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Characteristics of allergic sensitization among asthmatic adults older than 55 years: results from the National Health and Nutrition Examination Survey, 2005–2006

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ABSTRACT

Background: Approximately 60% to 80% of children and young adults with asthma are sensitized to at least one allergen. In contrast, previous studies from specific subpopulations of older patients with asthma suggest that allergic sensitization is significantly lower in this age group. The prevalence and patterns of IgE-mediated sensitization have not been compared among a broad population of younger and older patients with asthma.

Objective: To determine the prevalence and patterns of IgE-mediated sensitization among a broad population of younger and older patients with asthma.

Methods: Data were obtained from the National Health and Nutrition Examination Survey (NHANES) 2005–2006 to compare IgE-mediated sensitization rates between younger (20–40 years) and older (≥ 55 years) patients with current asthma. Atopy was defined as a detectable serum IgE to at least 1 allergen in a panel of 19 allergens. The associations among sensitization, current asthma, and asthma control measures (health care use and symptoms) were examined by logistic regression.

Results: In a group of 2,573 patients, either 20 to 40 years of age or 55 years or older, 108 (6.7%) and 43 (4.5%) patients with current asthma were identified, respectively. Allergic sensitization rates among the adults with asthma differed only moderately and not statistically significantly between the age groups; 75.4% of the younger and 65.2% of the older asthmatic patients were sensitized to at least 1 allergen. The association between sensitization and markers of asthma control did not appear to differ among the age groups.

Conclusions: Allergic sensitization in older patients with asthma may be more common than previously reported.

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Introduction

Asthma is relatively common among older adults. The prevalence of asthma in patients 60 years or older has been reported as 3.5% to 7.5%^{1–4}; however, the prevalence may be underestimated because asthma in older adults is often underdiagnosed.^{3,5,6} Furthermore, as the population older than 60 years increases, the number of older patients with asthma is expected to increase. It is well documented that rates of hospitalization and asthma mortality are high in older patients with asthma.^{7–9} The reasons for these trends are not entirely clear but are most likely multifactorial and include underdiagnosis and undertreatment of asthma in older

patients and medication nonadherence. In addition, there is a limited understanding of the role of allergic sensitization in older patients with asthma.

The purposes of this study were to determine the difference in frequencies of IgE-mediated sensitization by serologic evaluation between younger (20–40 years) and older (≥ 55 years) groups of patients with asthma and to determine the effect on measures of disease severity and control. A recent report on a workshop sponsored by the National Institutes of Aging on current understanding of asthma in elderly patients has reported that there are small studies that suggest a higher level of positive allergy test results in older patients with asthma; however, these studies have not been performed from a comprehensive national database.¹⁰ Prior studies of older patients with asthma have focused on homogeneous populations, particularly white, non-inner-city populations, and reported sensitization rates between 23.9% and 36.6%.^{4,11} However, some studies have reported higher rates of sensitization; in a recent study of an inner-city population, the

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prevalence of sensitization was 41%, and in another study, nearly two-thirds of older patients with asthma were sensitized to at least one or more allergens.^{12,13} The National Health and Nutrition Examination Survey (NHANES) 2005–2006 database offers a unique opportunity to compare the prevalence of allergen sensitization between a younger and older group of patients from a nationally representative sample of the US population. The results of this study are the basis for this report.

Methods

Data for this study were obtained from the NHANES 2005–2006 database, which is a Centers for Disease Control and Prevention, National Center for Health Statistics, program developed to assess the health and nutritional status of the civilian, noninstitutionalized US population.^{14,15} The NHANES 2005–2006 survey included a total of 10,348 patients. Serum specific IgE was assessed in 80.6% of the participants. The NHANES 2005–2006 protocol was approved by the National Center for Health Statistics, Centers for Disease Control and Prevention, Institutional Review Board. Informed consent was obtained from all participants 18 years and older. Details of the survey design and implementation of NHANES 2005–2006 can be found online at <http://www.cdc.gov/nchs/nhanes.htm>.

