

# Asthma disparities in urban environments

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#### Activity Objectives

1. To discuss the continued disparities in asthma morbidity between minority and white children.
2. To review the social and environmental factors that contribute to these disparities.
3. To understand that effective interventions to improve asthma outcomes must be multifactorial and address social and environmental aspects of care.

**Recognition of Commercial Support:** This CME activity has not received external commercial support.

#### Disclosure of Significant Relationships with Relevant Commercial

**Companies/Organizations:** T. Bryant-Stephens has received research grants from the Merck Childhood Asthma Network and the Center for Disease Control Research.

**Asthma continues to disproportionately affect minority and low-income groups, with African American and Latino children who live in low-socioeconomic-status urban environments experiencing higher asthma morbidity and mortality than white children. This uneven burden in asthma morbidity has been ever increasing despite medical advancement. Many factors have contributed to these disparities in the areas of health care inequities, which result in inadequate treatment; poor housing, which leads to increased exposure to asthma allergens; and social and psychosocial stressors, which are often unappreciated. Interventions to reduce individual areas of disparities have had varying successes. Because asthma is a complex disease that affects millions of persons, multifaceted comprehensive interventions that combine all evidence-based successful strategies are essential to finally closing the gap in asthma morbidity. (J Allergy Clin Immunol 2009;123:1199-206.)**

**Key words:** *Asthma, disparities, children, community-based, asthma morbidity, asthma interventions*

#### Abbreviations used

CAPP: Community Asthma Prevention Program of Philadelphia  
CHC: Community health center  
CHW: Community health worker  
ETS: Environmental tobacco smoke  
NAEPP: National Asthma Education Prevention Program  
NCICAS: National Cooperative Inner-City Asthma Study  
QI: Quality improvement  
SCHIP: State Children's Health Insurance Plan  
SES: Socioeconomic status

Asthma is the most common chronic childhood disease. Despite known effective strategies for asthma management, asthma continues to disproportionately affect minority and low-income groups, with African American and Latino children who live in low-socioeconomic-status urban environments experiencing higher rates of asthma prevalence, morbidity, and mortality than white children. Many studies have attempted to determine the reasons for asthma disparities among minority children with varying results. In the Second National Health Interview Survey, younger maternal age, residence in the city center, family income, low birth weight, and measures of overweight or obesity were associated with increased prevalence of asthma among black compared with white children.<sup>1</sup> In contrast, a study of 6 US cities found that even after controlling for environmental exposures, parental history, and demographic factors, black children still had 1.6 times the odds of asthma diagnosis compared with white children.<sup>2</sup>

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Received for publication January 29, 2009; revised March 26, 2009; accepted for publication April 14, 2009.

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0091-6749/\$36.00

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doi:10.1016/j.jaci.2009.04.030

Although at historically high levels, asthma morbidity indices have reached a plateau over the past 10 years, but the gap between black and white populations has widened.<sup>3</sup> Blacks are more likely to have asthma and are 2.5 times more likely to experience asthma-related emergency department visits and hospitalizations. Moreover, blacks are 5 times more likely to die from asthma than whites.<sup>4</sup> Yet the disparity in asthma morbidity is greater than the disparity in asthma prevalence, which suggests that once asthma is established, many factors converge to make asthma worse for underrepresented minority children and adults.<sup>2</sup> These factors include access to care, exposure to smoking, and adherence to treatment among inner-city children.<sup>5</sup>

Not only is this an ethical problem, it is an economic and societal problem. In general, health expenditures have been estimated to be 3 times higher in children with asthma compared with expenditures in those without asthma. The total expenditure for asthma in 2007 was 37.2 billion dollars.<sup>6,7</sup> In the current economy more than 41 million persons are uninsured, and in 2006, the number of uninsured children was 8.7 million, 11.7% of all children in the United States. As this number has increased each year, many times the burden of cost has rested on the state coffers (contributing to national expenditures) and child caregivers. Research has shown that inequities in insurance coverage might contribute to inequities in health care access and care, with a greater portion of costs now shifted onto caregivers.<sup>8-10</sup> Given the costs of asthma medications (up to hundreds of dollars monthly), insufficient insurance coverage can mean unaffordable health care for low-income families and partially explain the disproportionate level of hospitalized black compared with white children.<sup>11</sup> Black children who are insured by Medicaid are more likely to have emergency department visits, causing increased costs, and are less likely to make primary care visits, a potentially preventive and cost-saving behavior.<sup>12,13</sup>

