HHS Public Access

Author manuscript

Clin Pulm Med. Author manuscript; available in PMC 2016 August 25.

Published in final edited form as:

Clin Pulm Med. 2013 July ; 20(4): 172–177. doi:10.1097/CPM.0b013e3182991146.

Disparities in Asthma Care, Management, and Education Among Children With Asthma

Chanda N. Holsey, DrPH, MPH, AE-C[*], **Pamela Collins, MPA, MSA**[†], and **Hatice Zahran, MD, MPH**[†]

[*]Graduate School of Public Health, San Diego State University, San Diego, CA

[†]Air Pollution and Respiratory Health Branch, National Center for Environmental Health, Centers for Disease Control and Prevention, Atlanta, GA

Abstract

Health disparities are pervasive in the United States. Health and health care disparities are the differences or gaps in health (eg, life expectancy, morbidity, risk factors, and quality of life) and health care access and quality between segments of the United States population as related to race/ethnicity and socioeconomic status (eg, income, education). Multiple factors are associated with such disparities in asthma management and education. This article explores some of those factors and summarizes the strategies developed and interventions implemented to address disparities associated with asthma care and education among racial and ethnic minority children. It also discusses the need for further research to identify effective asthma education approaches for improving the management of asthma among racial and ethnic minority children. More exploration of the root causes of health care disparities, including policy studies in the area of social determinates of health and health equity, is also needed.

Keywords

health care disparities; child asthma management; asthma education; race/ethnicity; environmental factors

One fundamental concern of public health is why some people are healthier than others. Part of the answer may be related to health and health care disparities, which are the differences or gaps in health (eg, life expectancy, morbidity, risk factors, and quality of life) and health care access and quality between segments of the US population as related to race/ethnicity and socioeconomic status (eg, income, education):[1–4] A growing body of evidence over the past few decades has revealed racial and ethnic disparities in health and health care in the United States.[1–5] Racial and ethnic differences in health and health care generally reflect differences in life experiences (eg, family, social, and economic environment) and are closely linked to the relative privilege or disadvantage of the racial or ethnic group into which they are born.[6]

Address correspondence to: Chanda N. Holsey, DrPH, MPH, AE-C, Founder, Healthy Aims for Little Ones and Families®, P.O Box 9648, Fleming Island, FL. chandanicole@hotmail.com.

The authors declare that they have no conflicts of interest.

Health disparities also exist among persons with asthma, resulting in higher morbidity and mortality rates among minority groups.[7] Children have consistently higher rates of asthma than adults.[8–10] Among children, asthma disproportionately affects non-Hispanic black children, compared with white children. In 2009, asthma prevalence for non-Hispanic black children (14.6%) was almost twice that of non-Hispanic white children (8.2%).[8] In addition, asthma prevalence among children increased significantly during 2001 to 2009 (8.7% to 9.6%); equating to an average annual increase of 1.6% (95% confidence interval, 0.8%-2.4%) (Table 1). A rising trend in asthma prevalence was observed among non-Hispanic black children during 2001 to 2009 (from 11.4% in 2001 to 17.0% in 2009), compared with non-Hispanic whites (8.6% to 9.6%) and Hispanics (7.1% to 7.7%; Table 1).

Health disparities across racial and ethnic groups might have socioeconomic roots.[5] According to the 2011 Centers for Disease Control and Prevention (CDC) Health Disparities and Inequities Report, racial and ethnic minority groups are poorer and have greater health needs than nonminorities.[5] Higher asthma prevalence among racial and ethnic minority groups causes substantial personal and economic burden and increased demands on health care systems.[11] After adjusting for age, sex, race, ethnicity, education, insurance, region, and number of medications, children with asthma had 92% higher total medical cost than children without asthma (regression coefficient: 1.92; $P < 0.0001$).[11] A 9-state study of Medicaid population utilization claim data to assess the quality of care and health care costs/utilization associated with common chronic diseases, showed that the medical cost of asthma for black patients and patients of other races aged 4 years or more was almost twice as much as white and Hispanic patients.[12]

Because children have consistently higher rates of asthma than adults,[8–10] we can postulate that health disparities have a greater impact on children's asthma care and management than adults. Therefore, this article focuses primarily on children with asthma, exploring the differences in asthma care and education, and studying the types of initiatives undertaken in disparate populations: Multiple factors as relate to 3 main areas of concern that contribute to disparities in the burden of asthma are examined: (1) health care quality and access, (2) asthma education, and (3) environmental factors. Insufficiencies and strengths are identified, as well as effective interventions and proposed strategies to address disparities in asthma care and management.