Study Population

Our study population was restricted to data collection from participants ages 20 to 40 years and older than 55 years. These age groups were chosen based on the few prior studies that have examined older and younger patients with asthma^{16,17} to look at distinct ages and to include sufficient numbers of patients for evaluation. To best eliminate participants with chronic obstructive pulmonary disease and not asthma, patients were excluded if they had a history of any of the following: (1) a smoking history of 10 pack-years or longer; (2) those who answered “yes” to bringing up phlegm on most days for 3 consecutive months or more during the year; or (3) those answering “yes” to the question asking whether a physician or health care professional has told you that you have emphysema or chronic bronchitis. On the basis of selection criteria, our initial population was a total of 2,573 patients. Next, we selected patients with asthma based on a definition of physician-diagnosed current asthma. This group included participants who responded affirmatively to both of the following questions: (1) “Has a doctor or other health professional ever told you that you have asthma?” (2) “Do you still have asthma?” We identified 151 younger and older patients with current asthma.

Definition of Atopy

We defined atopy using specific IgE measurements. Patients with at least 1 positive allergen specific IgE test result were considered atopic. A sample of peripheral blood was obtained on participants during the NHANES 2005–2006 data collection to measure IgE antibodies against 19 allergens, as previously described.¹⁸ Specific IgE levels were determined with the Pharmacia Diagnostics Immuno-CAP 1000 System (Pharmacia Diagnostics, Kalamazoo, Michigan). Specific IgE levels greater than 0.35 kU_A/L were considered indicative of sensitization.^{19–22}

Asthma-Related Outcomes

Individual measures of asthma control were defined as follows: (1) use of health care resources (≥ 1 visit to the emergency department or urgent care department in the past 12 months or ≥ 1 visits to a physician or the emergency department for wheezing); (2) use of medications for wheezing; (3) symptoms and effect on activity of daily life, including limitation of activities, 1 or more attacks of wheezing in past 12 months, sleep disturbance due to

wheezing, chest sounding wheezy after exercise, or 1 or more days of work missed because of wheezing.

Statistical Analysis

The NHANES participants were selected using a complex, multistage, probability sampling design, and all percentages, odds ratios (ORs), and associated statistics were weighted to represent the civilian, noninstitutionalized US population. The NHANES is conducted to achieve a nationally representative sample in which sample weights are used to account for oversampling of selected subpopulations and for nonresponse. Sample weights were used in all analyses to obtain unbiased national estimates. SEs, confidence intervals (CIs), and *P* values were developed in accordance with the complex survey design by using Taylor series linearization methods. Distributional differences between the age groups were assessed using χ^2 tests. Logistic regression was used to construct adjusted ORs and 95% CIs to evaluate associations between asthma-related outcomes and allergic sensitization or exposures. Models were adjusted for sex, race/ethnicity, and educational level. It was verified that the observed associations were not greatly influenced by other potential confounders, including body mass index, serum cotinine level, and total IgE level. Interactions were examined to determine whether ORs differed across age groups and other factors of interest.

Results

Prevalence of Asthma

The initial study population was composed of 1,623 patients between the ages of 20 and 40 years (51% female) and 950 patients 55 years and older (61.5% female). More than 62% of both age groups were non-Hispanic whites, and approximately 80% had a high school education or above. Current asthma was reported by 6.65% of the population 20 to 40 years of age ($n = 108$) and 4.53% of the population 55 years or older ($n = 43$; Table 1). Among patients with current asthma, the age groups were comparable with respect to sex, race/ethnicity, and educational level. Although body mass index varied across the age groups, the differences did not reach statistical significance.

Prevalence of Allergic Sensitization

The prevalence of allergic sensitization in the US population ages 20 to 40 years ($n = 1,623$; nonasthmatic plus asthmatic

Table 1

Distribution of the study population with respect to sex, race, educational level, and BMI for each age group among participants with current asthma

Characteristic	No. (%) of patients		<i>P</i> value ^a
	20–40 Years old ($n = 108$)	≥ 55 Years old ($n = 43$)	
Sex			.96
Male	37 (43.2)	17 (42.7)	
Female	71 (56.8)	26 (57.3)	
Race/ethnicity			.99
Non-Hispanic white	51 (67.6)	18 (66.1)	
Non-Hispanic black	34 (17.0)	12 (16.7)	
Mexican American	15 (5.8)	9 (6.0)	
Other	8 (9.6)	4 (11.2)	
Educational level			.85
Less than high school diploma	24 (18.4)	9 (16.6)	
High school or above	79 (81.6)	34 (83.4)	
BMI			.12
Underweight (BMI <18.5)	2 (0.5)	2 (6.4)	
Normal (BMI ≥ 18.5 –25)	33 (36.6)	5 (18.1)	
Overweight (BMI ≥ 25 –30)	21 (16.8)	12 (25.7)	
Obese (BMI ≥ 30)	51 (46.2)	22 (49.8)	

Abbreviation: BMI, body mass index.