Although the costs for asthma are high, there is no one factor that can explain the gaps in asthma disparities among blacks and whites, but, poverty in particular plays a major role. In the United States 1 in 5 children grows up in neighborhoods characterized as poor, and for racial/ethnic minorities (particularly blacks), the rates are even higher.<sup>14</sup> Minority status, urban residence, and low socioeconomic status (SES) are closely interrelated in the United States. Wright and Subramanian<sup>15</sup> found in low-SES areas that those who live in predominately segregated minority neighborhoods bear a disproportionate asthma burden. They postulate that these neighborhoods might also be more exposed to air pollutants, indoor allergens (roaches and mice), and irritants, such as tobacco smoke. Ultimately, to affect asthma disparities, one must understand the interrelationships of factors that function at the individual, family, and community levels. Given the interrelatedness of factors contributing to asthma prevalence and morbidity, as well as the complexity of asthma, attempted interventions that target one area of this complex disease have had varied outcomes. The purpose of this article is to identify where disparities between blacks and whites exist in the areas of health care, home environment, and social/psychosocial environments and to consider how interventions such as asthma education and cultural competency training can contribute to addressing racial and socioeconomic disparities in asthma care. First, we will outline some of the major contributors to asthma disparities in the inner-city population, particularly as it relates to how these disparities impact health access and quality of care. We will then discuss several interventions that seek to address these contributors.

## HEALTH CARE DISPARITIES

The Institute of Medicine concluded that regardless of ethnicity, immigrant status, English language literacy, location of residence or socioeconomic status (SES), minorities and poor receive suboptimal treatment with less care and poorer quality care than middle class educated individuals.<sup>16</sup>

Differences in access to care have been documented with significant disparities across SES, racial and ethnic groups. Further racial disparities exist in access to health care and the quality of health care between blacks and whites.<sup>17</sup> Keickhefer and colleagues,<sup>18</sup> in a national survey conducted in 1996-2000, investigated the degree that families of children given diagnoses of asthma have a usual source of care, which is an indicator for good primary health care and essential for children with chronic illness. The results indicated that significant differences occur by race/ethnicity, language, and income. Whites (96%) were most likely to have a usual source of care, with blacks (92%) and non-English-speaking Hispanics (89%) less likely. Similarly, whites (52%) were more likely to identify a specific physician, followed by blacks (44%) and Spanish-speaking Hispanics (40%). Moreover, Strunk et al<sup>19</sup> found that ethnic and racial minorities experienced disparities in access to asthma care that lead to greater morbidity and mortality; black children who do not have a source of regular care are more likely to have increased morbidity.

Yet even when racial/ethnic minorities and low-SES patients have access to care, quality of care might still be an issue. Patients who have a primary care physician might experience substandard care because of both physician monitoring and patient comprehension.<sup>20</sup> In asthma management the ultimate goal is that patients will be symptom-free through optimized management, which includes severity classification, asthma control assessment, appropriate controller medicines, pulmonary function evaluation, avoidance of asthma triggers, and self-management education.<sup>21</sup> However, blacks are less likely than whites to experience optimized management because they are more likely to receive treatment for asthma in emergency departments, to use inhaled bronchodilator medications rather than controller medicine, and to receive care in poorer facilities with irregular follow-up. Moreover, racial/ethnic minorities are more likely to be seen by general hospital providers rather than by asthma specialists, who will provide the best asthma care.<sup>16</sup> This is evidenced in a study of children insured by Medicaid, in which fewer than half (45.8%) used National Institutes of Health-recommended controller medication, and instead, a majority (70.8%) managed symptoms with an inhaled  $\beta$ -agonist inhaler.<sup>22</sup>