HEALTH CARE ACCESS AND QUALITY

The Definition

Racial disparities persist in health care access and quality between blacks and whites.[2] Racial and ethnic minority groups differ from non-Hispanic whites in the type of health care insurance and quality of health care.[13,14] Nonwhites are more likely than whites to be uninsured or to have nonprivate insurance [eg, Medicare, Medicaid, State Child Health Insurance Program (SCHP), state-sponsored, or other government-sponsored health plans].[13,14] Although SCHIP plays an important role in providing health insurance to uninsured, low-income children in the United States, including those who are homeless, still 6% of children with asthma do not have health insurance.[8] The same study also reported that a higher percentage of parents of uninsured children cannot afford to buy prescription

medicine or to visit a primary physician or specialist for medical care, compared with parents of insured children with asthma.[8] Racial and ethnic minority children may have access to health care through private or public health insurance programs; the quality of health care may still be a concern. The Institute of Medicine concluded that minorities and the poor receive suboptimal treatment with less care and poorer quality care than middle-class, educated individuals.[15–19]

The Problem

Not having a usual primary care provider among racial and ethnic minority groups is an indication of disparities in asthma care.[14,20] Having a usual source of medical care is essential for children with chronic diseases such as asthma because it provides consistent and coordinated medical care and disease management. Greek and colleagues investigated differences in the usual source of health care for children with asthma by race and ethnicity, English language proficiency in the Hispanic population, and family income. In the study, whites (52%) identified a specific physician as a usual source of care, followed by blacks (44%), English-speaking Hispanics (42%), and Spanish-speaking Hispanics (40%).[20] Moreover, Strunk et al[7] found that disparities in asthma care among black and Hispanic children contribute to an increased rate of hospitalization and likelihood of death.

Furthermore, racial and ethnic minority children are more likely to receive treatment for asthma in emergency departments as opposed to seeing a primary care physician for medical care. For example, during 2001 to 2003, non-Hispanic black children (22.0%) and Hispanic children (14.1%) had a higher rate of emergency department visits than white children (9.0%). During the same time period, black children had a higher hospitalization rate (4.9%) and a higher mortality rate (0.8/10,000) than non-Hispanic whites (2.3% and 0.2/10,000, respectively).[10] Racial and ethnic minority children are more likely to use inhaled short-acting bronchodilator medications rather than long-term anti-inflammatory medicine, an essential component of effective asthma control and management.[15,20,21]

Although asthma care providers and patients frequently discuss effective goals for proper asthma therapy and management, racial and ethnic minority groups are still less likely than non-Hispanic whites to receive guideline-based treatment. Many factors influence the quality of care received by racial and ethnic minority groups. Disparities occur when individual-related, environment-related, and health care system–related unfavorable conditions interact with one another over a number of years. No one factor explains asthma disparities among racial and ethnic minority groups; however, the role of low socioeconomic status in disparities in asthma care and health outcomes is well documented.[5,22–24]

The quality of care they receive is also a particular area of concern among black, Hispanic, and low-income patients who have access to usual health care services.[12,20,21] Patient comprehension may be a factor in not receiving adequate care. Greek et al[20] reported that Spanish-speaking Hispanics and the poor were more likely to report difficulty in obtaining an appointment and longer wait times when arriving on time for an appointment. Access to asthma specialists, who usually provide the best and most up-to-date asthma care, is an integral part of effective asthma care; however, racial and ethnic minorities are more likely to be seen by general practitioners than by asthma specialists.[15]

Effective Strategies to Address Health Care Quality and Access

Communication between asthma patients/caregivers and health care providers is critical because of the complexity of asthma care, especially among racial and ethnic minority groups. A study by Diette and Rand[25] showed the importance of effective communication between the health care provider and patient/caregiver and how effective communication would improve satisfaction with care and adherence to asthma therapy for minorities. A study by Lieu et al[26] which examined asthma care quality for children with managed Medicaid found that patients of clinical practice sites with high cultural competent scores were more likely to use a preventive asthma medication, a predictor of higher quality of care. Another study examined the impact of a continuing medical education program that improves patient health outcomes and found that this program was effective in enhancing provider communication skills, decreasing the number of days affected by asthma symptoms, and reducing asthma health care use.[27]

