

Associations of place of birth with asthma and wheezing in Mexican American children

Kamal Eldeirawi, RN, MSN,^a Rob McConnell, MD,^b Sally Freels, PhD,^a and Victoria W. Persky, MD^a Chicago, Ill, and Los Angeles, Calif

Background: There are wide global variations in the prevalence of asthma and wheezing.

Objectives: We examined the associations of place of birth with doctor-diagnosed asthma, wheezing in the past 12 months, and other allergic conditions in Mexican American children.

Methods: The study used data on 4121 Mexican American children age 2 months to 16 years who participated in the Third National Health and Nutrition Examination Survey. **Results:** The risk of asthma was associated with being born in the United States after adjusting for sex, age, history of ear infection, and having a regular place for health care (odds ratio, 2.19; 95% CI, 1.09-4.40). Among children with no previous history of ear infection, US-born children were more likely to report wheezing in the past 12 months than their peers born in Mexico after controlling for confounding variables (odds ratio, 2.05; 95% CI, 1.09-3.87). Mexican American children born in the United States were more likely to have positive skin reaction to cat, house mite, *Alternaria alternata*, peanut, Bermuda grass, and short ragweed but were less likely to have a positive skin test to German cockroaches after adjusting for sex, age, ear infection, having a regular place for health care, and area of residence.

Conclusion: Our study indicated significant associations of place of birth with respiratory symptoms and allergic conditions in Mexican American children. These findings highlight the need for further studies to examine environmental factors that change by migration and explain the observed differential in the risk of asthma or wheezing. (J Allergy Clin Immunol 2005;116:42-8.)

Key words: Asthma, children and adolescents, immigrants, Mexican American, Mexico, place of birth, prevalence, respiratory symptoms, skin test reactivity, wheezing

Asthma is a worldwide problem and is one of the most common chronic conditions affecting children. In many developed societies, the prevalence rates of childhood

Abbreviations used

NHANES III: Third National Health and Nutrition Examination Survey
OR: Odds ratio

asthma have increased in the last 2 to 3 decades,^{1,2} with wide variations in the prevalence or the burden of asthma among various countries in the world.³

Migration studies may help identify environmental factors responsible for the development of asthma and explain the observed geographic variations in the prevalence of asthma. Several previous studies of immigrants⁴⁻⁷ have suggested an important role for environmental factors in the development or prevalence of asthma and asthma-related respiratory conditions. Although the United States has had huge immigrant surges over the last few decades, there have been no studies of migration and childhood asthma in the country. Such studies could help identify risk factors for asthma and other respiratory symptoms.

Studies on asthma in Mexico that used a methodology similar to that of studies conducted elsewhere in the world^{8,9} noted a low prevalence of asthma and asthma symptoms in Mexican school children. In the United States, Mexican Americans had a lower prevalence of asthma and asthma symptoms than other ethnic groups.¹⁰

In this study, we used data on a sample of 4121 Mexican American children age 2 months to 16 years who participated in the third National Health and Nutrition Examination Survey (NHANES III) to compare the prevalence of asthma and wheezing in the past year among children born in the United States and their counterparts born in Mexico and to identify environmental factors that could change by migration and could influence the risk of asthma and wheezing.

METHODS

Data

This study used data obtained from NHANES III, which was conducted from 1988 to 1994. A total of 33,994 persons age 2 months and older participated in this national survey representing the civilian noninstitutionalized population of the United States. The survey used a stratified multistage cluster sampling design. Participants or proxy respondents for children provided data on sociodemographics, health status, and family medical history during a household interview.

From ^athe Division of Epidemiology and Biostatistics, School of Public Health, University of Illinois at Chicago; and ^bthe Department of Preventive Medicine, University of Southern California.

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Reprint requests: Kamal M. Eldeirawi, RN, MSN, University of Illinois at Chicago, School of Public Health, Division of Epidemiology and Biostatistics (MC 923), 1603 West Taylor St, Room 912, Chicago, IL 60612-7260. E-mail: Keldei1@uic.edu.