Quality of care is also affected by communication between patients and providers, particularly across cultures. When persons of color access routine care, physicians are often unknowingly biased in their care.<sup>16</sup> This might partially be explained by different styles of communication between providers and patients, different belief systems, and unfamiliarity with the patients'/caregivers' social stressors, which affect their ability to be adherent to treatment.<sup>23</sup> Previous studies show that physicians adopt the National Asthma Education and Prevention Program (NAEPP) evidence-based guidelines in varying degrees. Given this discrepancy, minorities are still less likely to receive guideline-based treatment than whites. For example, NAEPP guidelines emphasize severity classification at the time of initial diagnosis. Yet studies have demonstrated that providers frequently underestimated symptom severity, which led to lower rates of

**TABLE I.** Highlighted interventions summary

Reference	Intervention	Research design	Population	Outcome
Cloutier <sup>34</sup>	HC: Easy breathing NAEPP guideline-based asthma management program for outpatient treatment of asthma	Prospective, longitudinal	2362 urban Hispanic and African American children	Decreased hospitalizations for both groups, decreased ED visits for Hispanics
Fox et al <sup>35</sup>	HC: Quality improvement Multidisciplinary team at 7 clinic sites	Prospective	7 urban pediatric clinics	Better adherence to guidelines by physicians, fewer reported asthma-related uses and symptoms
Howden-Chapman et al <sup>40</sup>	ENV: Replaced heating to reduce NO <sub>2</sub> levels in homes	Randomized controlled trial	409 children with asthma in New Zealand	Less absences; less urgent visits for asthma
Pilotto et al <sup>41</sup>	ENV: replaced heaters to reduce NO <sub>2</sub> levels in schools	Randomized controlled trial	18 schools, 98 children	Less asthma symptoms, no change in FEV <sub>1</sub>
Krieger et al <sup>42</sup>	ENV: Comprehensive home environment reduction of asthma triggers	Randomized controlled trial	274 low-income households	Reduction in antigens; improved quality of life and decreased health services use, no symptom improvement
Bryant-Stephens et al <sup>43</sup>	ENV: Comprehensive home environment reduction of asthma triggers	Randomized controlled trial	264 urban African American households	Both CHW groups had less symptoms, ED, inpatient visits; case-controlled population had more ED and inpatient visits
Morgan et al <sup>44</sup>	ENV: Comprehensive home environment reduction of asthma triggers	Multicenter randomized controlled trial	937 children in 7 major cities	Reduction of antigen; reduced symptom days, rescue medication use, and unscheduled sick visits
Canino <sup>46</sup>	CE: Home asthma education in 8 modules	Randomized controlled trial	221 children in Puerto Rico	Less hospitalizations and ED visits, increased asthma control and increased symptom-free nights
Robinson et al <sup>48</sup>	CE: Literacy and asthma self-management education in schools	Prospective, longitudinal	110 minority children in South Los Angeles	Less hospitalizations and ED visits, higher literacy skills and self-efficacy
Magszeman et al <sup>49</sup>	CE: School asthma education	Prospective, longitudinal	990 predominantly African American children	Reduction in symptoms and urgent care visits
Gerald et al <sup>51</sup>	CE: Comprehensive asthma education and medical management for students	Randomized controlled trial in 54 schools	736 predominantly African American children	No changes in school absences, grade point average, ED or inpatient visits

controller medications.<sup>22,24</sup> Unrecognized bias and misassumptions can contribute to this discrepancy.

NAEPP guidelines stress the importance of collaborating and negotiating in asthma care, but differences in race and ethnicity between patients and their providers can represent important cultural barriers to effective communication and partnerships for care.<sup>20</sup> Caregiver factors, such as literacy, language barriers, and lack of self-efficacy in low-income minority groups, might interfere with their feeling of empowerment and ability to communicate with the physician. Perhaps most importantly, physician factors, such as unintentional racial biases in interpreting symptoms, poor understanding of the patient's cultural and educational context, and low expectations, have been found to significantly influence the level of care that low-income minority patients receive.<sup>20</sup> Physicians were also found to be more verbally dominant and engaged in less patient-centered communication with black than with white patients.<sup>25</sup>

Differences in communication can also influence management decisions. In a study of black and white adults with asthma, it was found that African Americans used different words to describe their symptoms after a methacholine challenge. Their words described upper airway symptoms rather than lower airway symptoms.<sup>26</sup> It is not clear whether this represents a difference in perception or an actual physiologic event. Regardless, this might contribute to the underestimation of symptoms by physicians. Thus communication skills and recognition of biases all

must be integrated when training young physicians and integrated into all professional asthma management courses.

