HHS Public Access

Author manuscript

J Asthma. Author manuscript; available in PMC 2015 August 28.

Published in final edited form as:

J Asthma. 2015 April ; 52(3): 318–326. doi:10.3109/02770903.2014.956894.

Assessing asthma control and associated risk factors among persons with current asthma – findings from the child and adult Asthma Call-back Survey

Hatice S. Zahran, MD, MPH, **Cathy M. Bailey, MS**, **Xiaoting Qin, MS**, and **Jeanne E. Moorman, MS**

Division of Environmental Hazards and Health Effects, National Center for Environmental Health, Centers for Disease Control and Prevention, Atlanta, GA, USA

Abstract

Introduction—Monitoring the level of asthma control is important in determining the effectiveness of current treatment which may decrease the frequency and intensity of symptoms and functional limitations. Uncontrolled asthma has been associated with decreased quality of life and increased health care use. The objectives of this study were to assess the level of asthma control and identify related risk factors among persons with current asthma.

Methods—Using the 2006 to 2010 BRFSS child and adult Asthma Call-back Survey, asthma control was classified as well-controlled or uncontrolled (not-well-controlled or very-poorly-controlled) using three impairment measures: daytime symptoms, night-time symptoms, and taking short-acting β2-agonists for symptom control. Multivariate logistic regression identified predictors of asthma control.

Results—Fifty percent of adults and 38.4% of children with current asthma had uncontrolled asthma. About 63% of children and 53% of adults with uncontrolled asthma were on long-term asthma control medications. Among children, uncontrolled asthma was significantly associated with being younger than 5 years, having annual household income <$15 000, and reporting cost as barriers to medical care. Among adults, it was significantly associated with being 45 years or older, having annual household income of <$25 000, being “other” race, having less than a 4-year college degree, being a current or former smoker, reporting cost as barriers, being obese, and having chronic obstructive pulmonary disease or depression.

Conclusion—Identifying and targeting modifiable predictors of uncontrolled asthma (low educational attainment, low income, cigarette smoking, and co-morbid conditions including obesity and depression) could improve asthma control.

Keywords

Asthma; comorbidity; environment; risk factors; obesity

Correspondence: Hatice S. Zahran, Medical Epidemiologist Division of Environmental Hazards and Health Effects, National Center for Environmental Health, Centers for Disease Control and Prevention, 4770 Buford Highway, NE, MS F-60, Atlanta, GA 30341, USA. Tel: 770/488-1509. Fax: 770/488-1540. HZahran@cdc.gov.

Declaration of interest: The authors declare no conflicts of interest. The authors alone are responsible for the content and writing of the article.

Introduction

Asthma is a chronic inflammatory disease of the airways that causes recurring episodes of shortness of breath, tightness in the chest, coughing, and wheezing. Asthma affects nearly 26 million people, including 7.0 million children [1]. Although asthma cannot be cured, with effective asthma care and management, most persons with asthma can be free of symptoms and have a better quality of life. One of the key components of effective asthma care and management is monitoring the level of asthma control periodically and adjusting medical treatment accordingly [2].

Level of asthma control (the frequency and intensity of symptoms and functional limitations) is a function of underlying severity, responsiveness to treatment, and the adequacy of asthma care and management [2]. Multiple socioeconomic and environmental factors contribute to the exacerbation of asthma symptoms [3–8]. Uncontrolled asthma is associated with significant decreased quality of life and increased health care use [9,10]. These, in turn, increase the economic burden of asthma [11].

Monitoring the level of asthma control is important in determining the effectiveness of current treatment which may decrease the frequency and intensity of symptoms and functional limitations. Unlike the assessment of asthma severity, asthma control can be assessed while the patient is being treated and, therefore, it is easier to understand and incorporate asthma control assessment into individual asthma-management plans. Asthma control can also be evaluated using population-based survey data. A number of validated instruments for assessing asthma control among children and adults are currently available. These include the Asthma Control Questionnaire (ACQ) [12], the Asthma Control Test (ACT) [13], the Asthma Therapy Assessment Questionnaire (ATAQ) [14], and the guideline-based control measures [2]. For this study, we used impairment measures adapted from the NAEPP 2007 guidelines to determine the level of asthma control [2,8,15] and identify the factors associated with it among children and adults with asthma in the states that participated in the Centers for Disease Control and Prevention's (CDC) Behavioral Risk Factor Surveillance System (BRFSS) Asthma Call-back Survey (ACBS).

Methods

Survey data description

We combined 5 years of data to produce stable estimates. We analyzed the 2006 to 2010 child ACBS data and the 2006 to 2010 adult ACBS data from the CDC's BRFSS separately because CDC's BRFSS collects and maintains them separately. Our study includes children (aged 0–17 years) from the 35 states and adults (aged 18 years and older) from the 40 states and the District of Columbia.

The BRFSS ACBS is developed and funded by the Air Pollution and Respiratory Health Branch (APRHB) of the CDC's National Center for Environmental Health (NCEH). It has been implemented as a follow-up survey to the BRFSS since 2006. The BRFSS ACBS is conducted approximately 2 weeks after the BRFSS telephone interview. Although BRFSS is

a state-based, random-digit-dialed telephone survey of non-institutionalized U.S. adults, the BRFSS survey contains a Random Child Selection module and a Child Asthma Prevalence module, both of which were used in participating states to identify households with a child who had asthma in order to administer the child ACBS. BRFSS respondents who report them or proxy servers who report child ever being diagnosed with asthma are eligible for the ACBS. Only one adult or one child per household could participate in the ACBS. An adult family member serves as a proxy respondent for the selected child. The ACBS collects in-depth information about asthma symptoms and episodes/attacks, self-management education, healthcare utilization and access, medication use, comorbidities, and environmental allergens and irritants [16]. The ACBS response rate for children and adults varies by state and year. The median ACBS response rates for children (via adult proxies) ranged from 47.6% to 53.7% and for adults ranged from 47.5% to 54.3% during 2006–2010. The data include sample weights to adjust for the unequal probability of selection, the disproportionate selection of population subgroups relative to the state's population distribution, and disproportionate non-response [16]. More information on participating states, weight calculation, and the response rate can be found in the ACBS Summary Data Quality Report for each year at http://www.cdc.gov/brfss/acbs [16].

Variables

We evaluated asthma control status among children and adults with current asthma. Consistent with the methodology used with previous CDC publications, respondents were considered to have current asthma if they answered “yes” to both questions “Have you ever been told by a doctor, nurse, or other health professional that you (the child) had asthma?” and “Do you (the child) still have asthma?” [1].