The use of quality improvement (QI) strategies may also be an effective method in improving asthma health care disparities. A multidisciplinary team demonstration project was conducted with seven clinics treating children with asthma. Compared with baseline numbers, the QI strategy using a continuous QI process team, clinical champion, community health worker (CHW), and project coordinator led to better adherence to asthma guidelines by the physicians and fewer patients reporting asthma symptoms, urgent care visits, hospitalizations, and missed school days.[28]

ASTHMA EDUCATION

The Definition

An effective asthma care and management regimen can significantly improve health outcomes and quality of life for persons with asthma. According to the National Heart, Blood, and Lung Institute Expert Panel Report 3: Guidelines for the Diagnoses and Management of Asthma (EPR-3), the goal of asthma management is to make patients symptom-free with optimized management. Reaching this goal requires performing frequent assessments, monitoring asthma severity and control, providing self-management education, controlling environmental factors and comorbid conditions, and providing medications to meet patient needs and circumstances.[20]

The Problem

Despite overall improvements in asthma care, improved therapeutic treatments, and more attention given to asthma self-management education, disparities in health outcomes of children of racial and ethnic minorities and low socioeconomic status are still well documented across health care systems.[22] Because the causes of asthma disparities are complex and multifactorial, educational and clinical strategies to address these disparities must also be multilevel and comprehensive.

Effective Strategies to Address Asthma Education

Encouraging and enabling families to use asthma management tools effectively will make a substantial difference in the lives of both the child with asthma and the caregiver. Whether in

the home, community, clinic, or school, patient-centered asthma self-management education has become increasingly important in improving measures of asthma morbidity.[15,20] Teaching the following is a key component of asthma self-management education[20]:

- understanding basic facts about asthma and asthma medications
- monitoring symptoms
- recognizing early signs of worsening asthma
- taking/administering medication correctly
- seeking appropriate medical care.

CDC monitors asthma self-management education status among persons with asthma in the United States. The findings from the 2008 National Health Interview Survey data analyses indicate no racial and ethnicity differences in receiving asthma self-management education among children with asthma reported by their caregivers except for 1 component: more caregivers of non-Hispanic black children (23.3%) reported taking a "formal class to learn how to manage their children's asthma," compared with caregivers of non-Hispanic white children (8.1%; Table 2). Sufficient evidence indicates that many racial and ethnic minority children and their parents continue to demonstrate asthma care and management levels that do not adhere to current EPR-3 guidelines.[12,23,24] Various factors such as poverty, lack of social support, low literacy, and barriers to asthma education (eg, cost, language, and cultural beliefs) influence the quality of asthma education that racial and ethnic minority children receive.[20] Adopting asthma education and communication strategies to address these barriers may improve the quality of asthma care among racial and ethnic minorities.[20]

Culturally specific education programs are proven effective for both blacks and Hispanics.[29] To develop a culturally competent intervention, health care providers should identify specific characteristics that can explain the cultural differences and tailor interventions toward those characteristics. LaRoche and colleagues examined the effect of the multifamily asthma group treatment, which was designed to improve asthma management and reduce emergency department visits among blacks and Hispanic families. Black and Hispanic families who had children with asthma improved parental asthma knowledge and decreased emergency department visits.[29]

A study to improve asthma health outcomes among low-income Puerto Rican children by educating families about asthma self-management found that children had significantly more symptom-free nights, were more likely to have their asthma under control, and were less likely to visit the emergency department and be hospitalized as compared with the control group. In addition, caregivers were more confident about managing their children's asthma.[30]

Paasche-Orlow et al[31] showed that culturally tailored one-on-one educational models increase knowledge and reduce barriers to low-literacy populations. Similarly, a longitudinal study of 110 minority children with asthma examined the effect of a combined literacy improvement and self-management asthma education. The findings indicated that, over a 6-month period, literacy and self-efficacy were improved among children. The study also

reported a correlation between literacy enhancement and a decrease in both hospitalization and emergency department visits.[32]