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Further details on the procedures of NHANES III have been published elsewhere.¹¹

Lifetime prevalence of asthma was determined in NHANES III by the question, "Did a doctor ever say that (child's name) had asthma?" Place of birth was indicated by the question, "In what state or foreign country was the (child) born?" This analysis was limited to Mexican American children as indicated by the race/ethnicity variable, which was based on reported race and ethnicity, and to children who were born in either the United States or Mexico. The survey asked whether the child had wheezing or whistling in the chest at any time in the past 12 months. History of ear infection was assessed by the question, "Did (the child) ever have an ear infection or earache?" Parental history of asthma or hay fever was determined by the question, "Has either of the child's biological parents ever been told by a doctor that he or she had asthma or hay fever at any age?" Having a regular place for health care was measured by the question, "Is there a particular clinic, health center, doctor's office, or other place that (the child) usually goes to if (the child) is sick, needs advice about health or for routine care?" In addition, the national survey collected data on a wide array of variables including, but not limited to, daycare attendance, family size, pet ownership, breast-feeding, household smoking, personal smoking, maternal smoking during pregnancy, maternal age when the child was born, language used for the survey interview, and level of education of the family reference person.

Statistical analysis

The statistical package SAS Version 8.0 (SAS Institute Inc, Cary, NC) was used to manage data and to explore the characteristics of the sample. SUDAAN (Research Triangle Institute, Research Triangle Park, NC) was used to incorporate sampling weights and account for the unequal probabilities of selection, oversampling, nonresponse, and the complex multistage cluster sampling design. Using SUDAAN, weighted percentage distributions of asthma and wheezing in the past 12 months were computed by using the CROSSTAB procedure. χ^2 Statistics were performed to test the variations in the exposure and the outcome variables by levels of potential confounding variables. These variations were also examined by logistic regression analysis after adjusting for age group. Bivariate and multiple logistic regression analyses were conducted to examine the associations of place of birth with the prevalence of lifetime asthma and wheezing in the past 12 months while adjusting for potential confounding factors. An assessment of interaction between place of birth and other variables in the final models was performed by including the interaction terms in the logistic regression models. The final multiple logistic regression model examining the association between place of birth and asthma included age, sex, history of ear infection, and having a regular place for health care. Although both age and sex did not confound the association between asthma and place of birth in this analysis, we included them in the final model because they are important demographic variables and were found to be related to asthma in previous studies. History of ear infection and having a regular place for health care confounded the relationship between asthma and place of birth and thus were included in the final model. The final multiple logistic regression model for the relationship between place of birth and wheezing in the past 12 months included age, sex, history of ear infection, having a regular place for health care, and the interaction term between place of birth and history of ear infection. In this analysis, sex was not found to be a confounder but was left in the model because it is an important demographic variable. All of the other variables were included in the model because they altered the association between place of birth and wheezing in the past 12 months. In this study, a level of $P < .05$ was considered significant.

We explored the potential confounding effects of daycare attendance, family size, household smoking, maternal smoking during

pregnancy, pet ownership, body mass index, poverty-income ratio, area of residence (urban/rural), census region of participants, and level of education of the family reference person. We also examined the potential confounding effect of personal smoking (smoking at least 1 cigarette as well as smoking at least 100 cigarettes in the child's lifetime) on the associations of place of birth with asthma and wheezing among children age 8 to 16 years. However, we did not include these potential confounding variables in the final models because they did not alter the associations of place of birth with lifetime prevalence of asthma and prevalence of wheezing in the past 12 months.

We ran the models for children age 2 months to 11 years (where data on prenatal factors were available) before and after adjusting for maternal smoking during pregnancy and maternal age at delivery. Similarly, we used logistic regression analysis to explore the effect of breast-feeding in children age 2 months to 5 years (where data were available).

We analyzed data on 1652 Mexican American children age 6 to 16 years who were examined in NHANES III to assess the differences in skin test reactivity by place of birth. Skin prick tests were performed on the participants for a panel of allergens, including *Dermatophagoides farinae* (house mite), cat, German cockroach, short ragweed, perennial rye, *Alternaria alternata*, Bermuda grass, Russian thistle, white oak, and peanut. A positive reaction was defined as a mean of at least 3 mm for the length and the width of the weal, with the reaction of the negative control subtracted.

RESULTS

The study population consisted of 4121 Mexican American children who were born in Mexico or the United States and had complete data on the main covariates (92.7% of all Mexican American children examined in NHANES III; not shown). The mean age at interview of this population was 7.58 years, and 50.4% were males (not shown). The prevalence of lifetime asthma diagnosis among this population was 7.72% (not shown). It was higher (but not significantly) for boys than for girls, and it varied (but not significantly) by age groups, with the lowest rate (5.60%) reported for children age 2 months to 3 years and the highest rate (10.64%) reported for children age 6 to 11 years (not shown). The prevalence of asthma was significantly higher among children who reported a history of ear infection, a parental history of asthma or hay fever, and having a regular place for health care (not shown).