We used three impairment measures: daytime symptoms, night-time symptoms, and use of short-acting (β2-agonists (SABA) for symptom control (not for prevention of exercise-induced bronchospasm) to create an asthma control variable. We created a control variable with three mutually exclusive categories: well-controlled asthma, not-well-controlled asthma, and very-poorly-controlled asthma. Respondents were assigned to each category based on the most impaired level across the three impairment measures (Table 1) [2,17]. In addition, we used the term “controlled asthma” instead of well-controlled asthma, and “uncontrolled asthma” instead of not-well-controlled or very-poorly-controlled asthma. This is an adaptation of the 2007 NAEEP guidelines because the ACBS did not include all required measures for current impairment (e.g. pulmonary function measures) and for future risk assessment (e.g. asthma exacerbations, progressive decline in lung function in adults, or reduced lung growth in children) [2,17,18]. Also, we did not include one of the impairment measures, interference with normal activities, because the reference time for the question was the past 12 months and should only include more recent experiences.

For both children and adults, the variables included in the analysis were demographic characteristics (age, sex, race/ethnicity), annual household income, cost as barriers to medical care (being unable to see a primary care physician or specialist for asthma care or unable to buy medication for asthma in the past 12 months), long-term control medications (inhaled corticosteroids, systemic corticosteroids, long-acting $beta_2$ agonist, leukotriene

receptor antagonists, methylxanthines, and immunomodulators), and environmental factors (secondhand smoke (SHS) [environmental tobacco smoke[, pets allowed in bedroom, saw cockroach inside home in past 30 d, and saw or smelled mold in the past 30 d). In addition for adults, body mass index (BMI) (defined as weight in kilograms divided by height in square meter; obese = BMI ≥ 30), the presence of chronic obstructive pulmonary disease (COPD), depression, and smoking status were included in the analysis. The COPD variable includes responses to questions asking: "have you ever been told by a doctor or other professional that you have emphysema/chronic bronchitis/COPD?"

Statistical analysis

We used SAS-callable SUDAAN (version 10.0.0, RTI International, NC) to account for the complex sampling design of the BRFSS ACBS. Data from the participating states for each year were proportionately reweighted to account for the differences in sample size by year and the number of years each state participated. We used sample weights to produce estimates that were generalizable to a participating state's population. We used the chi-square test to test for group differences and multivariate logistic regression to test for association between asthma control status (dependent variable) and independent variables. We presented weighted percent estimates, adjusted prevalence ratios (aPR) (predicted marginal risk ratio), and 95% confidence intervals (CI). Adjusted PR is considered statistically significant if 95% CI does not overlap the null value of one. All prevalence ratios for both children and adults were adjusted (aPR) for sex, age, annual household income, cost as a barrier, long-term control medication status, and environmental factors. In addition, prevalence ratios for adults were adjusted for BMI, COPD, and depression. We did not find any multicollinearity between independent variables since all tolerance estimates were ≥0.70, and only tolerance estimates below 0.40 are a concern [19]. Statistical significance was determined as a p value <0.05 by a non-directional z-test or by non-overlapping 95% CIs. Relative standard error (RSE = standard error/prevalence estimate) was used as a measure of an estimate's reliability (a RSE of <0.30 indicates a "reliable" estimate) [20].

Results

Children with current asthma

Characteristics—In the combined 2006 through 2010 BRFSS ACBS sample, 9697 children had current asthma. Among children with current asthma, 61.6% had well-controlled asthma, 38.4% had uncontrolled asthma (21.5% not- well-controlled; 16.9% very-poorly-controlled asthma) and 46.0% were on long-term control medications (Table 2). Among children with uncontrolled asthma, 62.8% were on long-term control medications and among children who were taking long-term control medications, 52.4% had uncontrolled asthma (data are not shown).

Most of the children with current asthma were non-Hispanic white (57.2%) and male (57.0%). By age, 18.3% of children with asthma were aged 0–4 years, 43.5% were aged 5–11 years and 38.2% were aged 12–17 years. Nearly 12% (11.7%) of the children with asthma were in homes with annual household incomes of less than $15 000. A majority of

children had health insurance (90.6%). Less than 10% had no insurance (3.6%) or partial year insurance (5.9%) and 10.8% reported cost as a barrier to medical care. Fifty-six percent of children with asthma had pets and 33.3% of them allowed pets in their bedroom. Nearly 10% of the children with asthma were exposed to SHS (9.9%), 8.0% lived where a cockroach was seen, or 9.1% lived where mold was seen or smelled inside the home in the past 30 d (Table 2).

Asthma control and associated risk factors among children with asthma— Multiple factors (age, race/ethnicity, annual household income, cost as a barrier to medical care, and long-term control medication use) were significantly associated with level of asthma control (p values <0.05) (Table 2); however, after adjusting for other variables in the regression model, some of these associations were no longer statistically significant (Table 3).

Adjusted results from the multivariate logistic regression analyses for children are presented in Table 3. Prevalence of not-well-controlled asthma was significantly higher among girls (unadjusted prevalence = 24.1%; adjusted prevalence rate ratios (aPR) = 1.2(1.1–1.5)) than boys (19.6%). It was also higher among children who reported cost barriers (31.9%; aPR = 1.5(1.1–1.9)) or were on long-term control medications (28.2%; aPR = 1.8(1.5–2.1)) compared with those not reporting cost barriers and not on control medications (20.3% and 15.7%, respectively).

In addition, more children with current asthma aged 0–4 years had very-poorly-controlled asthma (25.9%; aPR = 1.6(1.2–2.1)) than children aged 12–17 years (13.9%). Also, very-poorly-controlled asthma was more prevalent among children with annual household income of less than $15 000 (27.5%; aPR = 1.6(1.1–2.4)) and children who were on long-term control medications (24.2%; aPR = 2.3(1.8–2.9)) than children with household income of $75 000 or more (14.5%) and children not on long-term control medications (10.8%).

Whether adjusted or not, no associations were observed between asthma control and healthcare insurance status or any environmental factors (SHS, saw cockroach inside home in past 30 d, or saw or smelled mold in past 30 d) (Tables 2 and 3).

Adults with current asthma

Characteristics—In the combined 2006 through 2010 BRFSS ACBS sample, 52 210 adults had current asthma. Fifty percent of adults with current asthma had uncontrolled asthma (25.9% not well controlled; 24.1% very-poorly-controlled) and 41.5% were on long-term control medications (Table 4). Among adults with uncontrolled asthma, 53.4% were on long-term control medications and among adults who were taking long-term control medications, 64.4% had uncontrolled asthma (data are not shown).

The majority of adults with current asthma were non-Hispanic whites (74.6%) and female (63.1%). Among adults with current asthma, 30.7% were aged 18–34 years, 18.5% were aged 35–44 years, 19.6% were aged 45–54 years, 15.9% were aged 55–64, and 15.3% were aged 65+ years. Of adults with asthma, 14.7% had annual household incomes of less than $15 000; 80.3% had health insurance, 13.1% had no health insurance, and 6.5% had partial

year insurance; 20.6% reported cost as a barrier to medical care, 18.2% reported exposure to SHS (someone other than the respondent smoked inside home), 19.5% were current smoker, and 11.9% were both current smoker and exposed to SHS. Thirty nine percent were obese (39.4%). One-third had COPD (34.6%) and 34.7% had depression. Sixty percent (59.5%) had pets, and 44.3% of adults with asthma allowed the pets in their bedroom. About 10% saw a cockroach inside the home in the past 30 d (9.7%) or saw/smelled mold in the past 30 d (11.6%) (Table 4).