Furthermore, the physician's ability to assess health beliefs and health literacy also affect patient-provider interactions and determines whether asthma management will be integrated into the patient's lifestyle. Apter et al<sup>27</sup> found that patients' beliefs affect whether they actually adhere to the medications and that communication by the physician influences the patients' health beliefs. Riekert et al<sup>22</sup> found that even when providers practiced according to the guidelines, at least a third of the patients did not take their controller medications because of their health beliefs. Others have also found that inattention to cross-cultural communication and health beliefs negatively affect asthma care and management.<sup>28</sup> Improving communications between physicians and caregivers-patients will require standardized training in communication skills and ability to assess symptoms and health beliefs in a caring manner.

## ENVIRONMENTAL DISPARITIES

Environmental disparities also play a role in asthma prevalence and morbidity. Indoor environmental exposures are a known risk factor for increased asthma morbidity and mortality rates among poor minority children in inner-city environments. The inner-city environment is characterized by overcrowding, housing density, crime, and older dilapidated housing. Overcrowding and dilapidated building structures become breeding grounds for indoor

allergens and triggers because of excessive moisture and water damage, which allows mites, mold, and cockroaches to multiply; breaks in walls, which allows rodents and cockroaches to enter; poor ventilation, which leads to higher environmental tobacco smoke (ETS), nitrous oxide, and allergen levels; and deteriorated carpeting, which becomes a reservoir for house dust mites and cockroach antigens. In this environment sensitization to cockroach antigen appears to occur early in life and is associated with increased asthma morbidity. In the National Cooperative Inner-City Study (NCICAS) urban children from low-income families were more likely to be exposed to cockroaches, which were associated with increased asthma symptoms and emergency department visits.<sup>29</sup>

As one might expect, exposure to cockroach allergen is significantly associated with household income. Families with lower incomes tend to have a greater exposure to cockroach antigen and to experience deteriorated housing, which has been directly related to high cockroach antigen levels in urban homes. Holes in the wall/ceiling were associated with a 6- to 11-fold increase in kitchen cockroach allergen concentrations ( $P < .05$ ). Occupancy in an apartment unit of 2 years or more was also associated with increased cockroach allergen concentrations.<sup>29,30</sup> Given this amount of exposure, it is not surprising that up to 70% of children and young adults with asthma have 1 or more positive skin test results.<sup>31</sup> In the NCICAS the most common positive skin test results were to *Alternaria* species (38%), cockroach (36%) and house dust mite (35%), whereas the most common exposures were to cockroach (89%), cat (86%), and dust mite (49%). When a child had both sensitivity and exposure, they were at increased risk for asthma morbidity, with the inpatient rate 3 times higher and unscheduled visits 2 times higher.<sup>29</sup>

Although it is not an allergen, one of the more refractive asthma triggers in the urban environment is ETS. Exposure to ETS, whether prenatal or postnatal, has been associated with increased asthma prevalence and morbidity.<sup>32</sup> In the NCICAS the rate of ETS exposure was quite high, with greater than 59% of children having at least 1 smoker in their homes, 39% having a primary caretaker who smoked, and greater than 48% having increased urinary cotinine levels compatible with heavy exposure to ETS.<sup>29</sup> Similar findings have been reported in other studies. Significantly more patients reporting ETS exposure also report exposure to cockroach allergen and mold than those not reporting ETS exposure. Furthermore, poorer quality of life is significantly associated with both cockroach and ETS exposure.<sup>33</sup>

In older dilapidated homes children are often exposed to more than 1 allergen, irritant, or both. Other common exposures include pets, mice, rats, house dust mite, and nitrous oxide.<sup>34-37</sup> Nitrous dioxide is an industrial pollutant that is generated as a byproduct of combustion and is generated by gas stoves and space heaters. Inner-city homes, which often have poor ventilation, frequently contain levels in excess of the US Environmental Protection Agency's environmental standards ( $>50$  ppb), which can also contribute to asthma morbidity.<sup>5</sup> Given the myriad of indoor asthma triggers in the homes of inner-city dwellers, supportive resources for home dwellers are essential in reducing triggers, thereby reducing asthma symptoms and the burden of asthma.