Data on prenatal factors were obtained for children age 2 months to 11 years (3433). In this subsample, the prevalence of asthma was significantly higher among children whose mothers smoked than children whose mothers did not smoke during pregnancy (not shown). Data on breast-feeding were available for children age 2 months to 5 years (2322). In this population, the prevalence of asthma was significantly lower in children who were than children who were never breast-fed (not shown).

Approximately 20% of the study population (4121) reported wheezing in the past 12 months (not shown). The prevalence of wheezing in the past year was 63.60% and 16.51% among children with and without asthma, respectively (not shown). The prevalence rate of wheezing

TABLE I. Relationship between place of birth of Mexican American children and selected variables (weighted*)

Variable	US-born		Mexico-born		P value†
	n (Unweighted)	%	n (Unweighted)	%	
Doctor ever said had asthma	3634		487		
Yes‡	247	8.51	9	2.80	.0015
Wheezing in past y	3634		487		
Yes	839	21.35	71	12.56	.0055
Wheezing without a cold	3630		486		
Yes	372	10.33	25	5.44	.0039
Chronic bronchitis	3632		487		
Yes	156	3.74	10	1.19	.0003
Hay fever	3634		487		
Yes	74	3.65	2	0.32	.0161
Pneumonia in past 12 mo	3634		487		
Yes	104	2.54	4	0.36	.0023
Stuffy, itchy, runny nose in past 12 mo	3629		486		
Yes	1843	50.51	141	27.73	<.0001
Watery, itchy eyes in past 12 mo	3628		486		
Yes	1035	28.04	74	15.92	.0005
Sinusitis/Sinus problems in past 12 mo	3626		486		
Yes	344	10.56	15	3.94	.0005
Sex	3634		487		
Male§	1787	50.88	226	47.35	.4072
Age group, y	3634		487		
2 mo-3 y	1462	28.89	99	12.26	.0001
4-5	685	13.40	77	10.20	
6-11	963	33.97	160	35.79	
12-16	524	23.75	151	41.75	
Ever ear infection	3634		487		
Yes	2067	60.57	163	35.01	.0001
Regular place for health care	3634		487		
Yes	3198	89.00	264	51.80	.0001
Parental history of asthma or hay fever	3634		487		
Yes	449	15.14	16	3.14	.0005
Maternal smoking during pregnancy	3100		333		
Yes	307	10.47	23	5.21	.0215
Ever breast-fed	2146		176		
Yes	1109	54.62	128	73.46	.0013
Area of residence	3634		487		
Urban	2124	60.36	312	67.03	.1183

*All estimates (except for sample sizes) were calculated by using the sampling weights to provide population estimates.

†For overall variations based on χ^2 test statistics.

‡Yes vs no.

§Male vs female.

||Urban vs rural.

in the past 12 months was significantly associated with age group and was significantly higher in children with a history of ear infection, parental history of asthma or hay fever, and regular place for health care (not shown).

Of the study population, 13.74% were born in Mexico (not shown). Table I shows the crude relationships among place of birth and asthma, wheezing, other conditions, and demographic variables. Children born in the United States were significantly younger and more likely to have a history of ear infection, to report having a regular place for health care, and to have parental history of asthma or hay fever than children born in Mexico. Maternal smoking during pregnancy was more common whereas breast-feeding was less common among US-born children than their Mexico-born peers.

Compared with Mexican American children born in Mexico, US-born Mexican American children were significantly more likely to report asthma; wheezing in the past 12 months; wheezing not related to cold; chronic bronchitis; hay fever; pneumonia in the past 12 months; sinusitis or sinus problems in the past 12 months; stuffy, itchy, or runny nose in the past 12 months; and watery, itchy eyes in the past 12 months. When the analysis was adjusted for age (not shown), all of the observed variations between US-born and Mexico-born children remained significant, except for wheezing in the past year.

In bivariate logistic regression analysis, US-born children had an increased risk of asthma compared with their counterparts born in Mexico (odds ratio [OR], 3.22; 95% CI, 1.32-7.89; not shown). This relationship persisted

after adjusting for sex, age, history of ear infection, and having regular place for health care (OR, 2.19; 95% CI, 1.09-4.40; Table II). There was no statistically significant evidence for interaction between place of birth and any of the variables included in the model.