Asthma control and associated risk factors among adults with asthma—All characteristics of adults with asthma listed in Table 4 were significantly associated with the level of asthma control (p values<0.05). However, after adjusting for other variables in the model, the associations for sex, healthcare and each of the environmental factors (pets allowed in bedroom, saw cockroach inside home in past 30 d, or saw or smelled mold in past 30 d) were no longer significant (Tables 3 and 4).

As seen in Table 3, prevalence of not-well-controlled asthma was significantly higher among adults who reported cost barriers (29.7%; aPR = 1.2(1.1–1.4)) and were on long-term control medications (31.4%; aPR = 1.5(1.4–1.6)), compared with those not reporting cost barriers and not on control medications (25.0% and 22.1%, respectively). Compared with adults aged 18–34 years, prevalence of not-well-controlled asthma was lower and prevalence of very-poorly-controlled asthma was higher among adults aged 45 years or older.

Very-poorly-controlled asthma was more prevalent among adults with current asthma who were 45 years or older (45–54: 28.1%; aPR = 1.4(1.2–1.5); 55–64: 30.5%; aPR =1.4(1.2–1.6); 65+: 32.1%; aPR = 1.5(1.3–1.7)) than among those aged 18–34 years (16.4%) and among adults with other race (31.4%; aPR = 1.3(1.1–1.4)) than among whites (22.7%). Not having 4-year college degree or higher was significantly associated with having very-poorly-controlled asthma (high school graduate or less: 33.7%; aPR = 1.4(1.3–1.5); some college: 23.7%; aPR = 1.2(1.1–1.3)). It was also more prevalent among adults with annual household income less than $15000 (41.6%; aPR=1.5(1.4–1.8)) and $15 000–$24 999 (35.3%; aPR = 1.4(1.3–1.6)) than among those with income of $75 000 or more (12.9%), and among those who reported cost barriers (40.0%; aPR = 1.5(1.4–1.6)) than those who did not (20.0%). Higher rates of very-poorly-controlled asthma were significantly associated with current or former smoking, regardless of SHS status (aPR ranges from 1.2 to 1.6), being obese (28.8%; aPR = 1.2(1.1–1.3)), having COPD (39.2%; aPR = 1.5(1.4–1.6)), and having depression (32.6%; aPR = 1.2(1.1–1.3)). The corresponding reference levels were 20.9%, 16.2%, and 19.6% respectively. In addition, being on long-term control medications was significantly associated with having very-poorly-controlled asthma (33.0%; aPR = 1.7(1.6–1.8)) than not being on long-term control medication (17.8%) (Tables 3 and 4).

Discussion

The purpose of this population-based study was to assess asthma control and identify related potential risk factors among children and adults with current asthma who participated in the ACBS in the years 2006 through 2010. Fifty percent of adults and 38% of children with

current asthma had uncontrolled asthma. Among both children and adults, having uncontrolled asthma was significantly associated with age (aged 0–4 years or 45 years or older), having cost barriers for medical care, having low annual household income (less than $15 000 for children and less than $25 000 for adults), and taking long-term control medications. In addition, among adults, not having 4 year or more college education, being current or former smoker, and having COPD or depression were significantly associated with having uncontrolled asthma. These findings were similar to the findings of the state-specific reports [8,18,21].

The strong association between taking long-term control medication and having uncontrolled asthma among both children and adults is as predicted. According to the NAEPP 2007 guidelines, all persons with uncontrolled asthma should be on long-term control medications [2]. Therefore, we expected that all persons with uncontrolled asthma were on long-term control medications. However, our findings show that only 63% of children and 53% of adults with uncontrolled asthma were on long-term control medications and 52% of children and 64% of adults had uncontrolled asthma despite being on long-term control medications. Possible explanation for these findings is that providers are not implementing the NAEPP 2007 guidelines or improper use of controller medications [2,24]. Treating those with uncontrolled asthma with long-term control asthma medications appropriately, as defined in the NAEPP 2007 guidelines, is an important component of asthma management that needs further improvement.

Multiple extraneous factors (e.g. inadequate treatment, non-adherence to treatment regimens, reduced responsiveness to therapy, environmental triggers and irritants, and comorbid conditions) could contribute to uncontrolled asthma [3–8,22–25]. However, many of these factors were either not examined because of a lack of data or, if examined, did not show an association. We were able to identify that age (being aged 0–4 years or aged 45 years and older), low annual household income (less than $15 000 for children and less than $25 000 for adults), and cost as barriers to medical care were predictors of uncontrolled asthma, especially very-poorly-controlled asthma, among both children and adults. Among adults, other race, education of less than a 4-year college degree, smoking (current or former), and co-morbid conditions (obesity, COPD, or depression) were also predictors of uncontrolled asthma. Identifying modifiable predictors of uncontrolled asthma (low income or low educational attainment, unable to afford medical care, smoking, and co-morbid conditions) is an important step in developing targeted interventions, producing strategies that reduce the health risks and economic cost of asthma, and improving the health and well-being of persons with asthma and their families.

The strength of this study is the ability to assess the level of asthma control among the large sample of children and adults with current asthma from the states participating in the ACBS. The ACBS is the only survey providing indicators that allow a guideline-based classification of asthma control [2] to evaluate population-based asthma control status.

There are several limitations to our study. One limitation is that the indicators for asthma control classification that are available in the ACBS circumscribed our findings. Because of the nature of telephone surveys and the content of the ACBS questionnaire, we were unable

to include all of the specified elements in the NAEPP guidelines (e.g. activity limitation, pulmonary function measures, asthma exacerbations that require oral corticosteroid and lung growth status in children) [2]. This limitation may alter asthma control prevalence estimates. However, the definition of asthma control used here is consistent with the definition in other reports of population-based estimates [8,15,18,21]. Another limitation is that the ACBS response rates for the participating states were around 50%. Low response rates may affect the results by introducing non-response bias, if survey respondents differed from non-responders on the characteristics studied. However, the BRFSS sampling and weighting procedures and varying response rates among states over the 5-year study period can minimize non-response effects on the results [16]. In addition, because of the cross-sectional nature of the survey data, we could not generally determine temporal sequence or causality. Finally, the findings cannot be generalized to the people with current asthma in states that did not participate in the ACBS.

In conclusion, despite national guidelines for managing asthma and available advanced medical treatments, 38% of children and 50% of adults with current asthma have uncontrolled asthma and not all those with uncontrolled asthma were on long-term control medications as recommended in the asthma treatment guidelines. Our findings indicate that multiple factors (low educational attainment, low income, tobacco smoking, and co-morbid conditions including obesity, COPD, and depression) were significantly associated with having uncontrolled asthma, especially very-poorly-controlled asthma. Development of targeted interventions or strategies aimed at reducing modifiable risk factors of poor asthma control can lead to better asthma control and improve the health and quality of life of people with asthma.

