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Socioeconomic Status, Ethnicity, and Health Disparities in Children and Adolescents in a Mixed Rural-Urban Community – Olmsted County, Minnesota

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Abstract

Objective: To characterize disparities in childhood health outcomes by socioeconomic status (SES) and ethnicity in a mixed rural-urban US community.

Methods: This was a retrospective population-based study of children ≤18 years of age residing in Olmsted County, Minnesota, in 2009. The prevalence rates of childhood health outcomes were determined using ICD9 codes. SES was measured using HOUSES (HOUsing-based SocioEconomic Status index) derived from real property data. Adjusting for age and sex, logistic regression models were used to examine the relationship between HOUSES, ethnicity, and prevalence of childhood health outcomes, considering an interaction between HOUSES and ethnicity. Odds ratios were calculated using the lowest SES quartile and non-Hispanic whites as the reference groups.

Results: Of 31,523 eligible children, 51% were male and 86% were non-Hispanic white. Overall, lower SES was associated with higher prevalence of bronchiolitis, urinary tract infection, asthma, mood disorder, and accidents/adverse childhood experiences (physical and sexual abuse) in a dose-response manner (P<.04). Prevalence rates of all childhood conditions considered except for

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Human Subjects:
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epilepsy were significantly different across ethnicities ($P<.002$). Racial disparities for asthma and mood disorder were greater among higher SES.

Conclusion: Significant health disparities are present in a predominately affluent, non-Hispanic white, mixed rural-urban community. SES modifies disparities by race/ethnicity in clinically less overt conditions. Interpretation of future health disparity research should account for the nature of disease.

Keywords

Health disparities; children; socioeconomic status; ethnicity

INTRODUCTION

Associations between poverty, ethnicity, and poor health outcomes in children are well documented in the extant literature. Investigations utilizing large national databases have uncovered socioeconomic and ethnic disparities in a broad range of childhood health outcomes, including obesity[1,2], asthma [2-4], diabetes[5], hypertension[6], obstructive sleep apnea[7], cancer [8-12], infections [13-16], congenital heart disease [11,17], and critical illness [18]. The American Academy of Pediatrics released a policy statement acknowledging child health to be strongly influenced by race, ethnicity, and socioeconomic status (SES) [19]. As the population of children and adolescents in the United States continues to increase in both ethnic diversity and socioeconomic disadvantage, understanding the mechanism of how ethnicity and SES impact health disparities is important to improve health equity[19-21].

The majority of literature regarding pediatric health disparities has been based in inner cities, and little is known regarding health disparities within a mixed rural-urban community like Olmsted County, Minnesota, where community-level factors such as easy access to health care services (about one third of the population working in the health care industry), higher health insurance coverage, and low air pollution may potentially mitigate health disparities. In addition, while previous studies are informative, methodological challenges abound. For example, individual SES measures such as maternal education and income are often unavailable in commonly used clinical datasets [22]. Thus, many studies use neighborhood-level SES measures based on recent census information as a proxy for individual-level SES[23,24]; however, the discordance between individual and neighborhood-level SES measures is significant, resulting in misclassification (20-35%) of individual SES [23,24]. To overcome the absence of SES measures in commonly used data sources, we previously developed and validated the individual-level housing-based SES index HOUSES (HOUsing-based SocioEconomic Status) [22] Furthermore, there is scant information on health disparities derived from population-based studies utilizing medical records instead of self-report. The present retrospective, population-based study sought to address these limitations and advance current understanding of pediatric health disparities using an innovative individual-level SES measure and comprehensive medical records in a self-contained health care environment.

We hypothesized that health disparities across SES and race/ethnicity exist for childhood health outcomes in our study setting, and the magnitude of racial disparities will differ by

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SES for clinically less overt conditions. To test this hypothesis, we specifically assessed the prevalence of clinically distinct conditions reflecting different levels of health care access and literacy. The results will have important health policy implications by providing insight into whether health disparities observed in inner cities occur in a mixed rural-urban setting and whether SES modifies the effect of race/ethnicity on disparities in childhood health outcomes.

