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## Revisiting the Hispanic Health Paradox: The Relative Contributions of Nativity, Country of Origin, and Race/Ethnicity to Childhood Asthma

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### Abstract

**Background**—This study examined the relationship between race and Hispanic ethnicity, maternal and child nativity, country of origin and asthma among 2,558 non-Hispanic white and Hispanic children across 65 Los Angeles neighborhoods.

**Methods**—A series of two-level multilevel models were estimated to examine the independent effects of race, ethnicity, and country of origin on childhood asthma.

**Results**—Lifetime asthma prevalence was reported among 9% of children, with no significant differences between Hispanics and non-Hispanic whites overall. However, in fully adjusted models, Hispanic children of non-Mexican origin reported higher odds of asthma compared to non-Hispanic white children. A protective nativity effect was also observed among children of foreign born mothers compared to US born mothers.

**Discussion**—Our study provides evidence in support of the heterogeneity of childhood asthma by Hispanic ethnicity and maternal nativity. These findings suggest moving beyond solely considering racial/ethnic classifications which could mask subgroups at increased risk of childhood asthma.

### Keywords

childhood asthma; nativity; Hispanic; Latino paradox

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## BACKGROUND

The Hispanic Health Paradox also described as the Latino or Epidemiologic Paradox, refers to the relatively good health of Latinos within the US, despite what lower levels of socioeconomic status might predict [1]. The Hispanic health paradox has been well studied within the literature across a range of health outcomes including, mortality, cardiovascular diseases, and preterm birth [2–6]. Health advantage has particularly been observed among Hispanics of Mexican background, particularly Mexican immigrants.

Within the Hispanic health paradox literature, asthma has also been studied [7–12]. Nationally, asthma prevalence among Hispanic children overall has been comparable to that of non-Hispanic White children. Among California children, the prevalence of active asthma varies by racial and ethnic groups—with the highest prevalence among African Americans (17%) and American Indians/Alaska Natives (17%), followed by Whites (10%), then Hispanics (7%) and Asians (7%) [13]. However, substantial heterogeneity within Hispanic subgroups has also been observed; Hispanics of Puerto Rican origin have the highest prevalence of asthma (26%) while Hispanics of Mexican origin reported the lowest (10%) [14–16]. The wide variation in asthma prevalence among Hispanic subgroups challenges the notion of the Hispanic health paradox and has prompted investigation into other factors, including acculturation, nativity, and country of origin.

Within Hispanics of Mexican origin, a nativity effect has also been observed, with immigrant children reporting a lower prevalence of asthma compared to second generation or third generation children [12]. These differences have also been observed among Hispanics of Puerto Rican origin, when comparing mainland Puerto Rican children to Puerto Rican children within the US [17]. Further research is needed to help disentangle the influences of race/ethnicity, nativity, and country of origin on childhood asthma outcomes, which can potentially target interventions and inform policy to reduce asthma disparities. The present study was designed to explore heterogeneity in childhood asthma across Hispanic ethnic groups by country of origin and maternal and child nativity.

## METHODS

### Participants

The Los Angeles Family and Neighborhood Survey (L.A.FANS) is a longitudinal study of children and adolescents within Los Angeles neighborhoods designed to examine the influences of neighborhood, family, and individual factors on a range of health outcomes and behaviors [18]. Wave 1 of L.A.FANS, a stratified random sample of 65 neighborhoods (defined by census tracts), included children (ages 0–17) living within one of 65 neighborhoods and oversampled participants within very poor and poor neighborhoods. Characteristics of sampled tracts generally correspond to the tracts they represent, within each poverty strata. However, due to the oversampling of very poor and poor neighborhoods, there are more Hispanics, but fewer whites, blacks, and Asians than expected given census data [19].

Interviews were conducted in-person in English or Spanish by trained field interviewers using computer assisted personal interviewing technology; 89% of primary caregivers selected for the study completed interviews [18]. Households with children received \$50 and participants without children received \$25 upon completion of the interview. Within the interviews, completed between 2000 and 2002, participants provided a wide range of information on nativity, country of origin, socioeconomic measures, and health measures for children and primary caregivers. These data allowed us to examine differences in asthma prevalence, not only by overall racial/ethnic groupings, but also by Hispanic subgroups and child and maternal nativity.