ENVIRONMENT

The Definition

The environment can play an important role in asthma-related health disparities. Exposure to environmental factors differs by geographic location, and exposure to environmental pollutants can vary substantially among sociodemographic subpopulations in the United States. Racial and ethnic minorities and low-income people are disproportionately exposed to pollutants in their homes and communities and may suffer adverse health effects as a result of such exposure.[33–35] Indoor home environment can also be unhealthy.[5] According to the CDC report, more non-Hispanic blacks (28.3%) and American Indian/Alaska natives (31.9%) lived in unhealthy houses (eg, presence of rodents or water leaks) in 2009 compared with non-Hispanic whites (22.7%).[5]

The Problem

Studies have linked poor asthma control to poor housing quality even after controlling for potentially confounding factors such as income, smoking, overcrowding, and unemployment[36] Some people are allergic to the flakes of skin or dried saliva from animals, dried dropping and remains of cockroaches, and pollen, mold spores, especially during allergy season. In urban settings, cockroach allergen is one of the major indoor allergen and a common cause of asthma. The previous studies have shown that exposure to tobacco smoke caused exacerbation of asthma symptoms among preschool-aged children and exposure to house dust mites causes development of asthma.[35,37]

Effective Strategies to Address Environmental Factors

Controlling environmental risk factors is as equally important as access to quality health care and the implementation of culturally tailored asthma education in low-income and minority populations. Home-based, multitrigger, and multicomponent interventions with an environmental focus are effective in improving overall quality of life and productivity in children and adolescents with asthma.[36–38] Furthermore, using CHWs to provide asthma education and multiallergen environmental mitigation for low-income families was successful in reducing health care use and improving quality of life.[39] Similarly, Morgan and colleagues found that a home-based intervention focused on reducing exposure to multiple indoor allergens and environmental tobacco smoke decreased symptoms (34 fewer days during the 2-y study period) among urban children with asthma.[40] In addition, Bryant-Stephens and Li[41] demonstrated that low-cost, in-home education and environmental remediation improved asthma control among urban children.

CONCLUSIONS

The determinants of disparities in asthma care are complex and multifactorial. Educational, clinical, and environmental strategies to address these disparities must also be multidimensional and comprehensive. Previous studies have shown that having no insurance

or insufficient insurance, low socioeconomic status, poor quality of care, language barriers, and poor living conditions are associated with disparities in asthma care among minority children.

Because of government safety net programs, such as Medicaid and SCHIP, many children with asthma have health insurance; however, having insurance does not necessarily mean having good quality of care. For example, minority children with asthma are more likely to be seen by general practitioners than by asthma specialists and more likely to seek care in emergency departments. Overall, minority children and their parents continue to demonstrate asthma care and management levels that do not adhere to current EPR-3 guidelines. A multidisciplinary approach can lead to the development of effective QI strategies such as training the providers to improve their cultural competency and establishing delivery system to make self-management education an integral part of asthma care. Efforts to promote health policy initiatives that lead to reimbursement for educational sessions provided by clinicians, health educators, and other health care professionals both inside and outside the clinical setting as well as services that reduce environmental asthma triggers and allergens could improve overall quality of care for minority children.

Effective asthma management includes empowering patients and caregivers through education to manage and control asthma. The EPR-3 recommends that patients and caregivers be educated at all points of care where health professionals interact with patients who have asthma, including clinics, medical offices, emergency departments and hospitals, pharmacies, homes, schools, and community settings. Asthma education interventions should be tailored as much as possible to the needs of each patient. In order to close the gap on disparities, asthma education should be culturally tailored to meet the needs of the minority population. Targeted interventions accounting for cultural, social, and educational differences can improve asthma management and subsequently will reduce the health and economic burden of asthma among disproportionately affected racial and ethnic minorities. The intervention should be culturally sensitive and also easily accessible and affordable, given socioeconomic barriers for asthma care among the minorities.

Since housing quality plays an important role in contributing to disparities in asthma care, home-based, multi-trigger, and multicomponent interventions with an environmental focus are needed to improve overall quality of life and productivity in children with asthma. The complexity of the causes of disparities in asthma care requires multicomponent interventions that focus on improving undesirable educational, health care, and environmental factors that some minorities face. Though a rich body of literature exists examining the effectiveness of asthma management strategies, the majority of these works have not taken into consideration cultural and other population characteristics. Further research is needed to identify effective asthma self-management education strategies for improving the management of asthma among racial and ethnic minority populations. More exploration of the root causes of health care disparities is also needed. This may require more in-depth analysis of factors that affect longevity and health and may include but not be limited to policy studies in the area of social determinates of health and health equity.