## SOCIAL DETERMINANTS OF DISPARITIES

Disparities that exist in health care and the environment for inner-city children with asthma are further affected by disparities

in social settings. In addition to poor housing, caregivers of children with asthma are often faced with disparities in neighborhoods with fewer supportive and essential resources and related chronic stressors.<sup>14</sup> Many times families are entrapped by lack of opportunities, services, and institutions that are needed for a family to succeed. Disadvantaged neighborhoods often have high crime rates, which interfere with the patients' and caregivers' ability to access safe transportation. All of this together can result in social and geographic isolation, which become important barriers to good health care. For example, lack of access to something as basic as transportation affects caregiver and patient compliance with office visits and travel to pharmacies and therefore asthma management. Lack of resources to sustain adequate housing and telephone access also can interfere with their adherence to both medical and environmental interventions prescribed, essential components of asthma management.<sup>38-40</sup>

Life stress affects health beliefs and behaviors, which in turn affect asthma management and the need for hospital treatment.<sup>14</sup> Many inner-city black parents have limited resources in the area of extended family social support.<sup>41</sup> Support from family members might not be available because they are facing similar (economic and social) stressors. Therefore a chronic illness, such as asthma, contributes additional caregiver psychologic stress and impairs the caregiver's ability to effectively manage his or her child's asthma.<sup>42</sup> These stressors might differ depending on race. For example, white parents reported that the most time-consuming caregiver demand was providing emotional support for their children, whereas black parents cited managing work or school outside the home and organizing asthma treatments at the same time as the most time-consuming demand. Understanding how to tailor asthma management to accommodate stressful lifestyles is important in helping caregivers provide optimal care at home.

Stressors associated with poverty, family dysfunction, and neighborhood conditions, such as exposure to violence, have been associated with pediatric asthma symptoms.<sup>43,44</sup> Chen et al<sup>45</sup> describe the role of psychosocial mechanisms that can lead to physiologic changes, such as increased asthma symptoms and poorer pulmonary function through allergic inflammation. Children with asthma who have increased psychosocial stress are significantly more likely to be ill and require hospital treatment.<sup>46</sup> For 18 months, Sandberg et al<sup>46</sup> studied 90 children (6-13 years old) who had moderate-to-severe asthma. Their research showed that severe negative life events in the presence of chronic stressors (eg, illness and family breakdown) significantly increased the likelihood of new asthma exacerbations in children. In addition to increasing asthma knowledge and skills, coping strategies and increased social support will be necessary to offset the effect of stressors, thus facilitating appropriate care for the child with asthma. Given the breadth of disparities that exist for inner-city children with asthma, it becomes overwhelming to consider solutions that would lead to better asthma outcomes. It is important to examine where strides have been made in attempting to address the many factors that contribute to disparities through health care and environmental and educational interventions.

Health literacy is still largely an underexplored frontier in health care that contributes to the disparities in asthma care. These inner-city areas not only have high illiteracy rates they also have low rates of high school graduation. Just being illiterate reduces quality of life<sup>47</sup> and adherence and ability to properly use medications.<sup>48</sup> Moreover, in clinical settings with time pressures, it is



often difficult for physicians to spend the time necessary to assess literacy and to appropriately tailor their education. This translates to an increased reliance on written materials that might not be written for low-literacy populations, which puts low-literacy patients and caregivers at a further disadvantage.

It appears through the previous discussion that there are multiple factors that contribute toward the disparities that black children with asthma face in health care, their environment, and their social settings. Many studies have attempted to find strategies that would effectively close the gap. The second part of the article will describe interventions that have tackled individual factors that lead to the disparities and their relative successes.

## INTERVENTIONS

### Health care interventions

Access to health care is a system-wide problem that requires system-wide solutions. There needs to be either access to affordable health insurance with a robust range of services and cost-sharing arrangements or access to free services from providers who are paid to provide this care. Two system-wide efforts to improve access to care are the community health centers (CHCs) and the State Children's Health Insurance Plan (SCHIP). CHCs are federally funded nonprofit agencies that provide primary care service to the underinsured or uninsured. By providing a usual source of care, CHCs have had some success in improving targeted health outcomes.<sup>49</sup> Unfortunately, with the current economy, the growth of the uninsured has outpaced the growth of CHCs.<sup>8</sup> Policies toward funding for additional CHCs would serve to make access to care available for all uninsured children, providing a usual source of care.