We restricted our sample to children of Hispanic or non-Hispanic White racial/ethnic origin due to the small sample sizes and lack of data regarding nativity of children within non-Hispanic Black, Asian, Pacific Islander, and Native American/American Indian categories. Due to these limitations we would have been unable to examine the effects of child or maternal nativity, two of our primary variables of interest. Children who were of White origin and another racial group were also excluded from our analyses. Children who were of both Hispanic origin and another racial group were categorized as Hispanic including children who reported both Hispanic and White race. Our analyses included 2,558 children (ages 0–17 years) of non-Hispanic White or Hispanic race/ethnicity who also had data on our outcome of interest, of which Hispanic children comprised approximately 78% of our sample.

## Measures

We ascertained child's lifetime asthma status via the primary caregiver's report of an asthma diagnosis within the parent module of L.A.FANS. Children were categorized as asthmatic if the primary caregivers reported a positive response to the following item: "has a doctor or other health professional ever told you that [child's name] has asthma?" Similar questions to ascertain asthma prevalence have been used within the International Study of Asthma and Allergies in Childhood (ISAAC) survey [20].

Child's race/ethnicity was provided by the primary caregiver within the roster module of L.A.FANS. Maternal nativity and country of origin was assessed within the parent module of L.A.FANS. Mother's response to the country where she was born was used to categorize maternal nativity; response options were collapsed into two categories- born in the (1) born in the United States and (2) born elsewhere. These categories enabled us to ascertain the effect of maternal nativity on asthma independent of country of origin. To categorize ethnicity within Hispanics, we used mother's response to the following questions:

- Are you a Mexican/Mexicano?
- Are you a Mexican American?
- Are you a Central American?
- Are you a Caribbean?
- Are you an other Latin American?
- Are you an other Hispanic?

Responses were further collapsed into the following categories- (1) Mexican or Mexican American; (2) Central American, Caribbean, Latin American, or other Hispanic. Approximately 20% of Hispanic respondents were of non-Mexican ethnicity.

The child's nativity was provided by the primary caregiver's response to the following question, "was the child born in the United States?" Although a considerable percentage of Hispanic children within L.A.FANS were foreign born (approximately 12%), the majority of foreign born children were born in Mexico. As such, we were unable to further categorize children by country of origin. In order to examine the interaction between country of origin and maternal nativity, we considered mother's response to questions regarding ethnicity and country of birth. We categorized mothers into the following categories: (1) US born Non-Hispanic White, (2) Foreign born White, (3) US born Mexican, (4) Foreign born Mexican, (5) US born other Hispanics and (6) Foreign born other Hispanics.

Covariates were chosen for inclusion based on prior literature and availability of data. At the individual level, child's age, gender, race/ethnicity, health insurance status, and place of care were included which were provided by the primary caregiver during the parent module. At the household level, we adjusted for primary caregiver's education (years), receipt of public assistance within the past 12 months, maternal history of asthma, and the primary caregiver's current smoking status. We reported both unadjusted and adjusted models to examine potential confounding due to observed covariates.