PATIENTS AND METHODS

Study Setting and Population:

Olmsted County, Minnesota, is a mixed rural-urban county located 90 miles southeast of Minneapolis, Minnesota [25]. In the 2010 United States Census, the population of Olmsted County was 86% non-Hispanic white, 5% black, 5% Asian, and 4% Hispanic [26]. Poverty levels in Olmsted County were 8%, well below national (14%) and state levels (11%), with median family income significantly higher than the national average ($66,252 vs $53,046 between 2009-2013) [26]. Furthermore, Olmsted County is not a Medically Underserved Area; a large proportion (27%) of residents work in health care, and 95% of adult residents have health insurance [27-29]. Air quality in Olmsted County, Minnesota is significantly cleaner than metropolitan cities such as Minneapolis according to the Minnesota Air Pollution Control Agency [30]. Olmsted County, Minnesota, is an ideal setting to conduct population-based epidemiologic research such as this because 98% of medical care received by county residents is delivered through Mayo Clinic, Olmsted Medical Center, and their affiliated health care facilities. The Rochester Epidemiology Project (REP) has been continuously funded since 1966 and has electronically indexed all inpatient and outpatient episodes of almost all Olmsted County residents including children (95%). For this study, we utilized the REP census to identify all children ≤18 years who resided in Olmsted County in 2009, excluding only those individuals without research authorization (<5%). The Institutional Review Boards at Mayo Clinic and Olmsted Medical Center approved this study.

Childhood Diseases:

Detailed identification algorithms for each disease were previously described[31]. Briefly, ICD9 codes for common acute and chronic conditions among children were extracted from the medical records of Olmsted County residents participating in the REP from January 1, 2005 through December 31, 2009 (5-year prevalence). We chose clinically distinct conditions reflecting different levels of clinical overtness and health care access and literacy for identification, allowing us to examine the nature of disparities in relation to SES and race/ethnicity. These conditions include 1) acute infectious diseases (bronchiolitis, pneumonia, urinary tract infections), 2) chronic diseases (asthma, epilepsy, mood disorders), and 3) accidents (accident in home and accidental poisoning) and adverse childhood experiences (child physical abuse and child sexual abuse). These ICD9 codes were first grouped into clinical classification codes (CCCs) proposed by the Agency for Healthcare Research and Quality-Healthcare Cost and Utilization Project [32,33]. The prevalence of each CCC was measured using April 1, 2009 with a 5-year capture time frame. While adverse childhood experiences include a broad range of early childhood maltreatment exposures

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(household mental illness, alcoholism, drug abuse, etc)[12,34], this study examined only physical and sexual abuse.

Individual SES as measured by HOUSES:

SES of the study population in 2009 was measured using the validated individual-level SES measure HOUSES. The development, initial testing, and validation of this index have been previously reported [22]. Briefly, the addresses of eligible study participants were geocoded - matched to real property data of individual housing units from the county assessor's office. Principle components factor analysis identified four real property variables (housing value, square footage of housing unit, number of bedrooms, and number of bathrooms) that were then formulated into a standardized HOUSES index score through summation of the z-score for each variable. The higher the HOUSES (z-score), the higher the SES. A broad range of health outcomes in both adults and children have been previously reported to be associated with HOUSES which include risk of low birth weight, obesity, smoking exposure at home, asthma control status, pneumococcal disease, postmyocardial infarction mortality, and rheumatoid arthritis [22,35-38].

Other variables:

In 2010, 15% of the population in both Olmsted County and Minnesota as a whole were minority [39]. For this study, we categorized self-reported race/ethnicity into 4 groups: non-Hispanic white, black, Asian, and Hispanic as recommended by the National Institutes of Health [40,41]. In line with a previous report, we grouped the other/unknown category with the non-Hispanic white category under the presumption that most of the patients in the other/unknown category were non-Hispanic white (86% of the Olmsted County's population self-reported white in the 2010 census) [26,31].

