse health and developmental impacts of particular housing exposures on children. Studies have linked lead exposure to poor cognitive, behavioral, and physical outcomes (President's Task Force on Environmental Health Risks and Safety Risks to Children, 2016), poor housing quality during early childhood to adolescent delinquent behavior (Elliott et al., 2016), and dampness, mold, and allergens to asthma and asthma-related medical utilization (Mudarri and Fisk, 2007; Rosenstreich et al., 1997; Thacher et al., 2017).

Indicators of neighborhood disadvantage have also been linked to poorer physical and mental health in children and youth (Coley et al., 2014; Elliott et al., 2016; Forsyth et al., 2015; Xue et al., 2005) and adolescent sexual risk behaviors (Browning et al., 2008). Lack of affordable housing has also been linked to poor health outcomes in both adult renters and homeowners (Maqbool et al., 2015; Pollack et al., 2010); however, less is known about the relationship of parental inability to pay rent or utilities with child health. Other social determinants of health, such as poverty, food insecurity, and education, directly impact health or the ability to afford housing (Commission on Social Determinants of Health (CSDH), 2008), but housing studies that evaluate child health outcomes (e.g., health status, specific diagnosis exacerbation, and healthcare utilization) have not comprehensively considered all of these aspects together. This study hopes to address those gaps and motivate additional research in these areas.

The impact of housing and neighborhoods on more global indicators of child health and healthcare use remains unknown. Using data from the Survey of Income and Program Participation (SIPP), we examined how housing quality and neighborhood perception were associated with the general health status and healthcare use of children.

Aim

The aim of this study is to examine how poor housing quality was associated with the health status and healthcare use of children.

Methods

A cross-sectional analysis of children aged 2–14 years ($N = 13,114$) using the public use file for Wave 1 of the 2014 SIPP was conducted. The SIPP is a nationally representative longitudinal survey administered by the United States (US) Census Bureau that collects information on economic well-being, family dynamics, and household composition via computer-assisted personal interviewing in the household (US Census Bureau, 2017).

The 2014 SIPP sample is a stratified sample of 53,070 housing units from 820 sample areas designed to represent the civilian, noninstitutionalized population of the US, with oversampling from low-income households to increase accuracy of estimates associated with those units. These data were collected between February and June of 2014 with the parent or caretaker of children under the age of 15 years (US Census Bureau, 2017). For more detailed information on the survey methodology, refer to the 2014 SIPP Source and Accuracy Statement (US Census Bureau, 2017) and information on nonresponse bias as well as sampling and non-sampling error is reported elsewhere (United States Census Bureau, 2016). Study procedures were approved by Nationwide Children’s Hospital Institutional Review Board.

Measures

For specific detail on the measures and construction of the below variables, please refer to Supplementary Table 1.

Dependent variables

Health status was measured by the parent’s response to the survey item, “What is [the referent child’s] health status?” Similar to other pediatric literature that compared children *in the best health to those with general health* (Krause and Lampert, 2015; Teranishi et al., 2011), this 5-point Likert scale of reported health status was dichotomized to very good/excellent versus poor/fair/good (Diaz et al., 2002; Harris et al., 2006). Response categories were interpreted by each parent as no additional guidance was provided by the interviewer on how the categories differed. In addition, the number of children in the poor/fair category ($n = 334$ or less than 3% of the analytic sample) limited statistical power to detect significant differences if health status was dichotomized to represent excellent/very good/good compared with fair/poor. See Supplementary Table 2 for the breakdown of frequencies in health status responses.

Number of medical visits (other than hospital stays and dental visits) in the preceding year was categorized into “0” for no healthcare utilization, “1” for 1–2 medical visits per year (reference group), and “2” for greater than two medical visits for the year. 1–2 medical visits were considered the reference group to adhere to the American Academy of Pediatrics’ recommendations on the standard number of visits for children from 2 years to 14 years (Hagan et al., 2017). In addition, most children whose parents reported that they were in “excellent” health also reported that the child had at least 1–2 medical visits throughout the year.

Number of hospital admissions in the preceding year was recoded to indicate any versus none due to the relative infrequency of hospitalizations in the sample.