When we further controlled for parental history of asthma or hay fever, US-born children continued to have an elevated risk of asthma than their Mexico-born peers (OR, 1.83; 95% CI, 0.92-3.65; not shown). There was no evidence for interaction between place of birth and parental history of asthma or hay fever (*P* value for the interaction term was .8271).

When the analysis was stratified by the language used to complete the NHANES III household interview, the increased risk of asthma among US-born children persisted regardless of the language used in the interview. In children whose proxy respondents completed the interview in Spanish, US-born children continued to have almost 2-fold risk of asthma compared with children born in Mexico after adjusting for sex, age, ear infection, and having a regular place for health care (OR, 1.96; 95% CI, 0.92-4.18; not shown). Among Mexico-born children whose proxy respondents completed the interview in English (30 children with 1 reporting asthma), the estimates were similar but very unstable because of sample size limitations and therefore were not presented.

When we limited the analysis to Mexican American children age 2 months to 11 years, those born in the United States had an increased risk (but not significantly) of asthma (OR, 2.27; 95% CI, 0.80-6.45; not shown) after adjusting for sex, age, history of ear infection, and having a regular place for health care. This increased risk among US-born children persisted (but the difference was not significant) when the analysis was further adjusted for parental history of asthma or hay fever (OR, 1.79; 95% CI, 0.61-5.25; not shown). Whether family history was included in the final model or not, the adjusted ORs did not change after the further adjustment for maternal smoking during pregnancy and maternal age when the child was born (not shown).

Similarly, when the analysis was limited to children age 2 months to 5 years, the increased risk of asthma among US-born children persisted (but was not significant) after adjusting for sex, age, history of ear infection, ever breast-feeding, and having a regular place for health care (OR, 2.50; 95% CI, 0.69-9.03; not shown). The OR was 1.80 (95% CI, 0.52-6.20) when parental history of asthma and hay fever was added to the model.

In children age 8 to 16 years (1359 children for whom data on personal smoking were available), there was no significant variation in personal smoking by place of birth. In this subpopulation, US-born children continued to have an increased risk of asthma (but not significantly) after adjusting for sex, age, history of ear infection, and having a regular place for health care (OR, 1.75; 95% CI, 0.82-3.74). The OR did not change significantly after adding personal smoking to the models (not shown).

In bivariate analysis, US-born children were almost 2 times more likely to report wheezing in the past 12 months

TABLE II. Weighted* adjusted ORs (and 95% CIs) for asthma in Mexican American children age 2 months to 16 years

Variable	Adjusted OR†	95% CI
Country of birth (United States vs Mexico)	2.19	1.09-4.40
Age group		
2 mo-3 y	0.70	0.38-1.27
4-5	0.92	0.48-1.78
6-11	1.53	0.72-3.27
12-16	1	
Sex (male vs female)	1.34	0.95-1.89
History of ear infection (yes vs no)	2.32	1.49-3.62
Attending a particular place for health care (yes vs no)	2.29	0.74-7.11

*All estimates were calculated by using the sampling weights to provide population estimates.

†Adjusted for all other factors listed in the table.

than their counterparts born in Mexico (OR, 1.89; 95% CI, 1.16-3.08; not shown). In multiple logistic regression analysis, there was evidence for an interaction between place of birth and history of ear infection after adjusting for sex, age, and having a regular place for health care (*P* value of the interaction term was .0239). Table III presents the results obtained from multiple logistic regression analyses for the association of place of birth and wheezing in the past 12 months with the interaction term between place of birth and history of ear infection included the model. Among children with previous history of ear infection, there was no association between place of birth and wheezing. In children who had no history of ear infection in the past, US-born children were almost twice more likely to report wheezing in the past 12 months than their Mexico-born counterparts after adjusting for sex, age, and having a regular place for health care (OR, 2.05; 95% CI, 1.09-3.87). The OR was 1.94 (95% CI, 1.01-3.73) on the further adjustment for parental history of asthma or hay fever (not shown). The increased risk of wheezing in US-born children who have no previous history of ear infection persisted when the analysis was limited to children whose parents completed the interview in Spanish after adjusting for sex, age, and having a regular place for health care (OR, 2.10; 95% CI, 1.09-4.05; not shown). Similar to our finding with regard to asthma, there was no evidence for interaction between place of birth and parental history of asthma or hay fever. In addition, personal smoking did not change the observed association between place of birth and wheezing in the past year among children age 8 to 16 years (not shown).