Acknowledgments

C.N.H., DrPH, MPH, AE-C is the president of the Association of Asthma Educators and receives support for meeting travel and accommodations.

References

1. National Institute on Minority Health and Health Disparities. Health disparities—mental health fact sheet. Available at: http://www.nimhd.nih.gov/hdFactSheet_gap.asp. Accessed September 23, 2011
2. US Department of Health and Human Services Healthy people. Disparities. Available at: http://www.healthypeople.gov/2020/about/disparitiesAbout.aspx. Accessed September 23, 2011
3. Agency for Healthcare Research and Quality. National Healthcare Disparities Report. 2008. Available at: http://www.ahrq.gov/research/findings/nhqrdr/nhdr08/nhdr08.pdf. Accessed September 23, 2011
4. Institute of Medicine (US). Introduction and Literature Review. In: Smedley, BD.; Stith, AY.; Nelson, AR., editors. Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care. Washington, DC: National Academies Press; 2003. p. 29-79.
5. Current Asthma Prevalence, United States, 2006–2008. CDC. CDC Health Disparities and Inequalities Report. United States, 2011. MMWR. 2011; 60(suppl):79–81.
6. Braveman, P.; Egerter, S.; An, J., et al. Race and Socioeconomic Factors. Princeton, NJ: Robert Wood Johnson Foundation; 2009.
7. Strunk RC, Ford JG, Taggart V. Reducing disparities in asthma care: priorities for research—National Heart, Lung, and Blood Institute workshop report. J Allergy Clin Immunol. 2002; 109:229–237. [PubMed: 11842290]
8. Zahran H, Bailey C, Garbe P. Asthma prevalence, disease characteristics, and self-management education—United States, 2001–2009. MMWR. 2011
9. Akinbami LJ, Moorman JE, Liu X. Asthma prevalence, health care use, and mortality: United States, 2005–2009. National Health Statistics Reports 2011. Jan 12.2011 (32)
10. Moorman JE, Rudd RA, Johnson CA, et al. National surveillance for asthma—United States, 1980–2004. MMWR Surveill Summ. 2007; 56:1–54. [PubMed: 17947969]
11. Kamble S, Bharmal M. Incremental direct expenditure of treating asthma in the United States. J Asthma. 2009; 46:73–80. [PubMed: 19191142]
12. Priest JL, Cantrell CR, Fincham J, et al. Quality of care associated with common chronic diseases in a 9-state Medicaid population utilizing claims data: an evaluation of medication and health care use and costs. Popul Health Manag. 2011; 14:43–54. [PubMed: 21142926]
13. Chino, M. From health disparities to health equity: navigating upstream. PowerPoint presentation presented at the California—Nevada Public Health Training Center Meeting; Las Vegas, NV. 2011.
14. National Center for Health Statistics. National Health Interview Survey (NHIS) Early Release of Selected Estimates Based on Data from the January–March 2011. Atlanta, GA: US Department of Health and Human Services, CDC, National Center for Health Statistics; Available at: http://www.cdc.gov/nchs/data/nhis/early-release/201109_02.pdf. Accessed October 4, 2011
15. Bryant-Stephens T. Asthma disparities in urban environments. J Allergy Clin Immunol. 2009; 123:1199–1206. [PubMed: 19501229]
16. Institute of Medicine, Committee on the National Quality Report on Health Care Delivery. Appendix A *Workshop: Envisioning a National Quality Report on Health Care*. In: Hurtado, MP.; Swift, EK.; Corrigon, JM., editors. Envisioning the National Healthcare Quality Report. Washington, DC: National Academies Press; 2001. p. 159-166.
17. Institute of Medicine. Chapter 2: The Healthcare Environment and Its Relation to Disparities. In: Smedley, BD.; Stith, AY.; Nelson, AR., editors. Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care. Washington, DC: National Academies Press; 2003. p. 80-124.
18. Institute of Medicine. Chapter 3: Assessing Potential Sources of Racial and Ethnic Disparities in Care: Patient-and System-Level Factors. In: Smedley, BD.; Stith, AY.; Nelson, AR., editors. Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care. Washington, DC: National Academies Press; 2003. p. 125-159.