### **Analytic strategy**

As our data have natural and sampling induced nesting, we conducted a series of two level multilevel logistic regression models of children at level 1 nested within census tracts at level 2. We first examined the overall effect of race/ethnicity of the log odds of reporting an asthma diagnosis among all Hispanic children compared to non-Hispanic Whites. This model enabled us to examine the contribution of Hispanic ethnicity overall on the log odds of reporting an asthma diagnosis compared to non-Hispanic Whites. We then modeled the unadjusted effect of maternal Hispanic country of origin (non-Hispanic White, Hispanics of Mexican origin, Hispanics of non-Mexican origin) on the log odds of reporting an asthma diagnosis and subsequently adjusted for child's age, gender, primary caregiver's education, receipt of public assistance, health insurance status and place of care, maternal smoking status and asthma history. Lastly, we modeled the unadjusted and adjusted effects of maternal nativity (foreign born vs. US born) and racial/ethnic groups on the log odds of reporting an asthma diagnosis within children. Together these series of models enabled us to test the heterogeneity within Hispanic subgroups and also the joint contributions of nativity and race/ethnicity on asthma outcomes [12]. Descriptive analyses were conducted using STATA v.11; multilevel models were implemented using MLwiN. The study was approved by the Office of Human Research Administration at the Harvard School of Public Health. Participants provided informed consent orally during the initial LAFANS interview; data were protected via a certificate of confidentiality. Reconsent was waived in order to avoid identification of study participants.

## RESULTS

Lifetime asthma prevalence was reported among 9.7% of children within the sample. Table I displays the individual and household sociodemographic characteristics of participants among asthmatics and non-asthmatics as well as the unadjusted odds ratios for predictors of interest and covariates. Approximately 22% of children within the sample were non-Hispanic White; among non-Hispanic White children, 11% had a lifetime reported asthma diagnosis. Among Hispanic children overall, 9% had a lifetime reported asthma diagnosis. However, significant heterogeneity was found within Hispanic subgroups as children of Mexican origin had the lowest asthma prevalence (approximately 6.9%), while 11.4% of children of non-Mexican origin reported an asthma diagnosis.

Children who were foreign born also had a lower prevalence of an asthma diagnosis compared to their US-born counterparts (5.8% versus 10.2% respectively). Children of foreign-born mothers also had a lower prevalence of reported asthma diagnosis (7.7%) compared to children of US born mothers (14.2%).

Examining additional sociodemographic variables, older children had higher odds of reporting an asthma diagnosis compared to those in younger age categories. Primary caregiver's education was also significantly associated with asthma diagnosis; primary caregivers with a high school degree or equivalent as well as those with more than a high school education reported higher odds of child's asthma diagnosis, compared to those with less than a high school education. Higher odds of reporting an asthma diagnosis among children were also seen among primary caregivers who were smokers as well as those who also had a history of asthma.

### Effects of race/ethnicity and maternal and child nativity

Within Table II, we reported the mutually adjusted effects of race/ethnicity and child nativity, after controlling for individual and primary caregiver characteristics. Odds of reporting lifetime asthma among children did not differ between Hispanics and non-Hispanic Whites overall. In addition, no significant differences were observed between foreign-born children and US-born children. However, children of immigrant mothers had significantly lower odds of reporting an asthma diagnosis compared to children of non-immigrant mothers (odds ratio [OR] = 0.69; 95% confidence interval [CI] = 0.47–0.99). This effect persisted even after controlling for race/ethnicity (OR = 0.64; 95% CI = 0.44–0.94).

Significant heterogeneity was found within Hispanic subgroups, even after controlling for all covariates and maternal and child nativity (Figure 1). The odds of lifetime reported asthma were not significantly different between children of Mexican ethnicity compared to non-Hispanic Whites. Non-Mexican Hispanic children had a substantially increased risk of reported asthma diagnosis compared to non-Hispanic White children (OR = 2.55; 95% CI = 1.03–6.28), even after controlling for maternal and child nativity.

In Figure 2, we reported the effects of maternal and child nativity, adjusted for individual and primary characteristics, as well as Hispanic ethnicity. Maternal nativity was significant

where children of mothers who were born outside of the United States had lower odds of reporting an asthma diagnosis compared to children born within the United States (OR = 0.38; 95% CI = 0.16–0.89). This effect persisted after controlling for all covariates and regardless of Hispanic ethnicity. No significant differences were observed with respect to child nativity (0.59; 0.41–1.18). Table III displayed the adjusted results for various combinations of race, Hispanic/ethnicity and maternal nativity. In unadjusted models, children of immigrant Mexican mothers were significantly less likely to report an asthma diagnosis compared to non-Hispanic white children (OR = 0.59; 95% CI = 0.31–0.70). Children of immigrant white mothers were also significantly less likely to report an asthma diagnosis compared children of US-born white mothers (OR = 0.44; 95% CI = 0.21–0.94). These effects did not persist in fully adjusted models.