Table IV illustrates results from bivariate and multiple logistic regression analyses for the associations between place of birth and a panel of allergens. Mexican American children born in the US were more likely to have positive skin reaction to cat, house mite, *A alternata*, peanut, Bermuda grass, and short ragweed. In addition, US-born Mexican American children were less likely to have a positive skin test to German cockroaches. All of these associations remained significant, except for peanut, after

TABLE III. Weighted* adjusted association of prevalence of wheezing in the past 12 months with place of birth in Mexican American children age 2 months to 16 years

Variable		OR [‡]	95% CI
Country of birth (United States vs Mexico) [†]	In children with a history of ear infection	0.79	0.40-1.56
	In children with no history of ear infection	2.05	1.09-3.87
Age group			
2 mo-3 y		2.60	1.83-3.68
4-5		1.26	0.89-1.80
6-11		1.15	0.79-1.68
12-16		1	
Sex (male vs female)		1.09	0.89-1.33
History of ear infection (yes vs no) [†]	In US-born children	1.67	1.30-2.14
	In Mexico-born children	4.31	1.98-9.37
Attending a particular place for health care (yes vs no)		1.44	1.02-2.01

*All estimates were calculated by using the sampling weights to provide population estimates.

[†]There was a statistically significant interaction ($P = .0239$) between place of birth and history of ear infection.

[‡]Adjusted for all other factors listed in the table and the interaction term between place of birth and history of ear infection.

TABLE IV. Associations of skin test reactivity with place of birth of Mexican American children (weighted*)

Variable	United States	Mexico	Unadjusted OR [†]	95% CI	Adjusted OR [‡]	95% CI
Total	1383	269				
German cockroaches	22.71%	40.29%	0.44	0.31-0.62	0.47	0.34-0.67
Cat	12.79%	4.29%	3.27	1.65-6.48	3.30	1.59-6.87
House mite	24.52%	14.58%	1.90	1.20-3.03	1.91	1.14-3.20
<i>Alternaria alternata</i>	14.70%	6.40%	2.52	1.27-4.99	1.89	1.00-3.57
Bermuda grass	18.91%	9.56%	2.21	1.12-4.33	1.99	1.06-3.73
Short ragweed	21.98%	13.67%	1.78	1.15-2.76	1.64	1.08-2.51
Russian thistle	12.43%	8.07%	1.62	0.82-3.18	1.48	0.83-2.63
Perennial rye	26.53%	22.03%	1.28	0.74-2.21	1.07	0.64-1.80
White oak	9.62%	5.07%	1.99	0.89-4.48	1.53	0.67-3.48
Peanut	7.65%	2.06%	3.93	1.12-13.78	3.22	0.97-10.70

*All estimates (except for sample sizes) were calculated by using the sampling weights to provide population estimates.

[†]Based on logistic regression models with place of birth (United States vs Mexico) as the independent variable and skin test reactivity (yes vs no) as the dependent variable—unadjusted.

[‡]Based on logistic regression models with place of birth (United States vs Mexico) as the independent variable and skin test reactivity (yes vs no) as the dependent variable—adjusted for sex, age, history of ear infection, having a regular place for health care, and area of residence.

controlling for sex, age, ear infection, having a regular place for health care, and area of residence.

DISCUSSION

This study is the first of its type in the United States focusing on migration and childhood asthma among Mexican American children. The study showed wide variations in the prevalence of asthma and wheezing between Mexican American children born in the United States and their peers born in Mexico. These results suggest the possibility that something environmental is dramatically different in Mexico and in the United States. US-born Mexican American children were significantly more likely to report asthma diagnosis and wheezing in the past 12 months. In multivariate analysis, US-born children were approximately 2 times more likely to report doctor-diagnosed asthma than children born in Mexico after accounting for potential confounding variables.

With regard to wheezing in the past year, an interaction was observed between place of birth and history of ear

infection. Among those with no previous history of ear infection, US-born children were almost 2 times more likely to wheeze in the past year than their peers born in Mexico after adjusting for confounding factors. The association did not hold among those with previous history of ear infection. Reasons for this differential because of ear infection are not fully understood and warrant further research.