Acknowledgments

This research received no specific grant from any funding agency in the public, commercial, or non-profit sectors.

References

1. Centers for Disease Control and Prevention. [last accessed 8 Apr 2013] National Center for Health Statistics. National Surveillance of Asthma: United States, 2001–2010. National Center for Health Statistics Data brief No 94. May. 2012 Available from: http://www.cdc.gov/nchs/data/series/sr_03/sr03_035.pdf
2. US Department of Health and Human Services, National Institutes of Health (NIH), National Heart, Lung, and Blood Institute, National Asthma Education and Prevention Program (NAEPP). [last accessed 23 Oct 2013] Expert panel report 3: guidelines for the diagnosis and management of asthma. 2007. Available from: http://www.nhlbi.nih.gov/guide-lines/asthma/asthgdln.pdf
3. Hannaway, PJ. Asthma—an emerging epidemic: a manual for patients with asthma, parents of children with asthma, asthma educators, health-care providers, school nurses and coaches. Marblehead (MA): Lighthouse Press; 2002.
4. Institute of Medicine Committee on the Assessment of Asthma and Indoor Air, Division of Health Promotion and Disease Prevention. “Front matter“ clearing the air: asthma and indoor air exposures. Washington (DC): The National Academies Press; 2000.
5. Bloomberg GR, Banister C, Sterkel R, Epstein J, Bruns J, Swerczek L, Wells S, et al. Socioeconomic, family, and pediatric practice factors that affect level of asthma control. Pediatrics. 2009; 123:829–835. [PubMed: 19255010]
6. Soriano JB, Rabe KF, Vermeire PA. Predictors of poor asthma control in European adults. J Asthma. 2003; 40:803–813. [PubMed: 14626337]

7. Halterman JS, Auinger P, Conn KM, Lynch K, Yoos HL, Szilagyi PG. Inadequate therapy and poor symptom control among children with asthma: findings from a multistate sample. Ambul Pediatr. 2007; 7:153–159. [PubMed: 17368410]
8. Nguyen K, Zahran HS, Iqbal S, Peng J, Boulay E. Factors associated with asthma control among adults in five New England states, 2006–2007. J Asthma. 2011; 48:581–588. [PubMed: 21668319]
9. Williams SA, Wagner S, Kannan H, Bolge SC. The association between asthma control and health care utilization, work productivity loss, and health-related quality of life. J Occup Environ Med. 2009; 51:780–785. [PubMed: 19528828]
10. Vollmer WM, Markson LE, O'Connor E, Sanocki LL, Fitterman L, Berger M, Buist AS. Association of asthma control with healthcare utilization and quality of life. Am J Respir Crit Care Med. 1999; 160:1647–1652. [PubMed: 10556135]
11. Barnett SBL, Nurmagambetov TA. Costs of asthma in the United States: 2002–2007. J Allergy Clin Immunol. 2011; 127:145–152. [PubMed: 21211649]
12. Juniper EF, O'Byrne PM, Guyatt GH, Ferrie PJ, King DR. Development and validation of a questionnaire to measure asthma control. Eur Respir J. 1999; 14:902–907. [PubMed: 10573240]
13. Nathan RA, Sorkness CA, Kosinski M, Schatz M, Li JT, Marcus P, Murray JJ, et al. Development of the asthma control test: a survey for assessing asthma control. J Allergy Clin Immunol. 2004; 113:59–65. [PubMed: 14713908]
14. Skinner EA, Diette GB, Algatt-Bergstrom PJ, Nguyen TT, Clark RD, Markson LE, Wu AW. The Asthma Therapy Assessment Questionnaire (ATAQ) for children and adolescents. Dis Manag. 2004; 7:305–313. [PubMed: 15671787]
15. Zahran HS, Person CJ, Bailey CM, Moorman JE. Predictors of asthma self-management education among children and adults-2006-2007 behavioral risk factor surveillance system asthma callback survey. J Asthma. 2012; 49:98–106. [PubMed: 22216949]
16. Centers for Disease Control and Prevention. [last accessed 6 May 2013] BRFSS call-back surveys, 2006–2010 Asthma call-back survey History and Analysis Guidance. Available from: http://www.cdc.gov/brfss/acbs
17. Centers for Disease Control and Prevention. Asthma Control Analysis Workgroup. Measuring the impairment construct of asthma control from ERP-3 using the Asthma call-back Survey data. Unpublished data. 2010
18. Montana Asthma control Program. [last accessed 18 Nov 2013] The Health impact of uncontrolled asthma. Available from: http://www.dphhs.mt.gov/publi-chealth/asthma/documents/surveillancereportJan-March2010.pdf
19. Allison, PD. Logistic regression using SAS system: theory and application. Cary (NC): SAS Institute Inc; 1999.
20. Centers for Disease Control and Prevention. [last accessed 8 May 2013] Adult asthma data Technical information. 2007. Available from: http://www.cdc.gov/asthma/brfss/07/brfsstechinfo.htm#anal
21. Utah Department of Health. [last accessed 25 Oct 2013] Asthma symptoms and management. 2013. Available from: http://health.utah.gov/asthma/pdf_files/Data/Burden%20Report/SymptomsManagement.pdf
22. Barns PJ. Corticosteroid resistance in patients with asthma and chronic obstructive pulmonary disease. J Allergy Clin Immunol. 2013; 131:636–645. [PubMed: 23360759]
23. Dixon AE, Holguin F, Sood A, Salome CM, Pratley RE, Beuther DA, Juan C, et al. An official american thoracic society workshop report: obesity and asthma. Proc Am Thorac Soc. 2010; 7:325–335. [PubMed: 20844291]
24. Bender BG. Overcoming barriers to nonadherence in asthma treatment. J Allergy Clin Immunol. 2002; 109:S554–S559. [PubMed: 12063512]
25. Pearlman AN, Chandra RK, Chang D, Conley DB, Tripathi-Peters A, Grammer LC, Schleimer RT, et al. Relationships between severity of chronic rhinosinusitis and nasal polyposis, asthma, and atopy. Am J Rhinol Allergy. 2009; 23:145–148. [PubMed: 19401038]

Table 1

Classification of asthma control among adults with asthma adopted from the National Asthma Education and Prevention Program Expert Panel Report 3 Guidelines[a].

Measures for current impairment	Controlled asthma	Uncontrolled asthma	
	Well-controlled asthma	Not-well-controlled	Very-poorly-controlled
Symptoms	≤2 d a week	>2 d a week	Throughout the day
Night-time awakenings			
Ages 0–4 years	≤1 time a month	>1 time a month	>1 time a week
Ages 5–11 years	≤1 time a month	≥2 times a month	≥2 times a week
Ages 12 years or older	≤2 times a month	1–3 times a week	≥4 times a week
Short-acting β2-agonists used for symptom control	≤2 d a week	> 2d a week	Several times a day

[a]Based on the most impaired level across the three variables, asthma control was classified into three mutually exclusive categories: well-controlled asthma, not-well-controlled asthma, and very-poorly-controlled asthma.