## DISCUSSION

Our study had several important findings. First, consistent with other literature examining asthma prevalence among Hispanic subgroups, our research demonstrated that classification of Hispanics as one ethnic group overall masked significant heterogeneity between groups. Overall, children of Hispanic ethnicity did not report different rates of asthma diagnosis compared to non-Hispanic White children; however this result may have been masked by lower prevalence among children of Mexican origin as further disaggregation by country of origin demonstrated that children of non-Mexican Hispanic origin reported an increased risk of asthma diagnosis compared to non-Hispanic white children.

Several studies of asthma prevalence, morbidity, and mortality have found significant variation among Hispanic ethnic groups [14–16]. Consistently, asthma prevalence has been highest among Puerto Ricans, followed by Dominicans and Cubans, and lowest among Central Americans and Mexicans [21–24]. Results from the ISAAC study indicated a wide variation of asthma prevalence between Latin American countries and within Latin American countries. Lifetime asthma prevalence ranged from 1.2% in the Mexicali Valley in Mexico to 33.1% in Lima Peru [25]. Researchers searching for potential explanations for this observed variation have examined the independent contributions of genetic, socioeconomic, and environmental factors as well as their potential interactions. Gene-environmental studies have yielded mixed results; while some studies have found evidence in support of the interplay of socioeconomic and ancestry markers among Hispanic subgroups [26], others have found no significant associations between ancestry and asthma prevalence and morbidity among Puerto Rican and Mexican groups [27,28].

Within Hispanics, a nativity effect was clearly observed for maternal nativity. Children of foreign born mothers had significantly lower odds of reporting an asthma diagnosis compared to their US-born counterparts, even after controlling for socioeconomic factors, smoking, maternal asthma history, and race/ethnicity. The nativity effect was also demonstrated among children of non-Hispanic origin; in unadjusted models, children of foreign born White mothers also demonstrated lower odds of an asthma diagnosis compared to children of US born white mothers. The effect of nativity on childhood asthma has been confirmed in prior studies as well [7, 10, 12, 29–31].



Several potential explanations for the protective effect of nativity among foreign born mothers and children have been offered in the literature. One potential explanation for the observed nativity effect has been referred to as the “healthy migrant effect,” which posits that individuals who have the health resources (general health with lower prevalence of various chronic diseases) to migrate are more likely to do so compared to their less healthy counterparts [32, 33]. However, research examining selective migration is scarce and results have been mixed [3, 17, 34]. While migrant effects may contribute to variation in asthma outcomes among foreign born and US born groups, it is unlikely to completely explain observed differences [35].

## Limitations

Our study did have several limitations which should be considered. First, our classification of child’s asthma status was derived from maternal reports. There may have been potential for diagnostic bias for asthma, particularly among households of lower socioeconomic status and racial/ethnic minority groups. In addition, Hispanic participants of Mexican-descent may be less likely to receive an asthma diagnosis (particularly among foreign-born Mexicans), given evidence lower health care use [36]. While we attempted to account for this by not only controlling for household SES, but also by adjusted for the health insurance status, we were unable to include additional factors on health care use (such as having a usual place of care or primary care physician). Prior studies examining diagnostic bias among children with asthma symptoms have not found evidence of under diagnosis among minority children compared to non-Hispanic white children [37]. Additional studies have also observed a nativity advantage with respect to physician-diagnosed asthma among children of Mexican descent [10]. In addition, although response rates were generally high among participants selected into the study, there may have been potential for response bias based on country of origin or nativity status among Hispanics. There also could have been differences by country of origin or nativity status among Hispanics which could have influenced parents to seek health care for asthmatic children, which we were unable to account for in our study.