Primary predictor of interest

Housing quality represented the number of poor housing characteristics reported. The household reference person was asked if any of the following conditions were present in the household: "... holes in the walls or ceiling, or cracks wider than the edge of a dime?"; "... holes in the floor big enough to catch your foot on?"; "... problems with pests such as rats, mice, roaches, or other insects?"; and "... a toilet, hot water heater, or other plumbing that did not work?" Similar to previous pediatric health literature (Coley et al., 2014; Elliott et al., 2016; Evans et al., 2001; Jones-Rounds et al., 2014), a response of "yes" to any of the aforementioned problems was coded as 1 and summed together to create a poor housing quality index. The index score was treated as an ordinal level of measurement (range 0–4), with higher values indicating poorer housing quality.

Covariates

Demographic characteristics of the child consisted of sex, race, ethnicity, age, and disability status. Age was coded as a continuous variable. Disability was coded as 0 ("no disability") when the parent did not report any disabling conditions for the child and 1 ("any disability") when the parent reported that the child had one or more of the eight child disability questions in the survey.

Socioeconomic characteristics consisted of federal income-to-poverty ratio for the year, food insecurity, health insurance coverage, and parental education. Food insecurity was coded as an ordinal score from 1 ("high food security") to 3 ("low food security"). Health insurance coverage for the child was coded to indicate that the child was publicly or privately insured for all or part of the year. Parental education was recoded into two groups: high school graduate (diploma or GED or equivalent) or less compared to some college credit or higher (reference group).

Other home environment and contextual characteristics included the number of people living in household, parental inability to pay rent/mortgage or housing utilities in the previous year, unsafe neighborhood perception, and nonmetropolitan status. Similar to recent literature, perception of unsafe neighborhood was dichotomized as 1 ("very unsafe, somewhat unsafe, or somewhat safe") and 0 ("very safe") (Datar et al., 2013; Malecki et al., 2018). Geographic considerations included metropolitan (reference group) or nonmetropolitan status of the interview address.

Statistical analyses

Logistic regression analyses were used to obtain odds ratios and 95% Wald confidence intervals for the associations of poor housing quality with child health status and healthcare utilization. The modeling strategy included a series of nested regressions to identify the relationships of the primary predictors with each outcome while accounting for additional factors. For each child health and healthcare utilization variable, Model 1 estimated the simple relationship between poor housing quality and the outcome of interest. Models 2

and 3 additively controlled for demographic, socioeconomic, and other home environment and contextual characteristics. The models and choice of covariates were developed a priori, guided by the theoretical underpinnings of social determinants of health frameworks, Bronfenbrenner's bioecological model of human development (Bronfenbrenner and Morris, 2007), and clinical implications.

Analyses used SIPP weights to adjust for disproportionate sampling. Percentages were weighted to be representative of noninstitutionalized US children between 2 and 14 years old. Variance estimates accounted for the complex clustered design of the SIPP study using replicate weights and Fay's balanced repeated replication method. Multicollinearity was assessed prior to multivariate modeling and demonstrated that tolerance (<1) and variance inflation factors (range 1–1.25) were within normal limits.

Health status was modeled using multivariate logistic regression comparing children whose parent reported poor/fair/good health to those with reported very good or excellent health. Number of hospital visits was modeled using multivariate logistic regression analyses comparing no hospitalizations to any nights spent in the hospital. Multinomial regression models were used for the outcome number of medical visits in the preceding year. Results are presented separately for the comparisons between children with no medical visits versus standard utilization (1–2 visits) and for the comparisons between children with high usage (three or more visits) versus standard utilization (1–2 visits).

Results

Study sample

Data for 13,114 children aged 2 years–14 years were collected in the SIPP. Approximately, 150 children (1.1% of the total sample) were excluded for lacking information on the income-to-poverty ratio. The final analytic sample included 12,964 children. Compared to the included sample, children who were excluded from the analytic sample significantly differed on all three health outcomes (see Supplementary Table 3) but not on housing quality or other home environment and context indicators. Multiple imputation for those excluded cases was not conducted due to the imputation procedures used within the SIPP (US Census Bureau, 2017).