Another promising solution is SCHIP, which provides health care for all uninsured children modeled after commercial managed care programs. SCHIP has the potential to reduce disparities by providing equal access to care for children who do not qualify for Medicaid but are not insured. Each state sets its own guidelines regarding eligibility and services. These children are the ones who exist in the gap of not qualifying for Medicaid but with caregivers who are unable to provide insurance, and minority children were less likely to have been insured, have employer-sponsored coverage, or a usual source of care but more likely to be enrolled in Medicaid than private insurance and be in poor health before SCHIP.<sup>9</sup> SCHIP has the potential to play a very important role in reducing racial and ethnic disparities in providing access to health care. Those children enrolled in SCHIP who lived in New York City were found to demonstrate significant improvements in access, continuity, and quality of care with increased use of the usual source of primary care once they received SCHIP.<sup>49</sup>

Once the patient has established a medical home, establishing trusting patient-provider relationships is essential to ensure appropriate asthma care. Focusing on improving physician communication skills in assessing health beliefs and providing nonjudgmental feedback has been found to be effective in improving asthma outcomes, reducing stress, and improving patient satisfaction.<sup>50-52</sup> Systemic efforts to improve relationships should target increased minority physicians in the workforce. Saha et al<sup>53</sup> found that when black patients have black physicians, they are more likely to report receiving preventive care and all needed medical care.

Another focus in improving health care disparities is the use of quality improvement (QI) strategies, which are often

implemented as disease management programs. QI strategies are characterized by a multidisciplinary approach requiring team effort and implementation of small steps with immediate evaluation. For example, in one study investigators activated a multidisciplinary team (consisting of a clinical champion, a community health worker [CHW], and a project coordinator) in 7 pediatric clinic sites. An intense QI program led to better adherence to asthma guidelines by the physicians. In addition, significantly fewer patients reported asthma symptoms, urgent care visits, hospitalizations, and missed school days compared with baseline numbers. In addition to being an integral member of the CQI team, the CHWs provided home asthma education, case coordination services, and home visits for environmental assessment and mitigation.<sup>54</sup> Other quality management strategies, such as pay-for-performance, are now under investigation and might prove to be effective in improving quality of care.<sup>20</sup> Disease management programs have also been effective in improving asthma management. Cloutier<sup>55</sup> conducted a disease management program for a municipal health department that increased primary care physicians' adherence to the NAEPP guidelines and resulted in reduced hospitalizations, emergency department visits, and outpatient visits for children with asthma. Essential components of this program were the team approach and the specialist support.

These types of health care interventions point to a best-practice model of care that would include equal access to all children in a quality-driven environment implemented by physicians who are trained to establish trust and 2-way communication. Implementation of this model would be a giant step toward eliminating disparities.

### Environmental interventions

The best asthma management plan includes quality health care and avoidance of environmental triggers. Environmental mitigation strategies that are comprehensive and multifaceted produce the best outcomes for children with asthma. Common indoor antigens include cockroach, house dust mite, rodents, pets, and molds. The Inner-City Asthma Study demonstrates that practical measures for cockroach, rodents, and house dust mites combined with high-efficiency particulate air filtration and home-based education are capable of reducing daily symptoms.<sup>56</sup> Efforts to reduce individual antigens have had mixed success. For example, a cockroach antigen reduction intervention which included integrated pest management was effective up to 6 months in public housing units.<sup>57</sup> In contrast, in a recent review of 54 trials, house dust mite control through physical avoidance measures or chemical treatment did not show any benefit in symptoms, peak flows, or medication use.<sup>58</sup> Other studies that have looked at nitrous oxide reduction successfully reduced school absences and asthma symptoms.<sup>59,60</sup>