J Asthma. Author manuscript; available in PMC 2015 August 28.

Table 2

Characteristics and level of asthma control[a] among children (aged 0–17 years) with current asthma[b]: Behavioral Risk Factor Surveillance System Asthma Call-back Survey, 2006–2010.

			Level of asthma control among children with current asthma					
			Controlled asthma		Uncontrolled asthma			
	Survey respondents		Well-controlled asthma		Not-well-controlled		Very-poorly-controlled	
Characteristics	**No.[c]**	**%[d] (95% CI[d])**	**No.[c]**	**%[d] (95% CI[d])**	**No.[c]**	**%[d] (95% CI[d])**	**No.[c]**	**%[d] (95% CI[d])**
Total	9697		6144	61.6 (59.3–63.9)	2065	21.5 (19.7–23.4)	1453	16.9 (15.1–18.9)
Sex								
Male	5536	57.0 (54.7–59.3)	3559	63.5 (60.5–66.4)	1151	19.6 (17.3–22.0)	826	16.9 (14.7–19.4)
Female	4126	43.0 (40.7–45.4)	2585	59.0 (55.4–62.5)	914	24.1 (21.2–27.2)	627	16.9 (14.1–20.2)
Age, year range[e]								
0–4	1213	18.3 (16.4–20.4)	655	52.7 (46.7–58.8)	265	21.4 (17.1–26.4)	293	25.9 (21.2–31.2)
5–11	3746	43.5 (41.2–45.9)	2307	62.0 (58.6–65.3)	835	22.0 (19.3–25.0)	604	15.9 (13.6–18.6)
12–17	4738	38.2 (36.0–40.4)	3201	65.2 (61.6–68.7)	975	20.8 (18.1–23.9)	562	13.9 (11.0–17.4)
Race/ethnicity[e,f]								
White	6472	57.2 (54.7–59.6)	4218	62.9 (60.3–65.5)	1354	21.4 (19.3–23.6)	900	15.7 (13.8–17.9)
Black	991	15.9 (14.2–17.9)	537	53.7 (47.0–60.2)	233	20.1 (16.3–24.5)	221	26.3 (19.9–33.8)
Hispanic	971	16.9 (15.0–19.1)	591	59.0 (51.9–65.9)	219	25.7 (19.7–32.8)	161	15.3 (11.1–20.7)
Other race	904	10.0 (8.5–11.6)	597	69.3 (62.0–75.7)	184	16.5 (12.4–21.7)	123	14.2 (09.5–20.8)
Household income[e]								
<$15 000	811	11.7 (9.9–13.9)	420	49.2 (40.1–58.5)	192	23.3 (16.3–32.1)	199	27.5 (18.7–38.5)
$15 000–$24 999	1223	14.5 (12.9–16.3)	707	59.0 (52.5–65.3)	272	21.0 (16.3–26.6)	244	20.0 (15.4–25.5)
$25 000–$49 999	2103	21.0 (19.3–22.9)	1329	61.4 (56.9–65.7)	445	19.9 (16.7–23.5)	329	18.7 (15.5–22.4)
$50 000–$74 999	1684	16.6 (14.9–18.5)	1107	69.1 (64.1–73.7)	370	19.4 (15.8–23.7)	207	11.5 (08.8–14.8)
≥$75 000	3351	36.1 (34.0–38.3)	2275	63.1 (59.5–66.6)	676	22.4 (19.4–25.7)	400	14.5 (12.1–17.3)
Health care coverage in past 12 months								
No insurance	332	3.6 (2.9–4.4)	203	62.0 (50.8–72.0)	72	19.8 (12.7–29.6)	57	18.2 (11.2–28.2)
Partial year coverage	476	5.9 (4.4–7.8)	257	55.8 (40.9–69.7)	103	17.2 (11.2–25.6)	116	27.0 (14.5–44.5)

			Level of asthma control among children with current asthma					
			Controlled asthma		Uncontrolled asthma			
	Survey respondents		Well-controlled asthma		Not-well-controlled		Very-poorly-controlled	
Characteristics	**No.[c]**	**%[d] (95% CI[d])**	**No.[c]**	**%[d] (95% CI[d])**	**No.[c]**	**%[d] (95% CI[d])**	**No.[c]**	**%[d] (95% CI[d])**
Full year coverage	8856	90.6 (88.6–92.2)	5679	61.8 (59.5–64.1)	1894	21.8 (20.0–23.9)	1283	16.3 (14.6–18.1)
Cost as barrier[e, g]								
Yes	891	10.8 (9.3–12.4)	404	46.3 (38.9–53.8)	236	31.9 (24.5–40.5)	251	21.8 (17.2–27.2)
No	8746	89.2 (87.6–90.7)	5711	63.3 (60.9–65.6)	1830	20.3 (18.5–22.1)	1205	16.5 (14.5–18.6)
Long-term control medications[e]								
Yes	4332	46.0 (43.7–48.3)	2150	47.6 (44.2–51.0)	1221	28.2 (25.4–31.3)	961	24.2 (21.4–27.2)
No	5365	54.0 (51.7–56.3)	4013	73.5 (70.3–76.4)	854	15.7 (13.5–18.1)	498	10.8 (08.6–13.6)
Anyone smoked inside child's home[h]								
Yes	877	9.9 (8.3–11.8)	527	57.3 (47.6–66.5)	198	21.0 (15.6–27.6)	152	21.7 (13.5–33.1)
No	8796	90.1 (88.2–91.7)	5615	62.0 (59.6–64.3)	1875	21.6 (19.7–23.6)	1306	16.5 (14.8–18.3)
If pets allowed in child's bedroom								
Pets allowed	3754	33.3 (31.2–35.5)	2518	66.9 (63.4–70.3)	779	20.8 (18.0–23.8)	457	12.3 (10.3–14.7)
Pets not allowed	2226	22.7 (20.9–24.7)	1345	59.8 (55.1–64.4)	514	24.6 (20.5–29.3)	367	15.5 (12.9–18.6)
No pets	3710	44.0 (41.7–46.3)	2295	58.4 (54.7–62.1)	781	20.3 (17.7–23.2)	634	21.3 (18.0–25.0)
Saw cockroach inside home past 30 d								
Yes	721	8.0 (6.9–09.3)	452	58.6 (50.6–66.2)	148	23.3 (17.2–30.8)	121	18.1 (13.1–24.5)
No	8945	92.0 (90.7–93.1)	5684	61.7 (59.3–64.1)	1924	21.4 (19.5–23.3)	1337	16.9 (15.0–19.0)
Saw or smelled mold past 30 d								
Yes	929	9.1 (7.8–10.6)	547	56.1 (47.8–64.1)	235	30.4 (22.6–39.5)	147	13.5 (09.6–18.7)
No	8720	90.9 (89.4–92.2)	5578	62.0 (59.6–64.4)	1836	20.7 (18.9–22.6)	1306	17.3 (15.4–19.4)

CI, confidence interval.