Table 1 presents descriptive statistics for the sample. The 12,967 children in the analytic sample had a mean age of 8.0 years (standard error (SE) 0.04) and 72.9% identified as white and 51.1% identified as male. Approximately, 25.0% of the children identified as Hispanic, and 9.1% were identified as having a disability. With respect to health status, 12.5% of the parents reported that their child had poor, fair, or good health status. With respect to healthcare utilization, 18.0% of the parents reported no medical visits for their child, 45.8% reported 1–2 medical visits (standard utilization), and 36.2% reported greater than two medical visits (high utilization). Approximately, 2.9% of the parents reported that their child had at least one hospitalization. In turn, we share the findings related to hospitalizations in the supplementary file due to the limited power to detect differences, and we caution interpretation of the associations between housing quality and hospitalizations. With respect to poor housing quality, 80.8% of the parents reported no poor housing characteristics,

12.4% reported one poor housing characteristic, 4.7% ($n = 711$) reported two poor housing characteristics, 1.7% reported three poor housing characteristics, and 0.4% reported having all four poor housing characteristics (cracks in ceiling, holes in floor, pest problems, and plumbing problems). The two most common housing quality issues reported were pests (11.4%) and cracks (8.5%). With respect to perceived neighborhood safety, 35.4% of the parents reported living in a somewhat safe, somewhat unsafe, or very unsafe neighborhood. Almost a fifth of the parents (19.0%), reported being unable to pay rent, mortgage, or utilities at some point in 2013.

Multivariate logistic regression results

Health status

Table 2 presents the results of the models that examined the associations of poor housing quality with parent-reported poor health status. Results of the baseline model indicated that each additional housing problem was associated with 43% greater odds of having poorer health status (Model 1: odds ratio (OR) = 1.43, 95% confidence interval (CI) 1.31, 1.56). Upon inclusion of demographic characteristics (gender, race, ethnicity, age, and disability) and socioeconomic characteristics (income-to-poverty ratio, food insecurity, health insurance coverage, and parent education), each additional housing problem was associated with 18% greater odds of having poorer health status (Model 2: OR = 1.18 (95% CI 1.08, 1.30)). Upon inclusion of the other housing-related indicators (number of people per household, inability to pay rent/utilities, unsafe neighborhood, and nonmetropolitan status), each additional housing problem was associated with a 16% greater odds of having poorer health status (Model 3 (fully adjusted model): OR = 1.16 (95% CI 1.05, 1.27)). Among the other housing-related indicators, only unsafe neighborhood perception demonstrated a statistically significant independent effect on child health status.

Number of medical visits

Table 3 presents the associations of poor housing quality with high medical utilization (three or more medical visits/services). Results of the baseline model indicated that each additional housing problem was associated with 18% greater odds of high medical utilization (Model 1: OR = 1.18 (95% CI 1.10, 1.27)). Upon inclusion of demographic and socioeconomic characteristics, each additional housing problem was associated with 13% greater odds of high medical utilization (Model 2: OR = 1.13 (95% CI 1.05, 1.22)). Upon inclusion of the other housing-related indicators, each additional housing problem was associated with 11% greater odds of high medical utilization (Model 3 (fully adjusted model): OR = 1.11 (95% CI 1.03, 1.20)). In addition, children who resided in a nonmetropolitan residence and in homes where the parent was unable to pay rent, mortgage, or other housing utilities at some point during the year were associated with a greater likelihood of having more medical visits than standard use.

Supplementary Table 4 presents the associations of poor housing quality with no medical utilization compared to standard utilization (1–2 medical visits/services). The only significant association between poor housing quality and no medical use in children appeared only in the fully adjusted model. For each additional housing problem, there were

greater odds of standard care (or use of care) in children (Model 3: OR = 0.89 (95% CI 0.79, 0.997)).

Hospitalization

Supplementary Table 5 presents the results of the models that examined the associations of poor housing quality with hospitalization. As with health status, the results of the baseline logistic regression model indicated that each additional housing problem was associated with 26% greater odds of hospitalization (Model 1: OR = 1.26 (95% CI 1.10, 1.45)). This effect did not remain significant with the inclusion of demographic and socioeconomic characteristics. In Model 3 (the fully adjusted model), a child who resided in a home with a parent who was unable to pay rent, mortgage, or utilities for the entire year was associated with a greater likelihood to be hospitalized.