^a*P* value for test of differences between age groups with respect to patient characteristic distributions.

Table 2

Prevalence of Atopy in the full population and distribution with respect to sex, race, educational level, and BMI for each age group among atopic patients

Characteristic	No. (%) of atopic patients ^a		P value ^b
	20–40 Years old (n = 1,623)	≥55 Years old (n = 950)	
Total	842 (51.1)	367 (38.8)	
Sex			.02
Male	412 (55.5)	181 (45.9)	
Female	430 (44.5)	186 (54.1)	
Race/ethnicity			<.001
Non-Hispanic white	302 (58.3)	191 (75.3)	
Non-Hispanic black	225 (15.9)	86 (10.7)	
Mexican American	228 (13.0)	68 (4.3)	
Other	87 (12.8)	22 (9.7)	
Educational level			.96
Less than high school diploma	216 (18.1)	103 (17.9)	
High school or above	600 (82.0)	259 (82.1)	
BMI			.26
Underweight (BMI <18.5)	16 (2.1)	5 (1.3)	
Normal (BMI ≥18.5–25)	257 (36.2)	87 (28.5)	
Overweight (BMI ≥25–30)	280 (31.4)	130 (36.9)	
Obese (BMI ≥30)	283 (30.2)	134 (33.3)	

Abbreviation: BMI, body mass index.

^aTotal row indicates number (percentage) of atopic patients among the overall population; subsequent rows indicate the distribution of each characteristic among atopic patients.

^bP value for test of differences between age groups with respect to patient characteristic distributions.

patients), defined as detectable IgE to at least 1 specific allergen, was 51.1% (Table 2). The prevalence of allergic sensitization in patients 55 years or older (n = 950; nonasthmatic plus asthmatic patients) was 38.8%. Those patients 55 years or older who were sensitized to at least 1 allergen were more likely to be female and non-Hispanic white compared with those 20 to 40 years old.

Association Between Asthma and Allergic Sensitization

The prevalence of allergic sensitization among patients with current asthma was 75.4% in those 20 to 40 years of age and 65.2% in those 55 years or older (Table 3). The adjusted OR of having a detectable IgE level to at least 1 allergen conditional to having asthma was 2.9 (95% CI, 1.7–4.9) among patients 55 years or older and 3.5 (95% CI, 2.3–5.2) among patients 20 to 40 years of age. Differences in the allergic sensitization–asthma relationship were not statistically significant between the 2 age groups studied ($P = .91$). The prevalence of allergic sensitization in those patients 55 years or older who developed asthma before the age of 40 years (n = 12, 72% sensitized) also did not differ significantly from those patients who developed asthma after the age of 40 years (n = 31, 62.8% sensitized, $P = .70$).

We examined other outcomes in addition to current asthma in the 2 age groups and found largely consistent results. For example, for self-reported current hay fever, the prevalence of allergic sensitization was 83.7% in the 20- to 40-year-old group and 76.4% in patients 55 years or older. Corresponding ORs were both 7.4, and the sensitization-age group interaction was nonsignificant

($P = .78$). Similar results were found for current allergies (prevalence of 64.6% among patients 20–40 years of age and 46.5% among patients ≥55 years old; ORs, 2.5 and 1.9, respectively; and $P = .22$).

Patterns of Sensitization Among Patients With Asthma

The older asthmatic patients were most commonly sensitized to was *Dermatophagoides pteronyssinus* (36.3%), followed by rye grass (33.1%), *Dermatophagoides farinae* (27.9%), cat (26.9%), dog (24.4%), and German cockroach (10.5%; Table 4). In people with asthma in this age group, 50.2% were sensitized to at least 1 indoor allergen and 39.3% to at least 1 outdoor allergen. Among younger asthmatic patients (20–40 years of age), 60.2% were sensitized to at least 1 indoor allergen and 53.3% to at least 1 outdoor allergen. The most common environmental allergens to which the asthmatic patients 20 to 40 years of age were sensitized included dog (49.5%), *D pteronyssinus* (44.8%), and *D farinae* (41.4%). Although indoor and outdoor IgE sensitization levels were not significantly different across the age groups, asthma in patients 55 years or older was more strongly associated with sensitization to indoor allergen levels alone, whereas asthma in patients 20 to 40 years of age was strongly associated with sensitization to both indoor and outdoor allergens.