Statistical Analysis:

Descriptive statistics were used to summarize socio-demographic characteristics and prevalence of each pediatric outcome. The raw HOUSES scores (z-score) were collapsed into four groups using quartiles [Q1 (lowest) to Q4 (highest)]. Distribution of demographic characteristics and prevalence of childhood conditions by HOUSES quartiles were first compared univariately using Chi-Square and Kruskal-Wallis tests (Table 1). To assess main effects of HOUSES index and race/ethnicity for each pediatric outcome, logistic regression models were applied, adjusting for age and gender (Table 2 and Table 3 [left column]). As the reference group, Q1 (the lowest quartile) for the HOUSES index and non-Hispanic white were used for each main effect model. Similar analysis for HOUSES was performed only for non-Hispanic whites (ie, single largest racial/ethnic group) to demonstrate the association of HOUSES on the prevalence of each pediatric outcome controlling for age and gender (right column of Table 3). To assess potential interactive effect between the HOUSES and race/ethnicity for each pediatric outcome, logistic regression models were used by testing an interaction term between binary HOUSES (above or below the median) and race/ethnicity, adjusting for age and gender. In this interaction analysis, binary HOUSES category (instead of quartiles) was used for improving statistical power for relatively rare outcomes such as epilepsy. Odds ratios (ORs) with corresponding 95% confidence intervals (CIs) were estimated for each combination of HOUSES and race/ethnicity groups using non-Hispanic

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whites with HOUSES index above the median HOUSES. $P<.05$ was considered statistically significant, and all statistical analyses utilized the R statistical software package (version 3.4.2).

RESULTS

Characteristics of Study Population:

There were 31,523 eligible study participants. The median age of the cohort was 7 years (interquartile range, IQR 3 to 12 years). Half of the cohort was male with 86% non-Hispanic white, 6% black, 5% Asian, and 3% Hispanic. The 5-year prevalence rates of the following health outcomes during the study period were as follows: bronchiolitis (10%), pneumonia (10%), urinary tract infection (UTI; 5%), asthma (11%), epilepsy (0.7%), mood disorder (6%), accident in home (3%), accidental poisoning (0.3%), child physical abuse (<0.1%), and child sexual abuse (0.2%).

SES and Prevalence of Childhood Conditions:

In the overall cohort, SES as measured by HOUSES was inversely associated with prevalence of bronchiolitis ($P<.001$), UTI ($P<.001$), asthma ($P=.008$), mood disorder ($P=.03$), and accidents/adverse childhood experiences ($P<.001$) when controlling for age and gender (Table 2). In the non-Hispanic white cohort, the results after adjusting for age and gender were similar to those for the overall cohort except the prevalence of asthma which became not associated with HOUSES ($P=.11$) while the prevalence of epilepsy was now inversely associated with HOUSES ($P=.04$) (Table 2). After adjusting for age, gender, and race/ethnicity, the association results of HOUSES for the whole cohort virtually remain unchanged (data not shown) except asthma and mood disorder compared to the results from non-Hispanic white cohort (see an interaction analysis below).

Ethnicity and Prevalence of Childhood Conditions:

Except for epilepsy (P=.92), prevalence rates of all childhood conditions considered were significantly different across ethnicities (all $P<.002$ for comparing 4 race/ethnicity groups) (Table 3). Compared to non-Hispanic whites, black children were more likely to have pneumonia [OR=1.31 (1.14, 1.50)], asthma [OR=1.80 (1.58, 2.03)], and accidents and adverse childhood experiences [OR=1.47 (1.16, 1.83)] and less likely to have mood disorder [OR=0.50 (0.38, 0.65)]. Children of Asian descent were less likely to have bronchiolitis [OR=0.75 (0.62, 0.91)], UTI [OR=0.64 (0.46, 0.85)], and mood disorder [OR=0.48 (0.34, 0.65)] than non-Hispanic white children but more likely to have pneumonia [OR=1.18 (1.00, 1.38)]. Children of Hispanic descent were more likely to have bronchiolitis [OR=1.23 (1.01, 1.48)], UTI [OR=1.32 (1.00, 1.71)], and accidents and adverse childhood experiences [OR 1.97 (1.50, 2.54)].