Discussion

Using nationally representative data, each additional poor housing characteristic (cracks in the ceiling, holes in the floor, plumbing, and pest problems) was associated with poorer health status and higher medical utilization in children even after controlling for other socioeconomic and housing indicators. The findings further substantiate the claims that housing matters and is an important nonmedical health-related need (Baker et al., 2017; Gibson et al., 2011; Krieger and Higgins, 2002). However, the findings relay a novel contribution that these poor housing associations are evident beginning in childhood and are only partially explained by other important contextual considerations known to impact health and development.

The results also revealed that considerations such as neighborhood safety, nonmetropolitan status, and a parent's ability to afford housing-related expenses had independent associations to poor health and increased medical use. Poorer health status was demonstrated when the child lived in unsafe neighborhoods, consistent with the findings from another nationally representative study using data from the 2011–2012 National Survey of Children's Health (Cronin and Gran, 2018). Poor housing quality and unsafe neighborhoods could affect children's health directly through injury or indirectly through chronic stress mechanisms and reduced opportunities for physical activity and adequate sleep. Perception of neighborhood safety has previously been linked to other neighborhood indicators that predict child health, such as neighborhood social capital (Ziersch et al., 2005), amenities such as parks and libraries (Cohen et al., 2016), and blight (Leon and Schilling, 2017; MacDonald, 2015), which could explain the associations with child health documented in this study.

Increased medical utilization was also observed when the child lived in nonmetropolitan areas, households with fewer occupants, and when the parent was unable to afford housing expenses (as measured by inability to pay mortgage, rent, or utilities during the year). A parent's inability to afford housing expenses may increase stress and exacerbate mental health problems (Suglia et al., 2011), which is known to impact child development. The number of people in the household might also serve as a mechanism for disease transmission and thus increase utilization while decreasing overall health (House and Keeling, 2009). Residing in a nonmetropolitan area has previously been linked to decreased primary care

visits (Spleen et al., 2014) and increased emergency department visits and hospitalizations (Greenwood-Ericksen and Kocher, 2019), although not evident in the present study. Difference in study design, specifically surrounding measurement of nonmetropolitan status or rurality, may account for the discrepancy.

As broadscale implementation of nonmedical health-related needs screening is employed in routine practice (Chung et al., 2016), the current findings suggest that providers could begin screening families not only on housing insecurity but also on housing quality. Similarly, Community Health Needs Assessments conducted by local hospitals could incorporate measures for housing quality, location, affordability, and also expand their housing quality measure beyond the current recommended assessments (Billioux et al., 2017) that only capture pests. Doing so could inform the development of a comprehensive housing screening tool to be further tested to capture critical housing indicators and then validated for use in a variety of populations across settings.

Building on the results reported here, states, local jurisdictions, and health systems could investigate if improvements in housing and neighborhood quality can improve child health and reduce preventable medical expenditures. Public and private partnerships could also be leveraged to assist health systems in addressing poverty-related health threats. For example, Nationwide Children's Hospital partnered with local organizations, nonprofits, and schools on efforts to improve the surrounding neighborhood by increasing affordable housing, improving educational outcomes and access to health care, and creating safe and accessible neighborhoods (Kelleher et al., 2018). Web-based initiatives, such as the Breathe Easy at Home initiative, could be used to help connect families of children who have certain health conditions (e.g., asthma) with housing officials in order to reduce the presence of environmental health stressors (City of Boston, 2018; State of Rhode Island Department of Health, 2019). The effectiveness of these web-based initiatives and housing programs on child health and healthcare use remain largely unknown. Research could also determine how effective formal medicolegal partnerships (that are not web-based) are in connecting families to available housing resources and subsequent improvement in health. In addition, collaborations between community institutions and students could capitalize on youths' energy and motivation to improve community conditions as has been done by the University of Michigan's Youth Empowerment Solutions program (Reischl et al., 2011). Thus, health systems might not have to shoulder the financial burden of such programs alone.

Limitations

First, these cross-sectional analyses were not exhaustive or causal. Longitudinal studies, randomized intervention trials, and comprehensive measures of poor housing quality (e.g., the inclusion of water quality, air quality, or heating issues) could be conducted to rule out alternative explanations for these findings. However, the study's nationally representative sample and parent-reported measures provide novel contributions to public health. Second, a relatively small number of children were excluded due to missing values on variables of interest. While the excluded children differed from the analytical sample on several characteristics, their small size reduces the likelihood of the exclusion affecting the study estimates. Third, 72.9% of the children in the analytic sample reported non-Hispanic

white race and are not in line with other national estimates (51% of the children were reported by the US Census Bureau as non-Hispanic white (National Kids Count, 2018). Since the majority of those who reside in homes of poor quality are nonwhite or Hispanic (Raymond et al., 2011), study results and effect sizes might underestimate the strength of the relationships.

