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Social Determinants: Taking the Social Context of Asthma Seriously

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Abstract

While asthma has emerged as a major contributor to disease and disability in American children, the burden of this disease is unevenly distributed within the population. This paper provides a brief overview of social status variables that predict variation in asthma risks and social exposures such as stress and violence that are emerging as important risk factors. However, the central focus of the paper is on the distal social variables that have given rise to unhealthy residential environments in which the risk factors for asthma and other diseases are clustered. Effective initiatives for the prevention and treatment of childhood asthma need to address these non-medical determinants of the prevalence of asthma.

Keywords

childhood asthma prevalence; low-income population; poverty; race; risk factors

A recent review by Gold and Wright demonstrates a pattern of childhood asthma risk in the US population based on race/ethnicity and socioeconomic status (SES).¹ Non-white children residing in urban areas and children living in poverty have a significantly higher risk of asthma and higher disease morbidity than white children; for example, asthma prevalence, hospitalization rates, and mortality are higher for black children than for white. Puerto Ricans have an elevated risk of asthma compared to other Latinos. Indicators of area deprivation are also positively related to childhood asthma prevalence and hospitalization, suggesting that SES characteristics at the individual, household, and community level affect a child's risk of asthma.²

Race/ethnicity and SES are two related but not interchangeable systems of social ordering that affect health risks. Considering how these systems simultaneously affect the distribution of disease can be informative. In the United States, for example, the risk of infant mortality varies by the mother's education and race; for women of all racial/ethnic categories, the risk of infant death declines as the mother's education increases. However, the persistence of a

racial disadvantage at every level of education is so marked that African American women who have graduated from college have higher rates of infant mortality than white, Asian and Latino women who are high school dropouts.³ The joint effects of race/ethnicity and SES are not typically considered in the study of childhood asthma; however, an examination of asthma prevalence for children under the age of 18 using the National Health Interview Survey data revealed that the risk is particularly high among children at the intersection of disadvantaged racial and socioeconomic status.⁴ This study found that while black children had a higher prevalence of asthma than white children, the prevalence among Hispanics and whites was similar. While there were no racial differences in asthma rates at moderate and high income levels, among families with incomes less than half the federal poverty level, black children had twice the risk of asthma compared to white children.

Concentration of Illness and Social Adversity

The social patterning of disease is not limited to childhood asthma. Disadvantaged social status predicts higher levels of morbidity and mortality for a broad range of conditions in both children and adults.^{5, 6} Moreover, illness and social adversity tend to cluster in the same people and places, so that individuals and areas that are at risk for one adverse condition tend to be at risk for multiple social ills. Thus the social distribution of childhood asthma must be understood and addressed in the context of concurrent, multiple adverse living conditions. It is worth noting that recent consensus statements by both the Institute of Medicine of the National Academies⁷ and the National Institute of Environmental Health Sciences⁸ support the position that examining disparities in environmental health requires attention to both environmental hazards and social conditions.⁹

Research reveals an association between growing up in conditions of childhood poverty and elevated exposure to a broad range of health-damaging conditions.¹⁰ Compared to high SES children, poor children are exposed to higher levels of family turmoil, violence, separation, instability, and chaotic household conditions; experience less support; and have parents who are less responsive and more authoritarian. Poor children are also read to less frequently, watch more TV, have less access to books and computers, and are less likely to have parents involved in their school activities. Evans' comprehensive review of the negative correlation of childhood poverty also indicates that compared to high SES children, poor children are more likely to consume polluted air and water; reside in noisier, lower quality, and more crowded homes; live in more dangerous neighborhoods with greater physical deterioration and poorer city services; and attend inferior schools and daycare centers.¹⁰ Ethnic minorities and individuals in lower socioeconomic position may also experience greater psychological stress, which may be compounded by the presence of overburdened or absent social supports, psychological morbidity (ie, anxiety, depression), and lack of control over their lives and environment.¹¹

The problems linked to poverty cut across racial lines. Although the rate of poverty in the US is higher for racial and ethnic minorities than it is for whites, the majority of the poor in the U.S. are white.¹² Some research indicates that a greater percentage of minority poor experience severe poverty (50% of the poverty threshold) than do the white poor.¹³ In the year 2005, African Americans earned 61 cents and Hispanics earned 71 cents for every dollar earned by whites.¹² Furthermore, racial/ethnic differences in wealth persist at every level of income: for every dollar that whites have, African Americans have 9 cents and Hispanics have 12 cents.⁽¹⁴⁾ Among persons whose income falls in the bottom 20% of all US households, for every dollar of wealth that whites have, blacks have one penny and Latinos have two. Further evidence that the black poor are poorer than the white poor comes from a large federal survey, which documented that even after adjusting for a broad range of socioeconomic, demographic, and household characteristics, African Americans were more

likely than whites to experience six economic hardships during the prior year.¹⁵ For example, blacks were more likely than whites to have been unable to pay their rent, mortgage, or utility bill; to have had their utilities and telephone service shut off; and to have been evicted from their apartment. The greater economic deprivation of African Americans is also evident at the neighborhood and community level. Research reveals that blacks and Puerto Ricans live in worse neighborhoods than whites with comparable income.¹² In fact, in none of the 171 largest cities in the United States did blacks and whites live in comparable neighborhood conditions in terms of poverty rates and the percentage of single parent households.¹⁶