19. Institute of Medicine. Chapter 4: Assessing Potential Sources of Racial and Ethnic Disparities in Care: The Clinical Encounter. In: Smedley, BD.; Stith, AY.; Nelson, AR., editors. Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care. Washington, DC: National Academies Press; 2003. p. 160-179.
20. Greek AA, Kieckhefer GM, Kim H, et al. Family perceptions of the usual source of care among children with asthma by race/ethnicity, language, and family income. J Asthma. 2006; 43:61–69. [PubMed: 16448968]
21. Riekert KA, Butz AM, Eggleston PA. Caregiver-physician medication concordance and under treatment of asthma among inner-city children. Pediatrics. 2003; 111:e214–e220. [PubMed: 12612274]
22. National Institutes of Health, Narional Heart, Lung, and Blood Institute. Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma. Bethesda, MD: US Department of Health and Human Services, National Institutes of Health, National Heart, Lung, and Blood Institute; 2007. Available at: http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.pdf. Accessed April 7, 2011
23. Agency for Healthcare Research and Quality. National Healthcare Disparities Report: Summary February 2004. Rockville, MD: Agency for Healthcare Research and Quality; Available at: http://www.ahrq.gov/qual/nhdr03/nhdrsum03.htm. Accessed April 7, 2011
24. Haselkorn T, Lee JH, Mink DR, et al. TENBOR Study Group. Racial disparities in asthma-related health outcome in severe or difficult-to-treat asthma. Ann Allergy Asthma Immunol. 2008; 101:256–263. [PubMed: 18814448]
25. Diette GB, Rand C. The contributing role of health-care communication to health disparities for minority patients with asthma. Chest. 2007; 132(suppl):802S–809S. [PubMed: 17998344]
26. Lieu TA, Finkelstein JA, Lozano P, et al. Cultural compentence policies and other predictors of asthma care quality for Medicaid-insured children. Pediatrics. 2004; 114:e102–e110. [PubMed: 15231981]
27. Cabana MD, Slish KK, Evans D, et al. Impact of physician asthma care education on patient outcomes. Pediatrics. 2006; 117:2149–2157. [PubMed: 16740859]
28. Fox P, Proter O, Lob S. Improving asthma related health outcomes among low-income, multiethnic, school-aged children: results of a demonstration project that combined continious quality improvement and community health worker strategies. Pediatrics. 2007; 129:e902–e911. [PubMed: 17908746]
29. LaRoche MJ, Koinis-Mitchell D, Gualdron L. A culturally competent asthma management intervention: a randomized controlled pilot study. Ann Allergy Immunol. 2006; 96:80–85.
30. Canino G, Normand SL, Acosta-Perez E, et al. Reducing asthma health disparities in Poor Puerto Rican childen: the effectiveness of a cultually tailored family intervention. J Allergy Clin Immunol. 2008; 121:665–670. [PubMed: 18061648]
31. Paasche-Orlow MK, Riekert KA, Biderback A, et al. Tailored education may reduce health literacy disparities in asthma self-management. Am J Respir Crit Care Med. 2005; 172:980–986. [PubMed: 16081544]
32. Robinson L, Calmes D, Bazargan M. The impact of literacy enhancement on asthma-related outcomes among underserved children. J Natl Med Assoc. 2008; 100:892–896. [PubMed: 18717138]
33. Gwynn RC, Thurston GD. The burden of air pollution: impacts among racial minorities. Environ Health Perspect. 2001; 109(suppl 4):501–506. [PubMed: 11544154]
34. Gunier RB, Hertz A, Von Behren J, et al. Traffic density in California: socioeconomic and ethnic differences among potentially exposed children. J Expo Anal Environ Epidemiol. 2003; 13:240–246. [PubMed: 12743618]
35. Institute of Medicine (US). Committee on the Assessment of Asthma and Indoor Air. Division of Health Promotion and Disease Prevention. Clearing the Air: Asthma and Indoor Air Exposure. Washington, DC: The National Academy Press; 2000.
36. Crocker DD, Stella K, Dumitru GG, et al. Effectiveness of home-based, multi-trigger, multicomponent interventions with an environmental focus for reducing asthma morbidity. Am J Prev Med. 2011; 41(2Sl):S5–S32. [PubMed: 21767736]