[a] Defined as the most impaired level from the 1 or more individual elements (i.e. daytime and night time symptoms in past 30 d and rescue medication use in past 3 months).

[b] Persons who answered “yes” to the question “Have you ever been told by a doctor or other health professional that you had asthma?” or “Has a doctor.”

[c] Unweighted pooled sample size, 2006–2010. Due to item non-response, individual characteristic categories may not sum to total.

[d] Weighted prevalence and 95% confidence interval.

[e] *p* Values <0.05 for the chi-square test of association between asthma controlled status and all selected variables.

[f] Race categories “white, non-Hispanic”, “black, non-Hispanic”, include persons who indicated only a single race group. “Other races, non-Hispanic” includes Asian, American Indian Alaskan Native, Native Hawaiian and Other Pacific Islander, persons reporting more than one race, and persons reporting their race as something other than those listed here.

[g] Cost as a barrier to primary care doctor, specialist, and medicine.

[h] Indicates secondhand smoke exposure.

J Asthma. Author manuscript; available in PMC 2015 August 28.

Table 3

Association between level of asthma control[a] and selected characteristics: Behavioral Risk Factor Surveillance System Asthma Call-back Survey, 2006–2010.

	Children with current asthma		Adults with current asthma	
	Not well-controlled asthma	Very-poorly-controlled asthma	Not well-controlled asthma	Very-poorly-controlled asthma
Characteristics (reference levels)	**aPR[b] (95% CI[b])**	**aPR[b] (95% CI[b])**	**aPR[b] (95% CI[b])**	**aPR[b] (95% CI[b])**
Sex (male)				
Female	1.2 (1.1–1.5)	1.0 (0.9–1.3)	1.1 (1.0–1.2)	0.9 (0.9–1.0)
Age, year range (ref: 12–17)				
0–4	0.9 (0.7–1.1)	1.6 (1.2–2.1)	N/A	N/A
5–11	0.9 (0.8–1.1)	1.1 (0.8–1.3)	N/A	N/A
Age, year range (ref: 18–34)				
35–44	N/A	N/A	0.9 (0.8–1.0)	1.2 (1.0–1.3)
45–54	N/A	N/A	0.8 (0.7–0.9)	1.4 (1.2–1.5)
55–64	N/A	N/A	0.8 (0.7–0.9)	1.4 (1.2–1.6)
65+	N/A	N/A	0.8 (0.8–0.9)	1.5 (1.3–1.7)
Race/Ethnicity[c] (ref: White)				
Black	1.0 (0.8–1.3)	1.3 (1.0–1.7)	0.9 (0.8–1.1)	1.1 (1.0–1.3)
Hispanic	1.2 (0.9–1.5)	0.8 (0.6–1.1)	0.9 (0.7–1.0)	1.2 (1.0–1.4)
Other race	0.8 (0.6–1.1)	0.8 (0.6–1.2)	0.8 (0.6–0.9)	1.3 (1.1–1.4)
Education level (ref: College 4 years or more)				
High School graduate or less	N/A	N/A	1.0 (0.9–1.1)	1.4 (1.3–1.5)
Some college	N/A	N/A	1.0 (0.9–1.1)	1.2 (1.1–1.3)
Household Income (ref: ≥$75 000)				
<$15 000	1.1 (0.8–1.5)	1.6 (1.1–2.4)	1.0 (0.8–1.1)	1.5 (1.4–1.8)
$15 000–$24 999	1.0 (0.7–1.3)	1.2 (0.9–1.7)	1.0 (0.9–1.1)	1.4 (1.3–1.6)
$25 000–$49 999	0.9 (0.7–1.1)	1.2 (0.9–1.5)	1.0 (0.9–1.1)	1.2 (1.0–1.3)
$50 000–$74 999	0.9 (0.7–1.1)	0.7 (0.5–1.0)	1.1 (1.0–1.2)	1.0 (0.9–1.1)
Health care coverage in past 12 months (ref: Full year coverage)				
No insurance	0.9 (0.6–1.4)	1.2 (0.8–1.9)	1.0 (0.9–1.1)	0.9 (0.8–1.0)
Partial year coverage	0.8 (0.5–1.2)	1.4 (0.8–2.4)	0.9 (0.8–1.1)	1.0 (0.9–1.2)
Cost as barrier[d] (ref: No)	1.5 (1.1–1.9)	1.1 (0.9–1.5)	1.2 (1.1–1.4)	1.5 (1.4–1.6)
Long-term control medications (ref: No)	1.8 (1.5–2.1)	2.3 (1.8–2.9)	1.5 (1.4–1.6)	1.7 (1.6–1.8)
Anyone Smoked inside child's home[e] (ref: No)	1.0 (0.7–1.3)	1.2 (0.8–1.7)	N/A	N/A
Smoking & SHS (ref: Non-smoker &No SHS)				
Current smoker &SHS	N/A	N/A	1.1 (1.0–1.2)	1.6 (1.4–1.8)
Current smoker & No SHS	N/A	N/A	1.0 (0.9–1.2)	1.5 (1.3–1.7)
Former smoker & SHS	N/A	N/A	1.1 (0.8–1.3)	1.4 (1.2–1.8)
Former smoker & No SHS	N/A	N/A	1.0 (0.9–1.0)	1.2 (1.1–1.3)
Non-smoker & SHS	N/A	N/A	1.0 (0.8–1.2)	1.1 (0.9–1.4)

	Children with current asthma		Adults with current asthma	
	Not well-controlled asthma	Very-poorly-controlled asthma	Not well-controlled asthma	Very-poorly-controlled asthma
Characteristics (reference levels)	**aPR[b] (95% CI[b])**	**aPR[b] (95% CI[b])**	**aPR[b] (95% CI[b])**	**aPR[b] (95% CI[b])**
Pets allowed in bedroom (ref: Does not have pets)				
Pets allowed	1.1 (0.9–1.3)	0.7 (0.6–0.9)	1.1 (1.0–1.2)	1.1 (1.0–1.1)
Pets not allowed	1.2 (1.0–1.5)	0.8 (0.7–1.1)	1.1 (1.0–1.2)	1.1 (1.0–1.2)
Saw cockroach inside home past 30 d (ref: No)	1.1 (0.8–1.5)	0.9 (0.6–1.4)	1.1 (1.0–1.2)	1.0 (0.9–1.1)
Saw or smelled mold past 30d (ref: No)	1.4 (1.0–1.8)	0.7 (0.5–1.0)	1.2 (1.1–1.3)	1.0 (0.9–1.1)
Obese (ref: Non-obese)	N/A	N/A	1.0 (0.9–1.1)	1.2 (1.1–1.3)
COPD[f] (ref: No)	N/A	N/A	1.1 (1.0–1.2)	1.5 (1.4–1.6)
Depression (ref: No)	N/A	N/A	1.0 (0.9–1.1)	1.2 (1.1–1.3)

CI, confidence interval; N/A: not applicable; SHS, secondhand smoke exposure; COPD, chronic obstructive pulmonary disease.