Most effective environmental strategies are comprehensive and multifaceted in nature. This is not surprising given the findings of the NCICAS, in which many children were sensitive to multiple antigens. Programs that include mitigation along with education appear to be the most successful. In studies that have looked at comprehensive environmental and educational interventions in homes of children with asthma, there have been generally positive results. Krieger et al<sup>61</sup> found that using CHWs to provide high-intensity asthma education and multiallergen environmental mitigation for low-income families was successful

in reducing health care use and allergens and improving quality of life. Bryant-Stephens et al<sup>62</sup> found in a randomized control trial with a historical control that using CHWs to conduct a home education and environmental mitigation project was successful in reducing allergens, symptoms, and health care use. In perhaps the largest study, Morgan et al<sup>63</sup> conducted a multicenter randomized controlled trial of children with asthma in 7 major cities to deliver home intervention targeting common indoor asthma triggers, including dust mite, cockroach, and pet dander. Using research assistants to deliver the intervention, Morgan et al found significantly lower allergen levels in the home and reduced symptom days, as well as rescue medication use and unscheduled sick visits. Thus these proved multifaceted approaches to make the home environment asthma friendly have a great effect on the ability of inner-city children with asthma to live symptom-free lives and to spend less time in the hospital and emergency departments.

### Social/educational interventions

Curing society's ills seems out of reach, but empowering 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 it is in the home, community, clinic, or school, patient-centered asthma self-management education has become increasingly important in improving measures of asthma morbidity, such as lung function, days of restricted activity, and nights disturbed by asthma, among adult and pediatric populations alike.<sup>64</sup> Asthma self-management education results in reduced asthma emergency department visits, inpatient visits, and lost days of work.<sup>62,64</sup> Asthma self-management education is fundamental to the patient's ability to correctly identify and interpret signs and symptoms, as well as to take medications appropriately. Yet the success of education depends on a number of factors, including cultural sensitivity, setting, literacy sensitivity, and communication skills.

Studies have demonstrated that culturally specific education programs are effective for both blacks and Latinos. Paasche-Orlow et al<sup>65</sup> showed that if one adopts a tailored one-to-one education model, barriers for low-literacy populations can be effectively overcome to produce knowledgeable caregivers. Similarly for children, a longitudinal study of a combined literacy improvement and self-management asthma education intervention was conducted with a convenience sample of 100 minority children with asthma. Over 6 months, the children demonstrated improvement in literacy and self-efficacy, and there was a correlation between improved literacy and asthma morbidity outcomes.<sup>66</sup>

Furthermore, self-management education is more effective when delivered by using culturally appropriate materials in a culturally sensitive manner. For example, a study of 267 African American caregivers who received a 5-series asthma self-management education program administered by parent facilitators in local community sites resulted in improved knowledge, quality of life, and perceived asthma control for the caregiver.<sup>67</sup> Similarly, Canino et al<sup>68</sup> found that asthma education intervention that included 8 modules for Puerto Rican families administered by asthma counselors resulted in significantly more symptom-free nights, improved quality of life, and self-efficacy scores in intervention groups as reported by caregivers. Unfortunately, community-based education is not widely available, and most black caregivers do not have access to information that is culturally

appropriate or sensitive. More efforts are needed to make self-management education an integral part of our health care delivery.

For children, schools are the most logical settings for education because children are in school most of their waking hours. Asthma education interventions in school settings have mixed results, with most showing improvement in school absences and reduction in symptoms, hospitalizations, and emergency department visits. In a series of 4 classes, a large school intervention targeting black students participated in the Kickin' Asthma program in Oakland Schools. Compared with baseline, students had reductions in symptoms and health care use, as measured by self-report.<sup>69</sup> Other large multifaceted school interventions for primarily black students were not as successful in changing these measures.<sup>70,71</sup> One of the most successful interventions involved case management and education which involved weekly group education sessions, care coordination and close monitoring of school absences. This close nurse case management program showed a reduction not only in school absences but also in hospitalizations and emergency department visits.<sup>72</sup> This is perhaps the best practice model going forward and should be disseminated to other school districts.

In this section we have explored best-practice models to change the face of asthma disparities through intervening in health care and the environment, as well as empowering caregivers and children through asthma self-management education in various social settings. Moving forward, a combination of best-practice models in all sectors will be necessary to make a population change that results in elimination of disparities. The next section will describe an attempt and perhaps a future model that incorporates best practices across all sectors.