Association of Asthma Control Measures With Allergic Sensitization

The percentage of asthmatic patients reporting various markers of health care use and symptomatic markers of asthma control was determined, along with the percentage of allergic sensitization among them, to determine whether there were age-related differences. Overall, the association between sensitization and health care use and asthma-related symptoms did not appear to differ across the age groups (asthmatic patients ≥55 years of age vs asthmatic patients 20–40 years of age; Table 5). A total of 71.5% of the patients between the ages of 20 and 40 years old and 100% of the patients 55 years or older who had more than 1 emergency department or urgent care department visit for asthma in the past 12 months were atopic. The adjusted OR for sensitization associated with several categories of health care use (ie, >1 visit to the emergency department or urgent care department, >1 physician or emergency department visits for wheezing, medication used for wheezing) was 0.43 (95% CI, 0.18–1.0) and 0.60 (95% CI, 0.21–1.70) for the patients 55 years or older and 20 to 40 years old, respectively.

Discussion

Between 60% and 80%^{23,24} of children and young adults with asthma are sensitized to at least 1 environmental allergen. However, the prevalence of allergic sensitization in older asthmatic patients has not been well characterized and is traditionally believed to be lower, as determined from studies of targeted populations. In this study, we demonstrated that the prevalence of sensitization in patients with current asthma differed only moderately and not statistically significantly between patients 20 to 40 years of age and those 55 years or older. These results suggest

Table 3

Prevalence and ORs for atopy among US adults with asthma

Outcome, age group	No. of patients	Atopic patients among those with outcome, % (SE)	Adjusted OR (95% CI) ^a	Interaction P value ^b
Current asthma, ≥55 years old	43	65.2 (6.5)	2.9 (1.7–4.9)	.91
Current asthma, 20–40 years old	108	75.4 (3.4)	3.5 (2.3–5.2)	

Abbreviations: CI, confidence interval; OR, odds ratio.

^aOR and P value adjusted for sex, race/ethnicity, and educational level.

^bP value for test of age group by atopy interaction in adjusted logistic model of current asthma.

Table 4

Prevalence of sensitization to indoor and outdoor allergens among US adults with asthma

Allergen specific IgE	Sensitized patients, % (SE)		Adjusted OR (95% CI)		P value ^b
	≥55 Years old (n = 43)	20-40 Years old (n = 108)	≥55 Years old ^a	20-40 Years old ^a	
Indoor					
<i>Dermatophagoides pteronyssinus</i>	36.3 (9.50)	44.8 (6.52)	4.09 (1.53-10.90)	2.73 (1.55-4.81)	.30
<i>Dermatophagoides farinae</i>	27.9 (9.75)	41.4 (7.09)	2.35 (0.79-7.01)	2.60 (1.43-4.73)	.80
Cat	26.9 (9.02)	40.5 (7.62)	3.33 (1.18-9.37)	5.81 (2.91-11.60)	.26
Dog	24.4 (8.38)	49.5 (6.90)	4.46 (1.49-13.32)	8.49 (4.11-17.53)	.46
German cockroach	10.5 (4.23)	18.3 (4.77)	1.14 (0.41-3.21)	1.89 (0.87-4.10)	.734
Rat	0.0 (NA)	3.5 (2.38)	... ^c	2.40 (0.40-14.59)	...
Mouse	0.0 (NA)	10.9 (4.19)	...	8.03 (2.72-23.72)	...
≥1 indoor	50.2 (6.84)	60.2 (5.73)	3.12 (1.60-6.10)	3.20 (1.88-5.45)	.75
Outdoor					
Rye grass	33.1 (8.40)	42.1 (5.50)	2.51 (1.41-4.48)	2.51 (1.65-3.80)	.76
Ragweed	10.7 (4.83)	31.9 (5.14)	0.86 (0.35-2.11)	1.98 (1.30-3.01)	.16
Bermuda grass	15.9 (7.37)	29.4 (5.52)	1.47 (0.51-4.26)	1.93 (1.15-3.24)	.85
Oak	9.0 (4.34)	24.0 (4.73)	0.98 (0.39-2.45)	2.11 (1.24-3.58)	.19
Thistle	9.5 (4.35)	20.1 (4.37)	1.26 (0.46-3.44)	1.91 (1.06-3.44)	.69
Birch	11.7 (5.72)	19.3 (4.75)	1.37 (0.40-4.62)	2.07 (1.06-4.04)	.64
<i>Alternaria alternata</i>	10.0 (5.30)	27.7 (4.61)	2.44 (0.72-8.26)	3.63 (2.51-5.24)	.62
<i>Aspergillus fumigatus</i>	6.4 (3.33)	17.1 (4.22)	1.98 (0.68-5.83)	2.71 (1.43-5.16)	.88
≥1 outdoor	39.3 (8.07)	53.3 (5.63)	1.93 (1.02-3.66)	2.32 (1.54-3.49)	.93