Interaction between SES and Ethnicity in Prevalence of Childhood Conditions:

To examine whether the magnitude of racial disparities will differ by SES, we assessed interactions between SES (above or below the median HOUSES) and ethnicity in relation to prevalence of each health outcome examined. While there were no interaction between SES and ethnicity in relation to bronchiolitis, pneumonia, UTI, epilepsy, and accidents/adverse

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childhood experiences, SES did modify the effect of ethnicity on both asthma (P=0.03 for interaction) and mood disorder (P=0.03 for interaction) (Table 4). Compared to non-Hispanic white children with HOUSES index above median HOUSES, SES significantly increased the odds ratio for asthma prevalence in black children and adolescents from 1.62 (1.40, 1.88) for children with lower SES (HOUSES below the median) to 2.36 (1.83, 3.04) for those with higher SES (HOUSES above the median) (Table 4 and Figure 1A). While non-Hispanic white children had an attenuated risk of asthma with higher SES (compared to those with lower SES; Table 2), black children presented persistently higher prevalence of asthma even with higher SES (Table 4, Figure 1A). On the contrary, the odds ratio for prevalence of mood disorder in Hispanic children (compared to non-Hispanic white children above the median) significantly increased from 0.74 (0.52, 1.06) for children with lower SES (HOUSES below the median) to 1.70 (1.01, 2.88) for those with higher SES (HOUSES above the median) (Table 4 and Figure 1B).

DISCUSSION

Our study results revealed significant disparities in childhood health outcomes in a mixed rural-urban community of the United States despite the existence of community-level factors presumed to mitigate health disparities. While SES did not modify the effect of ethnicity on prevalence of more clinically overt conditions which often require immediate care (infections, epilepsy, and accidents), SES widened the disparities in asthma and mood disorder, clinically less overt diseases where disease recognition is often dependent on health care access or health literacy.

While it is widely accepted that children in inner cities living in low SES households have health disadvantages, to our knowledge this is the first population-based study using medical records and an individual SES measure to demonstrate significant health disparities among children living in a mixed rural-urban community. Among the over 30,000 children living in Olmsted County, Minnesota, in 2009, higher proportions of non-Hispanic white children were in the lowest quartiles of SES. After adjusting for age and gender, children in the lowest quartiles of SES had increased prevalence of health outcomes examined in this present study; however, health disparities across ethnicity seem to be inconsistent and contextual. While this study is consistent with the extant literature showing more adverse health outcomes in children with low SES compared to high SES [2,11,20], there are a few important noteworthy findings. First, SES as measured by HOUSES is a more robust determinant of the disease burden reflected in prevalence of childhood health outcomes than ethnicity in our study setting. Second, although clinically more overt health conditions are less dependent on health care access and literacy in identification of health conditions overall, adverse effects of lower SES on disease burden have a dose-responsive relationship which is independent of clinical overtness and other factors (age and gender). Finally, community-level factors perceived to mitigate health disparities such as access to health care services, higher health insurance coverage, low air pollution, and higher family income have little influence on the magnitude of health disparities examined in our present study across SES and ethnicity. Our study highlights that in capturing adverse effects of SES, housing-based SES measure such as HOUSES index will be a crucial tool for future health disparities research, especially capturing the emerging lower SES groups in rural or suburban

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populations given the epidemiology of child poverty in the United States is shifting with the fastest and largest increases in poverty since 2008 occurring in the suburbs [21].