Our study did not include measures of acculturation, including language preference, length of stay, or other assessments of cultural beliefs. While much of the literature regarding the Hispanic health paradox focuses on acculturation, explanations for the paradox remain elusive [7]. Although nativity and country of origin have often been used as proxies for acculturation, our study have examined these factors as distinct constructs. Studying nativity and country of origin separate from acculturation enabled us to examine the contributions of immigrating to the United States from various native countries, prompting future research to utilize a cross-national perspective and focus on the environmental and social conditions of native countries. While the examination of acculturation may help highlight the processes by which conditions and characteristics of the host country influence the asthma outcomes of immigrants and subsequent generations, they are distinct questions and should be examined independently of one another. The second wave of the Los Angeles Family and Neighborhood Survey (L.A.FANS-2), which re-interviewed participants from the first wave and included a sample of new entrants into the neighborhoods, includes measures of acculturation. Future studies utilizing L.A.FANS-2 may be able to examine the relative

contributions of nativity, country of origin, and acculturation within a similar population and context.

Lastly, our study was restricted to Los Angeles County and may limit generalizability to other populations and contexts. However, comparing our results to additional similar studies conducted within Midwestern and Northeastern cities, we found similar results for the effects of nativity and country of origin. However, our study population may have been ideally suited to examine the Hispanic Health paradox, due to the large proportion of Hispanics within our sample and our ability to disaggregate by both country of origin and assess maternal and child nativity status.

## CONCLUSIONS

Our study provides evidence in support of the heterogeneity of childhood asthma across Hispanic ethnic groups and child and maternal nativity, prompting future research to reconsider the use of the term Hispanic Health paradox. The term misleadingly implies that Hispanic ethnic groups exhibit the same health outcome; our study provides support of the existing literature demonstrating that the prevalence of chronic disease may vary widely across Hispanic ethnic groups, particularly in the context of asthma. As the body of literature supporting the heterogeneity of health outcomes among Hispanic subgroups continues to increase, researchers should consider a nuanced approach to account for the paradox [38–40]. Future studies should further examine the effects of nativity within diverse racial/ethnic groups and across a variety of contexts, with a particular focus on multilevel strategies and examining the interplay between individual genetic, socioeconomic, and cultural factors and social and structural explanations [41–43]. Together, current and future studies can potentially inform programs and policies that may reduce childhood disparities in asthma within the United States.

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**What is already known on this subject**

Although overall asthma prevalence is low among Hispanic children, significant heterogeneity exists between subgroups. Although acculturation has been examined as a potential explanation for differences within Hispanics, few studies have explicitly examined the contributions of maternal and child nativity, country of origin, and their potential interactions.