[a] Defined as the most impaired level from the one or more individual elements (i.e. daytime and night time symptoms in past 30 d and rescue medication use in past 3 months).

[b] Adjusted prevalence ratio (predicted marginal risk ratio) and 95% confidence intervals. Adjusted for the variables listed in this table.

[c] Race categories “white, non-Hispanic”, “black, non-Hispanic”, include persons who indicated only a single race group. “Other races, non-Hispanic” includes Asian, American Indian Alaskan Native, Native Hawaiian and Other Pacific Islander, persons reporting more than one race, and persons reporting their race as something other than those listed here.

[d] Cost as a barrier to primary care doctor, specialist, and medicine.

[e] Indicates secondhand smoke exposure (SHS).

[f] Combined responses to questions for COPD, emphysema, and chronic bronchitis.

Table 4

Characteristics and level of asthma control[a] among adults (aged ≥18 years) with current asthma[b]: Behavioral Risk Factor Surveillance System Asthma Call-back Survey, 2006–2010.

			Level of asthma control among adults with current asthma					
			Controlled asthma		Uncontrolled asthma			
	Survey respondents		Well-controlled asthma		Not-well-controlled		Very-poorly-controlled	
Characteristics	No.[c]	%[d] (95% CI[d])	No.[c]	%[d] (95% CI[d])	No.[c]	%[d] (95% CI[d])	No.[c]	%[d] (95% CI[d])
Total	52 210		24 378	50.0 (48.9–51.0)	13 395	25.9 (25.0–26.8)	14 437	24.1 (23.3–25.0)
Sex[e]								
Male	13 760	36.9 (35.9–38.0)	6665	53.1 (51.0–55.1)	3286	24.3 (22.6–26.0)	3809	22.7 (21.1–24.3)
Female	38 450	63.1(62.0–64.1)	17 713	48.2 (47.0–49.3)	10 109	26.9 (25.9–27.9)	10 628	25.0 (24.0–25.9)
Age, year range[e]								
18–34	5617	30.7 (29.5–31.9)	3220	56.9 (54.3–59.4)	1469	26.8 (24.6–29.2)	928	16.4 (14.5–18.4)
35–44	6821	18.5 (17.8–19.3)	3682	52.7 (50.3–55.0)	1748	26.8 (24.7–29.0)	1391	20.5 (18.8–22.4)
45–54	11 416	19.6 (18.9–20.3)	5253	47.0 (45.3–48.8)	2890	24.8 (23.4–26.4)	3273	28.1 (26.6–29.8)
55–64	13 509	15.9 (15.4–16.5)	5982	44.5 (42.8–46.1)	3439	25.1 (23.7–26.5)	4088	30.5 (29.0–32.0)
65+	14 643	15.3 (14.8–15.8)	6148	42.5 (41.0–44.1)	3792	25.4 (24.1–26.7)	4703	32.1 (30.7–33.6)
Race/Ethnicity[e,f]								
White	42 517	74.6 (73.6–75.6)	20 052	50.5 (49.3–51.6)	11 091	26.9 (25.9–27.9)	11 374	22.7 (21.8–23.5)
Black	3236	9.7 (9.0–10.3)	1414	47.7 (44.1–51.4)	774	24.5 (21.4–27.7)	1048	27.8 (24.7–31.1)
Hispanic	2342	9.0 (8.3–9.7)	1094	49.8 (45.4–54.1)	566	23.8 (20.3–27.8)	682	26.4 (22.7–30.5)
Other race	3656	6.7 (6.2–7.4)	1606	48.7 (44.1–53.4)	852	19.9 (16.9–23.3)	1198	31.4 (27.6–35.5)
Education level[e]								
High School graduate or less	19 215	36.4 (35.4–37.4)	7583	41.6 (39.8–43.4)	4692	24.8 (23.2–26.4)	6940	33.7 (32.0–35.3)
Some college	15 486	28.5 (27.6–29.4)	6937	48.7 (46.8–50.5)	4119	27.7 (26.0–29.4)	4430	23.7 (22.3–25.1)
College 4 or more years	17 452	35.2 (34.2–36.1)	9843	59.8 (58.1–61.4)	4570	25.7 (24.3–27.2)	3039	14.5 (13.5–15.7)
Household income[e]								
<$15 000	8146	14.7 (14.0–15.5)	2509	33.8 (31.3–36.5)	1885	24.5 (22.0–27.2)	3752	41.6 (39.0–44.3)
$15 000–$24 999	8967	16.7 (15.8–17.5)	3389	39.4 (36.6–42.3)	2351	25.3 (23.1–27.7)	3227	35.3 (32.7–38.0)