Another aim of our present work was to examine whether an increase of SES reduces health disparities in the disease burden across ethnicity. There was no interaction between SES and ethnicity in the burden of clinically more overt diseases; however, an increase of SES widened the disparities in asthma prevalence between black and non-Hispanic white children (Figure 1A) and the disparities in prevalence of mood disorder between Hispanic and non-Hispanic white children (Figure 1B). These results may suggest a higher SES may not necessarily pose a mitigating effect on disparities across ethnicity. Also, the effect modification on health disparities across ethnicity by SES depends on the nature of health outcomes and certain race/ethnic background. For example, while disparities in clinical overt diseases (eg, UTI) across ethnicity might be less dependent on changes of SES, disparities in clinically less overt diseases (eg, mood disorder and perhaps asthma) might be more influenced by changes in SES among Hispanic children. This is conceptually supported by a recent Finnish study that examined prostate cancer risk by SES and found that patients with higher SES had an increased incidence of low-moderate risk prostate cancer and decreased incidence of advanced prostate cancer, supporting a notion that patients with higher SES may identify a disease in an early stage when it is clinically less overt [42]. Finally, as our study used ICD codes to measure prevalence of health outcomes, prevalence of health outcomes by ICD codes may represent both *risk of disease* and *detection of disease.* Therefore, it is difficult to know which constructs (eg, exposure to risk factors vs. health care access) ethnicity represents as it interacts with SES in clinically less overt diseases. There is limited data available addressing whether SES modifies the effect of ethnicity on the disease burden in children using distinct clinical conditions. A population-based, prospective study in an urban community found black children were twice as likely as whites to be readmitted for asthma and >40% of the disparity could be explained by SES and hardships measured by self-reported income, caregiver educational attainment, and hardships [43]. While supportive of our hypothesis that SES modifies the reported adverse effect of non-Hispanic white ethnicity on prevalence of childhood health outcomes, no studies using similar methodologies to our study are available to our knowledge for direct comparison of our study results.

The strengths of this study include population-based design, self-contained health care environment, and comprehensive identification of diseases based on documented physician-diagnoses obtained from the REP, a county-wide medical record linkage system, and objectively measured SES based on individual real property data. Since address information was utilized for HOUSES, the possibility exists for future geospatial analysis for hot spots for diseases of interest and their corresponding targeted interventions. The main limitation of our study is the inability to verify and validate the ICD9 codes; however, using ICD9 codes stored in electronic medical records to estimate prevalence rates may be an inexpensive and still valuable way to monitor population health over time[31]. Our study has inherent limitations as a retrospective, crosssectional study. Finally, given the unique epidemiological advantages of our study setting, generalizability of our study findings to other mixed rural-urban settings may be limited. However, given the unique strengths of the present study and paucity of pediatric population-based health disparity studies based on the comprehensive

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medical records and validated, individual-level SES measures, the study findings are an important addition to the current literature.

Conclusion

In conclusion, significant health disparities are present in both clinically more and less overt health outcomes across SES and ethnicity among children living in a mixed rural-urban community. While health disparities across ethnicity are inconsistent and contextual, the association between SES and the burden of adverse health outcomes is dose-dependent with SES interacting with ethnicity for clinically less overt conditions. Interpretation of research findings on health disparities in the future should account for disease nature, and HOUSES is useful for identifying vulnerable children in the community.

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Abbreviations:

SES	Socioeconomic status
HOUSES	HOUsing-based SocioEconomic Status index
ICD-9	International Classification of Diseases, Ninth Revision
REP	Rochester Epidemiology Project
UTI	Urinary Tract Infection

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What's New:

It is well documented that US children living in low SES households in inner cities are at risk of poor health outcomes. This study reveals significant disparities in health outcomes also exist among children living in a predominately affluent mixed rural-urban community.

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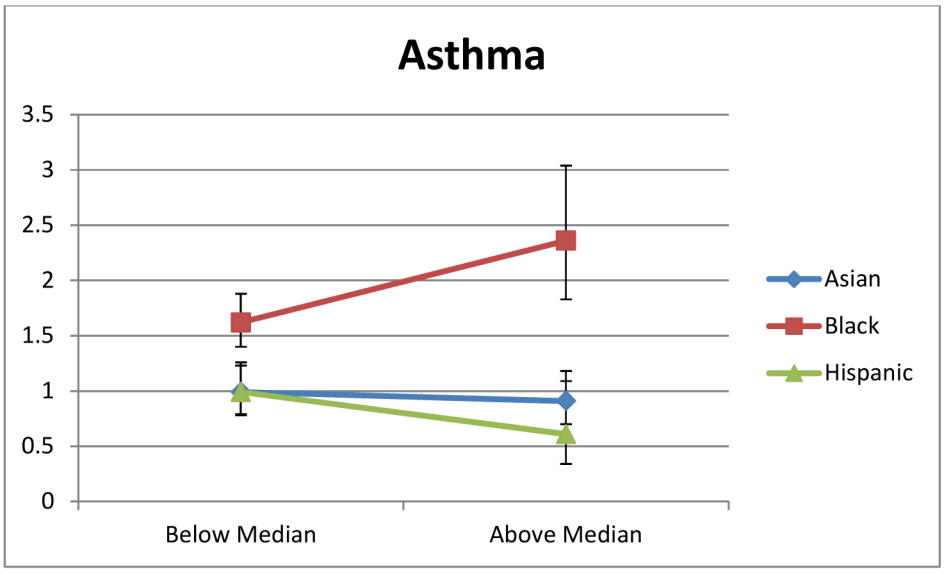