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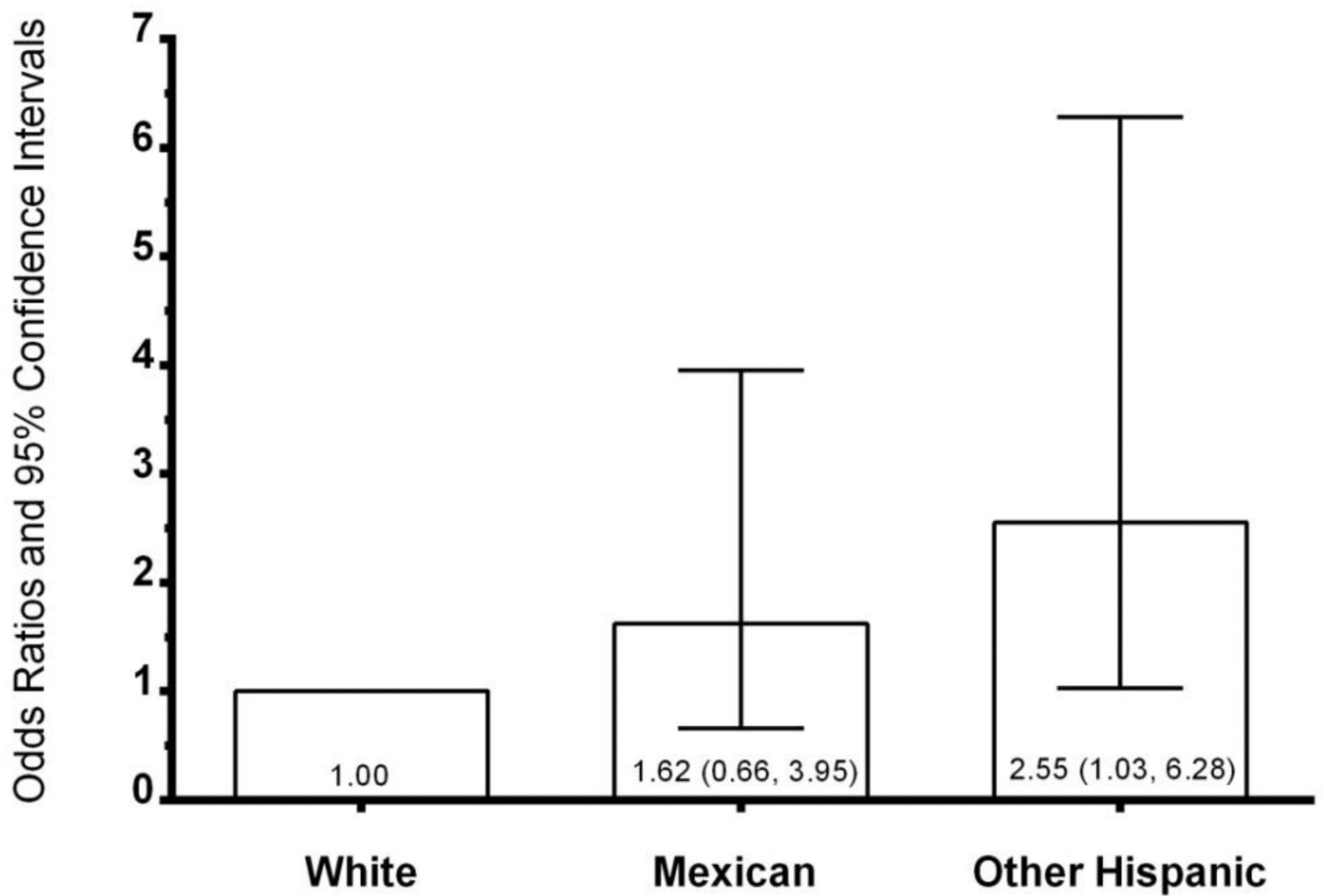