Abbreviations: CI, confidence interval; NA, not applicable; OR, odds ratio.

^aORs (95% CIs) adjusted for sex, race/ethnicity, and educational level.^bP value for test of age group by sensitization interaction in adjusted logistic model of current asthma.^cEllipses indicate OR and P value not reported because of zero cell count.

that allergic sensitization in older patients with asthma may be more common than previously reported.

Although asthma is frequently characterized as a disease of childhood and young adulthood, it is not uncommon in older patients. The literature suggests that asthma may be present in 3.5% to 7.5% of the population older than 60 years,^{1–4} although a study reported that as high as 15% of a general population in Australia older than 55 years old had asthma.²⁵ We report that 4.5% of the US population in NHANES 2005–2006 older than 55 years had a physician diagnosis of asthma. Asthma in the older age groups was more common in females with a greater body mass index.

The prevalence of allergen specific serum IgE levels in excess of a specific detectable threshold is reported to decrease with increasing age in general. These studies have included healthy individuals *with and without asthma and other atopic diseases* and suggest that approximately 40% to 50% of individuals younger than 50 years and approximately 35% of individuals older than 50 years are IgE sensitized to at least 1 allergen.^{26–28} (Of note, these studies have measured allergic sensitization to ≤6 antigens and used different methods to quantify IgE than in NHANES 2005–2006; therefore, direct comparison of the same antigens and threshold would be difficult.) In a group of 8,344 individuals between the ages

of 18 and 60 years, from the cross-sectional, multicenter Swiss Study on Air Pollution and Lung Diseases in Adults, serum allergen specific IgE decreased by 21.1% with every 10-year increase in age.²⁹ Our data from the 2,573 participants (asthmatic and nonasthmatic patients) evaluated in NHANES 2005–2006 are consistent with these previous studies; IgE-mediated sensitization to at least 1 allergen was present in 51.12% of our younger patients and in 38.84% of our patients 55 years or older.

For many years, asthma in older patients was characterized as nonatopic.³⁰ However, in the past 2 decades, data from large populations or from studies incorporating data from multiple sites of asthma care demonstrate that *some* older patients with asthma are also atopic (demonstrated either by serum evaluation or skin prick testing). Multicenter studies from the Netherlands³¹ and France³² reported that approximately 35% of older patients with asthma were sensitized to at least one allergen. In the longitudinal US Tucson epidemiologic study of obstructive disease, 36.6% of the participants with asthma who were older than 65 years were sensitized to allergen.⁴ (IgE-mediated sensitization rates in younger patients were not reported in this study.) Our study is similar to the Dutch and French studies in that it captures data from patients seen at multiple sites of care. However, only the Dutch study compared

Table 5

Prevalence of Atopy by asthma control measures and associated ORs for the association between the outcome measures and sensitization among US adults with asthma

Outcome	Atopic patients among those with outcome		Adjusted OR (95% CI) ^a		Interaction <i>P</i> value ^b
	≥55 Years old (n = 43)	20-40 Years old (n = 108)	≥55 Years old	20-40 Years old	
Health care use in past 12 months					
≥1 ED or urgent care department visits ^c	100.0	71.5 (12.6)	...	0.72 (0.10-4.98)	...
≥1 physician or ED visits for wheezing	58.7 (14.2)	72.8 (8.7)	0.68 (0.14-3.37)	0.59 (0.18-1.90)	0.909
Medication use for wheezing	49.5 (10.3)	75.2 (5.1)	0.27 (0.10-0.72)	1.08 (0.36-3.21)	0.108
Any use category above	55.3 (10.0)	72.1 (4.9)	0.43 (0.18-1.00)	0.60 (0.21-1.70)	0.568
Symptoms in past 12 months					
Limited activities due to wheezing	50.3 (16.3)	78.0 (8.4)	0.35 (0.05-2.31)	0.85 (0.22-3.34)	0.301
≥1 wheezing attacks	66.0 (9.8)	71.3 (5.4)	0.95 (0.26-3.45)	0.32 (0.07-1.44)	0.353
Any sleep disturbance due to wheezing	64.2 (15.8)	78.2 (5.9)	0.81 (0.17-3.93)	1.06 (0.29-3.87)	0.610
Chest sounding wheezy after exercise	33.8 (18.1)	69.9 (6.7)	0.17 (0.03-1.00)	0.44 (0.08-2.39)	0.295