Figure 1A.

Interaction between HOUSES, Ethnicity, and Odds of Asthma. Data are presented as age and sex adjusted OR (95% CI) with non-Hispanic white as reference group. (Blue line – Asian; Red line – Black; and Green line – Hispanic).

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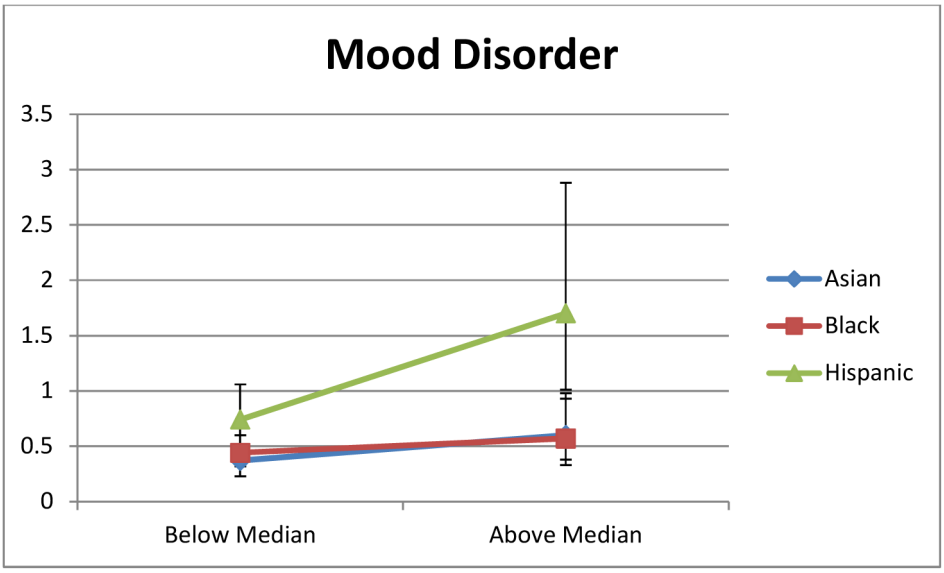

Figure 1B.

Interaction between HOUSES, Ethnicity, and Odds of Mood Disorder. Data are presented as age and sex adjusted OR (95% CI) with non-Hispanic white as reference group. (Blue line – Asian; Red line – Black; and Green line – Hispanic).

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Table 1.

Sociodemographic Characteristics, Prevalence of Childhood Conditions, and Association between Variables and HOUSES as a Continuous Scale and Quartiles[a, b, c, d, e]