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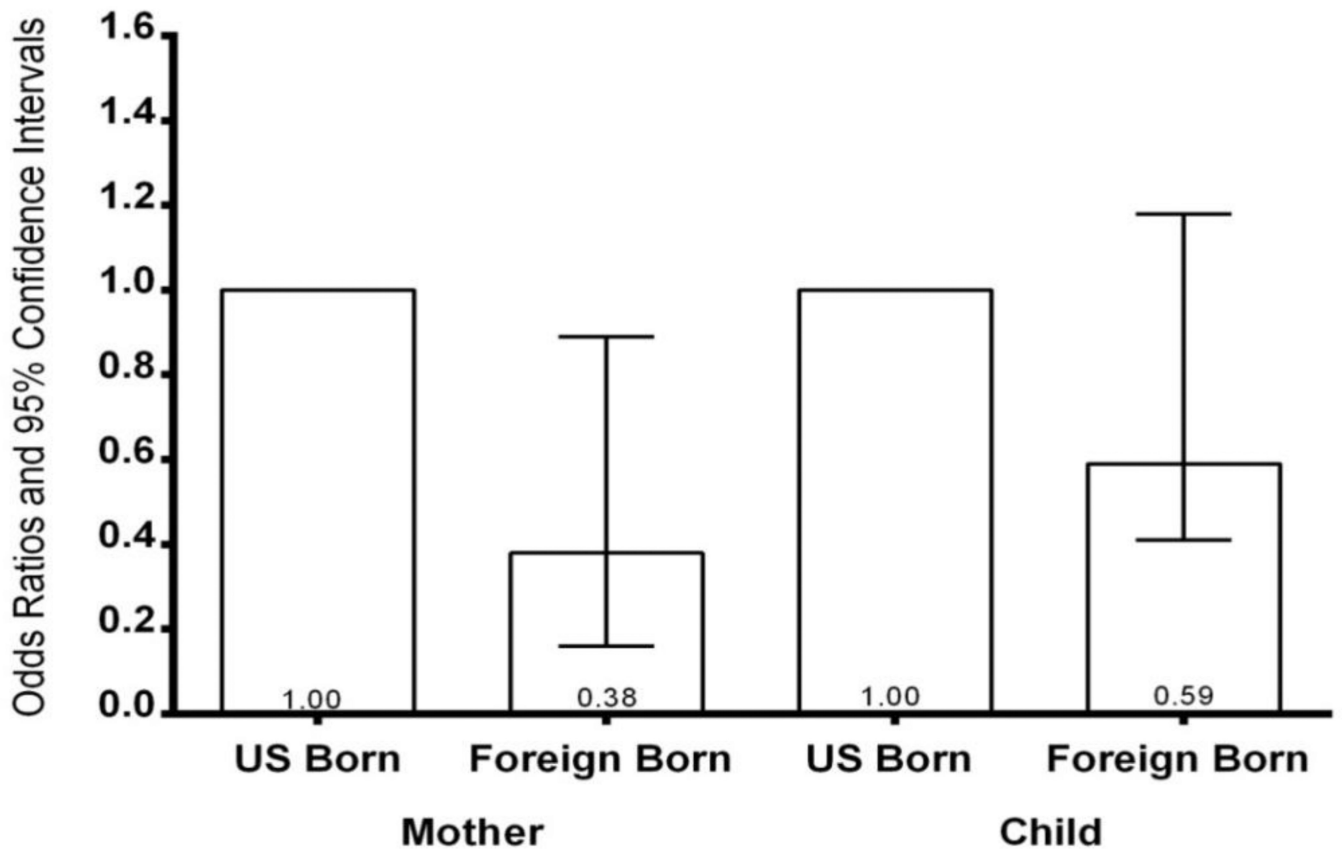
**What this study adds**