Conclusions

This study partially confirms findings from other literature documenting that children's health is associated with the conditions, location, and affordability of their home. Recognition of housing quality and safety issues in addition to housing insecurity in vulnerable families could support clinicians in providing holistic approaches to care. Screening for families not only on housing stability but also on housing quality, location, and affordability can assist clinicians in linking families to needed resources. Future work investigating and intervening on the social determinants of health in children could specifically include the quality and contexts in which homes are situated.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Percentages and means of the US children in the SIPP analytic sample ($N = 12,964$) weighted, children aged 2–14 years.

	Sample ($N = 12,964$)
	% or mean (standard error)
Outcome variable of interest	
Poor/fair/good health status	12.5% (0.42)
No medical utilization, 2013	18.0% (0.51)
Standard utilization (1–2 medical visits), 2013 (reference group)	45.8% (0.62)
High utilization (>2 medical visits), 2013	36.2% (0.57)
Any hospitalization, 2013	2.9% (0.18)
Housing quality	
No poor housing characteristics (reference group)	80.8% (0.55)
1 poor housing characteristic	12.4% (0.47)
2 poor housing characteristics	4.7% (0.29)
3 poor housing characteristics	1.7% (0.18)
4 poor housing characteristics	0.4% (0.10)
Other housing-related indicators	
Parental inability to afford rent/mortgage or utility bills	19.0% (0.58)
Number of people per household (range = 1–20)	4.6 (0.03)
Unsafe neighborhood	35.4% (0.65)
Nonmetropolitan area	13.2% (0.56)
Demographic characteristics	
Race and ethnicity	
Black/African American	15.1% (0.48)
Pacific Islander or American Indian	1.7% (0.22)
Multiracial/ethnic	5.1% (0.32)
Asian	5.2% (0.34)
White (reference group)	72.9% (0.62)
Hispanic	25.0% (0.59)
Male	51.1% (0.50)
Age, 2–14 years old	8.0 (0.01)
Disability status	9.1% (0.28)
Socioeconomic characteristics	
Income-to-poverty ratio, range 0–75	3.3 (0.06)
Health insurance coverage (for any coverage)	93.6% (0.66)
Food insecurity, range 1–3 (3: high insecurity)	1.3 (0.01)
Parental education	
High school graduate or less	38.1 (0.66)

Source. The 2014 Survey of Income and Program Participation, Wave 1, public use file. Data are subject to sampling and nonsampling error (for more information, see <https://www.census.gov/programs-surveys/sipp/methodology/sampling.html>). Poor health status indicated poor, fair, or good health status (“1”) compared to very good or excellent health status (“0”). Unsafe neighborhood indicated somewhat safe, somewhat unsafe, and very unsafe (“1”) compared to very safe (“0”) (for frequencies associated with variable percentages, please refer to the Supplementary Tables).

Table 2.

Models 1–3 logistic regression odds ratio estimates and 95% confidence limits of models predicting poor, fair or good health status of children aged 2–14 years in the United States ($N = 12,964$).