Variable	Summary Statistics[c]	HOUSES[b]					*P* value[d]
		Median (IQR) (n=31523)	Q1 (lowest)[e] (n= 7881)	Q2 (n= 7884)	Q3 (n= 7879)	Q4 (highest) (n=7879)	
Age in years, median (IQR)[a]	7 (3, 12)		5 (2, 11)	7 (3, 12)	7 (3, 12)	9 (5, 13)	<.001
Gender							.96
Male	16045 (51%)	0.19 (−2.00, 2.69)	4026 (51%)	4021 (51%)	3993 (51%)	4005 (51%)	
Female	15478 (49%)	0.20 (−1.97, 2.70)	3855 (49%)	3863 (49%)	3886 (49%)	3874 (49%)	
Ethnicity							<.001
Non-Hispanic White	26970 (86%)	0.40 (−1.48, 2.99)	5522 (70%)	6943 (88%)	7113 (90%)	7392 (94%)	
Black	1954 (6%)	−4.22 (−5.15, −0.14)	1179 (15%)	400 (5%)	292 (4%)	83 (1%)	
Asian	1506 (5%)	−0.05 (−2.81, 2.08)	454 (6%)	350 (4%)	374 (5%)	328 (4%)	
Hispanic	1093 (3%)	−4.88 (−4.97, −0.68)	726 (9%)	191 (2%)	100 (1%)	76 (1%)	
Prevalence of childhood conditions							
Acute condition							
Bronchiolitis	3018 (10%)	−0.39 (−2.62, 1.70)	900 (11%)	855 (11%)	716 (9%)	547 (7%)	<.001
Pneumonia	3274 (10%)	0.00 (−2.32, 2.31)	899 (11%)	846 (11%)	794 (10%)	735 (9%)	<.001
Urinary tract infection	1487 (5%)	−0.05 (−2.27, 2.21)	421 (5%)	375 (5%)	368 (5%)	323 (4%)	.004
Chronic condition							
Asthma	3429 (11%)	0.17 (−2.05, 2.70)	872 (11%)	857 (11%)	841 (11%)	859 (11%)	.89
Epilepsy	211 (1%)	−0.58 (−2.75, 1.84)	65 (1%)	55 (1%)	49 (1%)	42 (1%)	.14
Mood disorder	1855 (6%)	0.39 (−1.50, 2.98)	386 (5%)	482 (6%)	474 (6%)	513 (7%)	<.001
Accidents and Adverse Childhood Experiences							
Any of accidents or adverse childhood experience	1017 (3.6%)	−0.82 (−3.81, 1.11)	350 (4%)	274 (3%)	200 (2%)	173 (2%)	<.001
Accident in home	864 (3%)	−0.78 (−3.53, 1.17)	291 (4%)	240 (3%)	179 (2%)	154(2%)	<.001
Accidental poisoning	83 (0.3%)	−1.06 (−4.44, 0.52)	37 (0.5%)	19 (0.2%)	16 (0.2%)	11 (0.1%)	<.001
Physical abuse	22 (<0.1%)	−2.15 (−4.97, −0.18)	11 (0.1%)	7 (<0.1%)	2 (<0.1%)	2 (<0.1%)	.02

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Variable	Summary Statistics[c]	HOUSES[b]					
		Median (IQR) (n=31523)	Q1 (lowest)[e] (n= 7881)	Q2 (n= 7884)	Q3 (n= 7879)	Q4 (highest) (n=7879)	*P* value[d]
Sexual abuse	48 (0.2%)	−1.77 (−4.23, 0.55)	21 (0.3%)	14 (0.2%)	6 (<0.1%)	7 (<0.1%)	.01

[a] IQR: interquartile range

[b] HOUSES: HOUsing-based index of SocioEconomic Status

[c] Data are presented as No. (percentage) of patients unless indicated otherwise

[d] P value from Kruskal Wallis test (Age) or Chi-square test (all other variables) using quartiles HOUSES

[e] Q1 is lowest quartile, Q4 is highest quartile

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Table 2.

Association Between HOUSES and Prevalence of Childhood Conditions in Overall Cohort and Among Non-Hispanic Whites