Our study provides evidence in support of the heterogeneity of childhood asthma across Hispanic ethnic groups and child and maternal nativity, prompting future research to reconsider the use of the term Hispanic Health paradox. Future studies should further examine the effects of nativity within diverse racial/ethnic groups and across a variety of contexts.



**Figure 1. Odds ratios and 95% confidence intervals for lifetime asthma diagnosis among LA FANS children by race/ethnicity**

*Note:* The results reflect adjustment for children's age, gender, health insurance status, primary caregiver's education, receipt of public assistance, current smoking status, maternal asthma history, and maternal and child nativity.



**Figure 2. Odds ratios and 95% confidence intervals for lifetime asthma diagnosis among LA FANS children by maternal and child nativity**

*Note:* The results reflect adjustment for children's age, gender, health insurance status, primary caregiver's education, receipt of public assistance, current smoking status, maternal asthma history, and ethnicity.

**Table I**

Distribution of lifetime reported asthma diagnosis by individual and primary caregiver characteristics among non-Hispanic White and Hispanic children within the Los Angeles Family and Neighborhood Survey

<i>Individual characteristics</i>	<b>Asthmatics (n = 247)</b>	<b>Non-asthmatics (n = 2311)</b>	<b>Crude OR (95%CI)</b>
<b>Gender</b>			
Male	137 (55.5)	1151 (49.8)	1
Female	110 (44.5)	1160 (50.2)	0.83 (0.64–1.09)
<b>Age (years)</b>			
5	68 (27.5)	869 (37.6)	1
6–10	71 (28.7)	699 (30.3)	1.35 (0.95–1.91)
11–14	63 (25.5)	433 (18.7)	1.82 (1.26–2.63)
15	45 (18.2)	310 (13.4)	1.82 (1.21–2.73)
<b>Race/ethnicity</b>			
White	65 (26.3)	503 (21.8)	1
Hispanic	182 (76.7)	1808 (78.2)	0.80 (0.57–1.14)
<b>Child nativity</b>			
US born	228 (92.3)	2005 (86.8)	1
Foreign born	19 (7.7)	306 (13.2)	0.58 (0.36–0.93)
<b>Health Insurance</b>			
Insured	197 (86.0)	1659 (78.8)	1.49 (1.08–2.07)
Partially or uninsured	32 (14.0)	447 (21.2)	1
<i>Primary caregiver characteristics</i>			
<b>Ethnicity (country of origin)</b>			
Non Hispanic White	65 (32.3)	503 (24.7)	1
Hispanic, Mexican origin	82 (40.8)	1,111 (54.6)	0.53 (0.39–0.73)
Other Hispanic origin	54 (26.9)	420 (20.7)	0.81 (0.54–1.22)
<b>Maternal nativity</b>			
Foreign born	130 (53.3)	1578 (69.5)	0.52 (0.39–0.69)
US born	114 (46.7)	692 (30.5)	1
<b>Education (years)</b>			
< 12	86 (34.8)	1152 (49.9)	1
12	60 (24.3)	389 (16.8)	2.01 (1.41–2.88)
>12	101(40.9)	770 (33.3)	1.72 (1.24–2.40)
<b>Public assistance</b>			
No	210 (86.4)	2025 (89.4)	1
Yes	33 (13.6)	239 (10.6)	1.42 (0.96–2.11)
<b>Current smoking status</b>			
No	213 (87.3)	2078 (92.0)	1
Yes	30 (12.7)	181 (8.0)	1.56 (1.02–2.39)
<b>Asthma history</b>			
No	209 (84.9)	2155 (95.4)	1
Yes	34 (15.1)	104 (4.6)	3.39 (2.23–5.16)



**Table II**

Adjusted Odds Ratios (ORs) and 95% Confidence Intervals (CI) for Lifetime Reported Asthma among L.A.FANS Children by Race/Ethnicity and Mother and Child Nativity

	Model 1 <sup>a</sup>	Model 2 <sup>b</sup>
<b>Race/Ethnicity</b>		
White	1.00	1.00
Latino	1.20 (0.78–1.83)	1.34 (0.88–2.06)
<b>Maternal nativity</b>		
US born	1.00	1.00
Foreign born	0.69 (0.47–0.99)*	0.64 (0.44–0.94)*
<b>Child nativity</b>		
US born	1.00	1.00
Foreign born	0.59 (0.39–1.11)	0.59 (0.39–1.10)

\* p < 0.05

<sup>a</sup> Model 1 Adjusted for child's age, gender, child's health insurance status, primary caregiver's education, receipt of public assistance, primary caregiver's current smoking status, and maternal asthma history

<sup>b</sup> Model 2 Adjusted for all covariates in model 1 and mutually adjusted for race/ethnicity and nativity

**Table III**

Unadjusted and Adjusted Odds Ratios (ORs) and 95% Confidence Intervals (CI) for Lifetime Reported Asthma among L.A.FANS Children by Race/Ethnicity and Maternal Nativity

	Model 1 <sup>a</sup>	Model 2 <sup>b</sup>
<b>Nativity and Race/Ethnicity</b>		
US born White	1.00	1.00
Foreign born White	0.44 (0.21–0.94)*	0.50 (0.22–1.08)
US born Mexican	1.01 (0.63–1.61)	1.05 (0.61–1.81)
Foreign born Mexican	0.59 (0.31–0.70)*	0.59 (0.44–1.27)
US born other Hispanic	1.36 (0.65–2.84)	1.69 (0.73–3.92)
Foreign born other Hispanic	0.59 (0.51–1.27)	1.22 (0.70–2.11)

\*  
p < 0.05

<sup>a</sup>Model 1 Unadjusted model

<sup>b</sup>Model 2 Adjusted for child's age, gender, child's health insurance status, primary caregiver's education, receipt of public assistance, primary caregiver's current smoking status, and maternal asthma history