Our results are plausible, because the relatively low rates of asthma and wheezing in Mexico-born children observed in our study were similar to those noted in other standardized studies from Mexico.^{8,9} In addition, the findings of this study are consistent with those from previous investigations^{4-7,12,13} showing that the prevalence of asthma and wheezing increased in immigrants who moved from areas of relatively low to relatively high prevalence of asthma or asthma-related symptoms. It could be argued that the observed difference in the prevalence of doctor-diagnosed asthma between US-born and Mexico-born children is a result of variations in diagnostic practices or access to health care. In this study, US-born children were more likely to have a regular

place for health care and therefore might be more likely to be diagnosed with asthma than their counterparts born in Mexico. In our study, the increased risk of asthma among US-born children persisted even after accounting for having a regular place for health care or when the analysis was limited to only children who reported having a regular place for health care (not shown). It is still possible that Mexico-born children might be new immigrants to the United States and therefore do not have their own doctors or receive the same quality of care even though they reported having a regular place for health care. Nonetheless, the observed differences in skin test reactivity between US-born and Mexico-born children and the findings that US-born children were also at an increased risk of wheezing and other allergic conditions argue against a diagnostic bias.

Another possibility is that the observed difference in the risk of asthma and wheezing is a result of differential reporting depending on the language used for data collection. In our study, the increased risk of asthma and wheezing among US-born children persisted regardless of the language used in the interview after adjusting for confounding variables. Therefore, our results are not likely a result of reporting bias as a result of the language used to complete the NHANES III interviews.

The observed reduced risk of asthma among Mexico-born children could be a result of social and cultural factors. These immigrants might be hesitant to report illness or personal information because of certain cultural beliefs. Their views of health and illness could be different from people who were born or people who have spent most of their life in the United States and therefore are more acculturated to the main US culture. Previous studies have linked the level of acculturation of Mexican immigrants to several health-related events,¹⁴⁻¹⁶ including asthma.¹⁶ In a study by Klinnert et al,¹⁶ low-accultured Hispanic mothers (mainly Mexican Americans) were less likely to report having asthma than high-accultured Hispanic, European American, or African American mothers.

In our study, we documented differences in the prevalence of asthma, wheezing, skin test reactivity, and other allergic conditions among a population with a similar genetic makeup, and therefore, the observed heterogeneity might be a result of environmental or lifestyle factors that could be related to asthma. Our study showed wide variations in factors related to asthma among Mexican American children living in the United States. The increased risk of asthma among US-born children persisted after controlling for confounding factors. It is possible that other environmental or lifestyle factors not accounted for in this analysis may explain the observed difference in asthma prevalence. Several studies showed that exposure to farm environments in the first few years of life protects against the development of asthma and asthma-related conditions.¹⁷⁻²¹ Other investigations indicated that asthma rates are higher among the more affluent countries^{22,23} and that asthma rates increase as countries become more urbanized.²³⁻²⁵ Although data on the specific place (farm, city, town, and so forth) where children were born in

Mexico were not available, previous studies suggested that the majority of Mexican immigrants in the United States come from rural areas in Mexico.^{26,27} This might explain the reduced risk for asthma or wheezing in Mexico-born Mexican American children.

In this study, parental history of asthma or hay fever met the criteria for a confounder, but we did not include it in the final models because we think that being Mexico-born may be a surrogate for environmental or cultural factors that caused lower rates of asthma and wheezing both in parents and in children. Therefore, including it could be an overadjustment and might not be appropriate. There was no evidence for effect modification by parental history of asthma or hay fever.

This study is subject to the limitations inherent in any cross-sectional survey. The study relied on self-report of both the exposure and the outcome variables, and therefore, this may have introduced a misclassification bias. Data used for this analysis were collected retrospectively and relied on parental recall of both the outcome and the exposure variables and thus could be subject to recall bias. However, we think that it is less likely that parents will not remember where their child was born. Self-report of doctor-diagnosed asthma has been heavily used in epidemiological studies of asthma and has been validated in previous studies.²⁸ The prevalence rates of asthma and some of the conditions examined in this study were very low in Mexico-born children. This may have affected the estimates observed in the study and limited our ability to detect additional differences between Mexico-born and US-born participants. A limitation of the skin testing results may be that children were tested for standard allergens appropriate for US-born children and not for their Mexico-born peers, who may have different allergens in Mexico. Because the current study is not prospective, it is not clear whether children developed asthma or wheezing in the United States or in Mexico, and therefore, the temporal nature of the association between asthma or wheezing and place of birth could not be examined.

Overall, our study is the first to document variations in the prevalence of asthma and respiratory symptoms among a national and a representative sample of Mexican American children. However, further research is still needed to identify factors behind such variations. This could lead to better understanding of asthma and its epidemiology and prevention.

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