Characteristics	Survey respondents		Level of asthma control among adults with current asthma					
			Controlled asthma		Uncontrolled asthma			
			Well-controlled asthma		Not-well-controlled		Very-poorly-controlled	
	No.[c]	%[d] (95% CI[d])	No.[c]	%[d] (95% CI[d])	No.[c]	%[d] (95% CI[d])	No.[c]	%[d] (95% CI[d])
$25 000–$49 999	12 351	23.8 (23.0–24.7)	5883	48.5 (46.5–50.5)	3323	27.5 (25.7–29.4)	3145	24.0 (22.4–25.7)
$50 000–$74 999	7143	15.1 (14.4–15.8)	3879	55.3 (52.7–57.8)	1915	27.7 (25.4–30.2)	1349	17.0 (15.3–18.8)
≥$75 000	10 428	29.7 (28.7–30.7)	6332	61.9 (59.9–63.9)	2644	25.2 (23.4–27.0)	1452	12.9 (11.8–14.2)
Health care coverage in past 12 months[e]								
No insurance	4616	13.1 (12.3–14.0)	1910	45.3 (41.8–48.9)	1227	27.0 (24.0–30.2)	1479	27.7 (24.8–30.7)
Partial year coverage	2515	6.5 (6.0–7.1)	1004	42.7 (38.4–47.2)	607	26.0 (22.1–30.3)	904	31.3 (27.3–35.7)
Full year coverage	44 876	80.3 (79.4–81.3)	21 324	51.2 (50.1–52.3)	11 534	25.8 (24.8–26.8)	12 018	23.0 (22.1–23.9)
Cost as barrier[e,g]								
Yes	9443	20.6 (19.7–21.4)	2644	30.3 (28.1–32.6)	2643	29.7 (27.6–32.0)	4156	40.0 (37.7–42.3)
No	42 572	79.4 (78.6–80.3)	21 636	55.0 (53.9–56.1)	10 701	25.0 (24.0–26.0)	10 235	20.0 (19.2–20.9)
Long-term control medications[e]								
Yes	24 786	41.5 (40.5–42.5)	8698	35.6 (34.3–37.0)	7346	31.4 (30.0–32.8)	8742	33.0 (31.7–34.4)
No	27 424	58.5 (57.5–59.5)	15680	60.2 (58.8–61.5)	6049	22.1 (20.9–23.2)	5695	17.8 (16.8–18.8)
Anyone Smoked inside home[e,h]								
Yes	8866	18.2 (17.4–19.1)	2714	35.3 (32.7–37.9)	2233	26.5 (24.3–28.9)	3919	38.2 (35.8–40.7)
No	43 243	81.8 (81.0–82.6)	21 603	53.2 (52.1–54.3)	11 145	25.8 (24.8–26.8)	10 495	21.0 (20.1–21.9)
Smoking status[e]								
Current smoker	9510	19.5 (18.7–20.3)	2945	35.2 (33.0–37.6)	2440	27.4 (25.2–29.6)	4125	37.4 (35.2–39.6)
Former smoker	17 622	27.1 (26.3–28.0)	7690	46.6 (44.9–48.4)	4613	25.2 (23.8–26.7)	5319	28.2 (26.7–29.7)
Non-smoker	24 858	53.4 (52.4–54.4)	13 634	57.0 (55.5–58.5)	6293	25.8 (24.5–27.1)	4931	17.2 (16.2–18.3)
Smoking status & SHS[e]								
Current smoker &SHS	6353	11.9 (11.2–12.6)	1716	31.2 (28.2–34.3)	1618	27.3 (24.5–30.2)	3019	41.5 (38.7–44.5)
Current smoker &No SHS	3138	7.6 (7.1–8.2)	1219	41.4 (37.7–45.2)	817	27.7 (24.3–31.3)	1102	31.0 (27.5–34.7)
Former smoker &SHS	1341	2.6 (2.3–2.9)	461	34.6 (29.2–40.4)	325	25.9 (20.1–32.7)	555	39.5 (33.8–45.7)
Former smoker &No SHS	16 247	24.6 (23.8–25.4)	7210	47.9 (46.0–49.7)	4285	25.2 (23.7–26.7)	4752	27.0 (25.5–28.5)
Non-smoker & SHS	1143	3.8 (3.3–4.3)	527	48.7 (41.9–55.6)	281	24.7 (20.0–30.1)	335	26.6 (21.1–32.9)

			Level of asthma control among adults with current asthma					
			Controlled asthma		Uncontrolled asthma			
	Survey respondents		Well-controlled asthma		Not-well-controlled		Very-poorly-controlled	
Characteristics	**No.[c]**	**%[d] (95% CI[d])**	**No.[c]**	**%[d] (95% CI[d])**	**No.[c]**	**%[d] (95% CI[d])**	**No.[c]**	**%[d] (95% CI[d])**
Non-smoker &No SHS	23 667	49.6 (48.6–50.7)	13 075	57.6 (56.1–59.1)	6003	25.9 (24.6–27.3)	4589	16.5 (15.5–17.6)
If pets allowed in bedroom[e]								
Pets allowed	22 711	44.3 (43.3–45.3)	10 565	49.2 (47.7–50.8)	6069	27.1 (25.7–28.5)	6077	23.7 (22.4–25.0)
Pets Not allowed	6950	15.2 (14.4–16.0)	3042	46.5 (43.7–49.4)	1820	27.0 (24.5–29.6)	2088	26.5 (24.2–29.0)
No pets	22 542	40.5 (39.5–41.5)	10 768	52.1 (50.5–53.6)	5506	24.3 (22.9–25.7)	6268	23.7 (22.5–24.9)
Saw cockroach inside home past 30 d[e]								
Yes	4098	9.7 (9.1–10.3)	1800	43.7 (40.2–47.2)	984	26.8 (23.6–30.2)	1314	29.5 (26.7–32.5)
No	47 972	90.3 (89.7–90.9)	22 497	50.6 (49.5–51.7)	12 383	25.8 (24.9–26.8)	13 092	23.5 (22.7–24.4)
Saw or smelled mold past 30 d[e]								
Yes	6017	11.6 (11.0–12.2)	2335	41.5 (38.7–44.5)	1692	29.8 (27.2–32.6)	1990	28.7 (26.3–31.1)
No	45 844	88.4 (87.8–89.0)	21 899	51.1 (50.0–52.2)	11 640	25.4 (24.5–26.4)	12 305	23.5 (22.6–24.4)
Body mass index[e]								
Obese	20 714	39.4 (38.4–40.4)	8874	45.2 (43.5–46.9)	5401	26.1 (24.7–27.5)	6439	28.8 (27.3–30.2)
Non-obese	29 539	60.6 (59.6–61.6)	14 593	53.4 (52.0–54.7)	7495	25.8 (24.6–27.0)	7451	20.9 (19.9–21.9)
COPD[e,i]								
Yes	21 539	34.6 (33.7–35.5)	6868	33.7 (32.1–35.2)	5619	27.2 (25.8–28.7)	9052	39.2 (37.7–40.7)
No	30 480	65.4 (64.5–66.4)	17 417	58.6 (57.2–59.9)	7724	25.3 (24.1–26.5)	5339	16.2 (15.2–17.2)
Depression[e]								
Yes	19 734	34.7 (33.7–35.6)	7617	41.1 (39.4–42.7)	5230	26.4 (25.0–27.9)	6887	32.6 (31.0–34.1)
No	32 133	65.3 (64.4–66.3)	16 596	54.6 (53.3–55.9)	8077	25.8 (24.6–26.9)	7460	19.6 (18.7–20.6)

CI, confidence interval; SHS, secondhand smoke exposure; COPD, chronic obstructive pulmonary disease.

[a] Defined as the most impaired level from the one or more individual elements (i.e. daytime and night time symptoms in past 30 d and rescue medication use in past 3 months).

[b] Persons who answered “yes” to the question “Have you ever been told by a doctor or other health professional that you had asthma?” or “Has a doctor.”

[c] Unweighted pooled sample size, 2006–2010. Due to item non-response, individual characteristic categories may not sum to total.

[d] Weighted prevalence and 95% confidence interval.

[e] *p* values were <0.001 for the Chi-square test of association between asthma controlled status and all selected variables in the table.

[f] Race categories “white, non-Hispanic”, “black, non-Hispanic”, include persons who indicated only a single race group. “Other races, non-Hispanic” insurance includes Asian, American Indian Alaskan Native, Native Hawaiian and Other Pacific Islander, persons reporting more than one race, and persons reporting their race as something other than those listed here.

[g] Cost as barrier for primary care doctor, specialist, and medicine.

[h] Indicates secondhand smoke exposure (SHS).

[i] Combined responses to questions for COPD, emphysema, and chronic bronchitis.

J Asthma. Author manuscript; available in PMC 2015 August 28.