Abbreviations: ED, emergency department; CI, confidence interval; OR, odds ratio.

^aORs (95% CIs) adjusted for sex, race/ethnicity, and educational level.^bP value is for age group by atopy interaction adjusted for sex, race/ethnicity, and educational level.^cSE, OR, and P value not reported because of zero cell count.

sensitization rates across age groups and determined that prevalence of allergic sensitization decreases significantly with age in patients with asthma. Our study also allows comparison of sensitization rates among individuals in the general population (asthmatic and nonasthmatic patients) with those only with asthma. We demonstrated a higher allergic sensitization rate among asthmatic patients (62.5%) compared with the general population 55 years or older (38.8%). We also noted that sensitization to indoor allergens was more strongly associated with asthma in patients 55 years or older, whereas sensitization to both indoor and outdoor allergens was associated with asthma in patients 20 to 40 years of age. Sensitization to indoor allergens alone, rather than indoor and outdoor allergens, has been suggested as potentially more important to asthma in older patients.³³

Asthma in older patients is associated with high rates of morbidity and mortality. Older patients with asthma have one of the highest rates of hospitalizations from their disease.^{8,9} In addition, greater than 50% of the deaths secondary to asthma were reported in patients older than 65 years.³⁴ The etiology of increased mortality and morbidity from asthma in older patients is most likely multifactorial and includes potential medication non-adherence, age-related change in response to medications, changes in the immune response with age, and permanent changes of the airway parenchyma. In children and young adults, allergic sensitization and exposure to allergens increase asthma severity.^{35,36} Whether the same relationship is seen in older patients has not been established. Rogers et al³⁷ demonstrated in a study of 45 patients older than 65 years recruited from an asthma clinic in New York City that IgE-mediated sensitization to cockroach increased asthma severity. We selected markers of asthma control, including health care use for asthma and the presence of asthma symptoms, and determined the percentage of patients with asthma who were sensitized to allergen(s) with the specific clinical outcome for both the younger and older groups of participants. We did not find strong evidence that the association between sensitization and the selected outcomes was different in these 2 age groups.

Our study has several strengths and limitations that are worth acknowledging. First, our study was based on data collected from a nationally representative population with a wide range of ages. This allowed us to directly compare sensitization rates from asthmatic patients of different ages. Second, atopy was confirmed by a standardized measurement of allergen specific IgE. Third, we limited our patients to those with a history of physician-diagnosed disease and with active symptoms and excluded patients with possible chronic obstructive pulmonary disease. Although the numbers of asthmatic patients in both the 55-year-or-older and 20- to 40-year-old groups were modest compared with the entire NHANES population, our sample size was sufficient to detect a 25.7% difference in sensitization rates between age groups with 80% power, which would have been comparable to that reported in other studies. A limitation of this study is the cross-sectional nature of the NHANES population, which precludes temporality or causality conclusions from being drawn. We were unable to determine the natural history of asthma in the 20- to 40-year-old patients as they age. In addition, we could not determine the age at which patients developed allergic sensitization. Although beyond the scope of this article, future work should address the association between antigen exposure and asthma symptoms with increased age. Although it was a strength that we used strict diagnostic criteria for asthma in older patients, we may not have captured some patients 55 years or older with asthma who have not had their conditions diagnosed. Despite these potential limitations, we believe that our study is an initial first step in understanding allergic sensitization in older patients with asthma and should be addressed in future work.

In summary, our study of the NHANES 2005–2006 database suggests that allergic sensitization in older patients with asthma is not uncommon and may differ only slightly from patients 20 to 40 years of age. Physicians providing care for older patients with asthma should consider testing for allergic sensitization and counseling about environmental control practices, particularly among those with poorly controlled asthma.

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