37. Woods RA, Peyton A, Eggleston MD, et al. Cockroach allergen abatement with extermination and sodium hypochlorite cleaning in inner-city homes. Ann Allergy Asthma Immunol. 2001; 87:60–64. [PubMed: 11476465]

38. Evans R III, Gergen PJ, Mitchell H, et al. A randomized clinical trial to reduce asthma morbidity among inner-city children: Results of the National Cooperative Inner-City Asthma Study. J Pediatr. 1999; 135:332–338. [PubMed: 10484799]

39. Krieger J, Takaro T, Song L, et al. The Seattle-King County healthy homes project. Am J Public Health. 2005; 95:652–659. [PubMed: 15798126]

40. Morgan WJ, Crain EF, Gruchalla RS, et al. Results of a home-bases environmental interventions among urban children with asthma. N Engl J Med. 2004; 351:1068–1080. [PubMed: 15356304]

41. Bryant-Stephens T, Li Y. Community asthma education program for parents of urban asthmatic children. J Natl Med Assoc. 2004; 96:954–960. [PubMed: 15253327]

TABLE 1

Asthma Prevalence Among Children* by Race/Ethnicity and Year—National Health Interview Survey, United States, 2001 to 2009

	% (SE)			
Year	**Total Children**	**White Children**	**Black Children**	**Hispanic Children**
2001	8.7 (0.31)	8.6 (0.40)	11.4 (0.91)	7.1 (0.53)
2002	8.3 (0.31)	8.0 (0.40)	12.5 (0.94)	6.3 (0.48)
2003	8.5 (0.31)	7.6 (0.41)	13.6 (0.84)	7.4 (0.60)
2004	8.5 (0.30)	8.2 (0.38)	12.8 (0.94)	6.9 (0.47)
2004	8.5 (0.30)	8.2 (0.38)	12.8 (0.94)	6.9 (0.47)
2005	8.9 (0.31)	8.0 (0.38)	13.0 (0.92)	8.6 (0.61)
2006	9.3 (0.38)	8.8 (0.51)	12.7 (0.91)	9.0 (0.78)
2007	9.1 (0.37)	7.4 (0.49)	15.5 (1.11)	9.3 (0.71)
2008	9.4 (0.40)	8.8 (0.55)	15.7 (1.14)	6.7 (0.69)
2009	9.6 (0.37)	8.5 (0.48)	17.0 (1.36)	7.7 (0.67)
Average annual increase (9S% CI)	1.6 (0.8, 2.4)	0.3 (−1.5, 2.2)	4.1 (2.0, 6.3)	27 (−1.3, 6.9)

* Children aged below 18 years.

CI indicates confidence interval.

TABLE 2

Self-management Education Status Among Children* With Asthma† by Race/Ethnicity—National Health Interview Survey, United States, 2008

Self-management Education‡	All Children (n=806) % (95% CI§)	White Children (n=340) % (95% CI)	Black Children (n=233) % (95% CI)	Hispanic Children (n=173) % (95% CI)
Given an asthma action plan	44.3 (40.0, 48.8)	44.9 (38.3, 51.8)	48.9 (40.8, 57.0)	39.6 (31.5, 48.3)
Taken a class to learn how to manage their asthma	12.5 (10.0, 15.7)	8.1 (5.34, 12.2)	23.3 (16.7, 31.5)	11.6(7.1, 18.3)
Taught to recognize early signs and symptoms of an asthma attack	72.1 (68.1, 75.9)	73.6 (67.6, 78.9)	75.4 (67.6, 81.2)	64.2 (53.7, 73.7)
Taught to respond to an asthma attack	78.3 (74.2, 82.0)	80.6 (75.0, 85.1)	78.9 (71.6, 84.8)	68.0 (57.3, 77.1)
Taught how to use a peak flow meter	49.4 (45.1, 53.7)	50.5 (43.9, 57.1)	56.7 (48.7, 64.3)	39.9 (30.9, 49.6)
Given advice on environment control	50.6 (45.9, 55.2)	52.5 (45.8, 59.1)	51.9 (44.2, 59.4)	43.8 (33.8, 54.3)

*Children aged below 18 years.

†Includes persons who answered “yes” to the questions, “Have you ever been told by a doctor or other health professional that (you/your child) had asthma?” and “Do (you/your child) still have asthma?”.

‡Ever been taken/given.

§Weighted estimates.

CI indicates confidence interval.