	Overall Study Cohort OR (95% CI) [*P* Value]	Non-Hispanic White Subset OR (95% CI) [*P* Value]
Bronchiolitis		
Q1	1.0 (Reference) [*P*<.001]	1.0 (Reference) [*P*<.001]
Q2	1.01 (0.92, 1.12)	0.99 (0.88, 1.11)
Q3	0.85 (0.77, 0.95)	0.82 (0.73, 0.92)
Q4	0.70 (0.62, 0.78)	0.69 (0.61, 0.78)
Pneumonia		
Q1	1.0 (Reference) [*P*=.07]	1.0 (Reference) [*P*=.08]
Q2	0.97 (0.88, 1.07)	0.95 (0.85, 1.07)
Q3	0.91 (0.83, 1.01)	0.88 (0.79, 0.99)
Q4	0.88 (0.79, 0.98)	0.88 (0.78, 0.99)
Urinary tract infection		
Q1	1.0 (Reference) [*P*<.001]	1.0 (Reference) [*P*<.001]
Q2	0.86 (0.74, 0.99)	0.83 (0.71, 0.97)
Q3	0.83 (0.72, 0.96)	0.81 (0.69, 0.96)
Q4	0.70 (0.60, 0.82)	0.66 (0.56, 0.78)
Asthma		
Q1	1.0 (Reference) [*P*=.008]	1.0 (Reference) [*P*=.11]
Q2	0.92 (0.83, 1.02)	0.92 (0.82, 1.03)
Q3	0.88 (0.80, 0.98)	0.90 (0.80, 1.01)
Q4	0.84 (0.76, 0.93)	0.87 (0.77, 0.97)
Epilepsy		
Q1	1.0 (Reference) [*P*=.10]	1.0 (Reference) [*P*=.04]
Q2	0.83 (0.58, 1.19)	0.73 (0.49, 1.09)
Q3	0.74 (0.50, 1.07)	0.68 (0.45, 1.01)
Q4	0.62 (0.41, 0.91)	0.53 (0.35, 0.82)
Mood Disorder		
Q1	1.0 (Reference) [*P*=.03]	1.0 (Reference) [*P*<.001]
Q2	1.04 (0.90, 1.20)	0.90 (0.77, 1.05)
Q3	0.96 (0.83, 1.11)	0.81 (0.70, 0.95)
Q4	0.85 (0.74, 0.99)	0.72 (0.62, 0.84)
Accidents and Adverse Childhood Experiences		
Q1	1.0 (Reference) [*P*<.001]	1.0 (Reference) [*P*<.001]
Q2	0.79 (0.67, 0.92)	0.78 (0.65, 0.94)
Q3	0.57 (0.48, 0.68)	0.57 (0.46, 0.69)
Q4	0.50 (0.41, 0.60)	0.54 (0.44, 0.66)

OR adjusted for age and gender and p value from likelihood ratio test

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Table 3:

Association Between Ethnicity and Prevalence of Childhood Conditions[a]

	Black	Asian	Hispanic	*P* Value[b]
Bronchiolitis	1.08 (0.93, 1.26)	0.75 (0.62, 0.91)	1.23 (1.01, 1.48)	.002
Pneumonia	1.31 (1.14, 1.50)	1.18 (1.00, 1.38)	1.17 (0.97, 1.41)	<.001
Urinary tract infection	0.81 (0.63, 1.02)	0.64 (0.46, 0.85)	1.32 (1.00, 1.71)	<.001
Asthma	1.80 (1.58, 2.03)	0.96 (0.80, 1.14)	0.95 (0.76, 1.16)	<.001
Epilepsy	0.92 (0.49, 1.59)	1.00 (0.50, 1.80)	1.25 (0.59, 2.30)	.92
Mood Disorder	0.50 (0.38, 0.65)	0.48 (0.34, 0.65)	0.99 (0.73, 1.31)	<.001
Accidents and Adverse Childhood Experiences	1.47 (1.16, 1.83)	0.75 (0.53, 1.05)	1.97 (1.50, 2.54)	<.001

[a]Data are presented as OR (95% CI) with non-Hispanic white as reference group models adjusted for age and gender

[b]*P*-value from likelihood ratio test comparing all ethnic groups

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Table 4:

Association Between Ethnicity, HOUSES, and Odds of Asthma and Mood Disorder in Children

	Black	Asian	Hispanic	Interaction *P* Value
Asthma				.03
HOUSES below Median	1.62 (1.40, 1.88)	0.99 (0.78, 1.26)	0.99 (0.79, 1.23)	
HOUSES above Median	2.36 (1.83, 3.04)	0.91 (0.70, 1.18)	0.61 (0.34, 1.09)	
Mood Disorder				.03
HOUSES below Median	0.44 (0.32, 0.60)	0.37 (0.23, 0.60)	0.74 (0.52, 1.06)	
HOUSES above Median	0.57 (0.33, 0.98)	0.60 (0.38, 0.93)	1.70 (1.01, 2.88)	

OR (95% CI) and *P* value adjusted for age and gender