	Model 1	Model 2	Model 3
<i>Housing quality</i>			
Poor housing quality, 0–4	1.43 (1.31, 1.56)***	1.18 (1.08, 1.30)***	1.16 (1.05, 1.27)**
<i>Demographic characteristics</i>			
Black/AA		1.66 (1.36, 2.03)***	1.61 (1.31, 1.99)***
Asian		1.39 (0.95, 2.02)	1.41 (0.97, 2.06)
American Indian/Pacific Islander		1.14 (0.67, 1.96)	1.18 (0.68, 2.05)
Multiracial		1.14 (0.83, 1.57)	1.12 (0.82, 1.55)
White (reference group)			
Hispanic		1.26 (1.06, 1.50)**	1.25 (1.05, 1.49)**
Male		1.04 (0.93, 1.16)	1.04 (0.93, 1.16)
Age		1.02 (1.00, 1.03)	1.02 (1.00, 1.03)
Disability status		4.46 (3.72, 5.36)***	4.37 (3.63, 5.25)***
<i>Socioeconomic characteristics</i>			
Income-to-poverty ratio		0.94 (0.90, 0.99)*	0.95 (0.91, 0.99)*
Food insecurity		1.21 (1.09, 1.34)***	1.17 (1.04, 1.31)**
Health insurance		1.48 (1.12, 1.96)*	1.47 (1.11, 1.95)**
Parental education			
High school graduate or less		1.58 (1.36, 1.84)***	1.58 (1.35, 1.84)***
<i>Other housing-related indicators</i>			
Number of persons per household (range = 1–20)			0.98 (0.92, 1.03)
Inability to pay rent/mortgage or utilities			1.12 (0.92, 1.37)
Unsafe neighborhood			1.18 (1.01, 1.37)*
Nonmetropolitan status			1.12 (0.92, 1.38)

Indicates statistically significant differences at the

* p -value < 0.05,

** p -value < 0.01,

*** p -value < 0.001.

Source: The 2014 Survey of Income and Program Participation, Wave 1, public use file. Data are subject to sampling and non-sampling error (for more information, see <https://www.census.gov/programs-surveys/sipp/methodology/sampling.html>). Poor housing quality was measured as a count variable from 0 to 4, with 0 indicating no house problems up to 4 house problems (cracks in ceiling, holes in floor, pest, and plumbing problems).

Table 3.

Models 1–3 multinomial logistic regression odds ratio estimates and 95% confidence limits of models predicting high medical utilization ($n = 4681$) compared to standard medical utilization ($n = 5786$) in children aged 2–14 years in the United States.

	Model 1	Model 2	Model 3
<i>Housing quality</i>			
Poor housing quality, 0–4	1.18 (1.10, 1.27) ***	1.13 (1.05, 1.22) **	1.11 (1.03, 1.20) **
<i>Demographic characteristics</i>			
Black/AA		0.76 (0.63, 0.91) **	0.76 (0.63, 0.91) **
Asian		0.63 (0.50, 0.81) ***	0.66 (0.52, 0.85)
American Indian/Pacific Islander		0.94 (0.59, 1.51)	1.01 (0.62, 1.64)
Multiracial		0.94 (0.72, 1.22)	0.93 (0.71, 1.20)
White (reference group)			
Hispanic		0.84 (0.73, 0.96) *	0.87 (0.75, 1.00) *
Male		0.98 (0.89, 1.08)	0.98 (0.89, 1.08)
Age		0.94 (0.92, 0.95) ***	0.94 (0.92, 0.95) ***
Disability status		2.64 (2.28, 3.07) ***	2.57 (2.21, 2.99) ***
<i>Socioeconomic characteristics</i>			
Income-to-poverty ratio		1.01 (0.99, 1.03)	1.01 (1.00, 1.03)
Food insecurity		1.14 (1.04, 1.26) **	1.10 (0.99, 1.21)
Health insurance		1.99 (1.51, 2.61) ***	1.99 (1.51, 2.61) ***
Parental education			
High school graduate or less		0.95 (0.85, 1.07)	0.96 (0.85, 1.08)
<i>Other housing-related indicators</i>			
Number of persons per household (range = 1–20)			0.93 (0.89, 0.97) ***
Inability to pay rent/mortgage or utilities			1.21 (1.04, 1.40) *
Unsafe neighborhood			1.04 (0.91, 1.18)
Nonmetropolitan status			1.29 (1.11, 1.50) **

Indicates statistically significant differences at the

* p -value < 0.05,

** p -value < 0.01,

*** p -value < 0.001.

Source. The 2014 Survey of Income and Program Participation, Wave 1, public use file. Data are subject to sampling and non-sampling error (for more information, see <https://www.census.gov/programs-surveys/sipp/methodology/sampling.html>). Poor housing quality was measured as a count variable from 0 to 4, with 0 indicating no house problems up to 4 poor house problems (cracks in ceiling, holes in floor, pest, and plumbing problems). High medical utilization indicates that the child accessed medical services greater than 2 times compared to only those children who had standard medical utilization (1–2 visits).