### Other interventions/future models

Although many interventions that target one element of disparity have been successful, asthma is a complex disease, and interventions need to be comprehensive and integrate all areas, including health care, the home and built environment, and the social/psychosocial environment, to effectively reduce disparities. Given the scope and depth of the determinants of disparities and the various ways that these disparities affect asthma outcomes, a multifaceted approach might have the best chance of closing the gap between the majority and the poor minority patients.<sup>73</sup> The Institute of Medicine's "Unequal treatment" report argues for a comprehensive multilevel strategy to eliminate health care disparities, addressing health care systems, the legal and regulatory contexts in which they operate, health care providers, and patients.<sup>16</sup>

Strategies that engage the community in the creation of this program are most likely to be successful in the creation of such a comprehensive program that becomes sustainable. Engaging the community allows the interventions to reach a larger group because their participation helps to facilitate recruitment of participants, ensure feasibility, and promote community acceptance. This is confirmed by studies of programs conducted by communications which are more likely to be sustainable over time.<sup>74</sup>

Merging the strengths of science with the strengths of the community and then building on these strengths through a community-based participatory process might be the most effective and sustainable way to integrate evidence-based interventions known to reduce disparities. One such program, the Community

Asthma Prevention Program of Philadelphia (CAPP) Collaborative, established in 1997, is a case study of how to use this model to create a comprehensive community-driven asthma program. As CAPP expanded to a new urban area with high asthma prevalence, the community participatory model was used to develop a multifaceted, evidence-based, community-driven asthma program. The collaborative merged science with community interests and designed a comprehensive program that focused on 4 areas in the community: schools, faith-based organizations, physicians, and homes. By using an evidence-based approach, the literacy of all written materials was a major consideration, and a literacy expert was engaged during the formation of materials. Classes in the community used a standardized validated curriculum and were conducted by peers. Trained CHWs provided asthma self-management education and a multifaceted environmental intervention in the home. Although a disease management program could not be implemented because of infrastructure barriers, school nurses and professionals received state-approved asthma education, and student classes used validated asthma education curriculum. Finally, provider training was interactive and based on the PACE model, which included communication strategies but was also augmented by QI strategies, as well as physician communication strategies. Although based on scientific evidence, the community participated in designing where, how, and when these interventions were conducted. For example, based on their recommendation, parents were allowed to choose low- or high-intensity home interventions. Similarly, providers were allowed to choose from 3 different levels of intervention. Approximately 3500 community participants directly experienced one of the interventions over 4 years. The focus of the collaborative is now on gathering support for policies that will sustain these efforts.

Community participation has been an essential element to the successful implementation of CAPP's multifaceted comprehensive asthma program. The strengths contributed by the community partners include understanding of the culture and challenges faced by families who have children with asthma, realistic approaches to the challenges that provide caregivers the knowledge and tools they need to provide an asthma-safe environment, use of community sites to implement the interventions, recognition and acceptance in the community, introduction to new community partners, and 11 self-sustainable sites for community classes.

In this age of medical advancement and technology, existing asthma disparities are unacceptable. It is clear that individual interventions will not work alone and that a comprehensive and multifaceted approach to reduce asthma disparities that incorporate interventions that address family, social, and behavioral factors, along with continued medical advances within a culturally competent health care system, is needed. Currently, our system is limited by fragmentation across all sectors, as well as the high cost of health care. As we take a public health approach to eliminating disparities, we will need to cross boundaries and together advocate for fundamental changes to improve outcomes for minority children with asthma. Systems that reward physicians for evidence-based practice and policies that promote healthy environments for all children are essential. Creation of policies that support healthy housing, reimbursement for CHWs, reimbursement for office asthma education and environmental measures, and culturally appropriate educational materials are critical. Much research has been conducted to understand asthma disparities and the ways to reduce the widening gap between poor minority children and whites. The implementation of these

interventions in a systematic way is our next frontier. More research should be focused on ways to advocate for best practices and for a comprehensive approach to eliminating disparities for minority children with asthma.

#### What do we know?

- Asthma disparities exist between blacks and whites in outcomes such as asthma-related hospitalizations, emergency department visits, and deaths.
- Lack of attention to the interrelationship of SES, minority status, and environment contribute to these disparities.
- Interventions that are based on cultural and health beliefs are effective.

#### What is still unknown?

- Effective means of integrating health, environment, and educational interventions on a broad scale to reduce asthma disparities between blacks and whites are still needed.

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