Social adversities that affect health risks also cumulate over the life course. Exposure to poor socioeconomic conditions during childhood has been shown to have long-term negative effects on adult health and functioning. For example, in the Coronary Artery Risk Development in Young Adults (CARDIA) study, for both blacks and whites and males and females, low childhood SES as measured by parental education level was associated with poorer baseline pulmonary function among adults, and greater declines in pulmonary functions as assessed on three occasions over a 5-year period.¹⁷ This graded association remained significant even after adjustment for current SES, asthma history, smoking history, and other risk factors. Evolving research, summarized below, suggests that differential exposure to stressors and adverse residential conditions over the life course, both independently and cumulatively, may have implications for asthma.

Stress and Asthma

While physical characteristics of neighborhood and housing environments such as air pollution, dampness, dust, and the presence of pests contribute to variations in the risk of asthma within populations, these factors alone do not fully account for the social distribution of childhood asthma.^{2, 18} Evidence suggests that the social patterning of asthma reflects differential exposure to pathogenic factors in both the physical and social environment. The social environment may contribute to asthma risk due to upstream social factors that determine differential exposure to relevant asthma pathogens^{11, 19, 20} and more proximately by contributing to the experience of psychological stress, which is increasingly linked to asthma expression.^{21, 22} The National Cooperative Inner-City Asthma Study examined psychosocial factors and asthma morbidity in 1528 urban children (ages 4-9 years) and found that 50% of caretakers reported clinically significant levels of psychological distress symptoms on the Brief Symptom Inventory.²³ Moreover, the caretaker's mental health (but not the child's) was the strongest predictor of asthma hospitalizations among these children.

Much of the association between SES and health disparities may be determined by increased exposure to acute and chronic stress, compounded by the presence of overburdened or absent social supports, psychological morbidity (i.e., anxiety, depression), and lack of control over one's life.¹¹ Ecological views on health recognize that individual-level health risks and behaviors have multi-level determinants, in part influenced by the social context within which the individual lives; that is, the degree of chronic stress is significantly influenced by the characteristics of the communities in which we live.²⁴ One type of chronic stress that has been investigated in relation to urban children's development is neighborhood disadvantage (ND), which is characterized by the presence of a number of community-level stressors including poverty, unemployment/underemployment, limited social capital or social cohesion, substandard housing, and high crime/violence exposure rates. In the US, many urban communities are characterized by a high ND level.²⁵

The evidence on the determinants of health disparities among racial and ethnic minorities and low SES populations points to the powerful influence of community characteristics in promoting health and well-being. One potential mediating feature of community life that has

generated considerable attention is the concept of “social capital.” Social capital and related constructs have been linked to a community’s economic development; investment in public goods such as education; and crime/violence rates.²⁶ Ongoing work by Wright and colleagues has identified violence exposure as a prevalent factor that influences asthma morbidity in US urban communities.²⁷ Social capital is strongly correlated with violent crime rates, which impact community resilience by undermining social cohesion.^{28, 29} Thus, high rates of violence and crime within a community and society are not only chronic psychosocial stressors, but also indicators of compromised collective well-being and non-optimal social relations, or social cohesion.³⁰

Empirical Evidence Linking Violence to Asthma Morbidity

The Moving to Opportunity (MTO) study sponsored by the Department of Housing and Urban Development (HUD) suggests that there may be an important link between asthma and violence. The MTO study used a randomized lottery that offered families from high poverty areas (i.e., census tracts with more than 40% of the population at or below poverty level) and public housing to receive vouchers to pay for rental housing from private landlords in census tracts with less than 10% poverty.³¹ The study found that families with children with asthma who moved to apartments in better neighborhoods rated their children’s asthma as less severe after the move, independent of other risk factors. In the initial phases of the MTO study, in-depth interviews with community residents in the Boston cohort indicated that stress around community violence and worry about safety was important to their health and their biggest motivation for wanting to move.³² Although the initial hypothesis around the benefits of moving participants from high poverty to low poverty neighborhoods centered on quality housing and reduced exposure to indoor allergens, qualitative data collection redirected the focus of the quantitative survey to include the domains of violence, crime, safety, and health.

In a study of 851 children ages 5 to 12 years old and their caretakers enrolled in the Inner-City Asthma Study (ICAS), Wright and colleagues demonstrated an association between higher levels of community violence and increased caretaker-reported asthma symptoms.²⁷ The caretakers reported on community violence prevalence, other negative life events, perceived stress, unwanted thoughts and memories (rumination), caretaker behaviors (e.g., keeping children indoors, smoking, medication adherence), as well as socio-demographic factors (eg, income, employment, race/ethnicity, housing quality). Increased frequency of exposure to violence in the communities predicted a greater number of asthma symptom days among the children even after controlling for socioeconomic factors and housing dilapidation. Caretakers reporting high-level violence in these analyses were also more likely to ruminate. Ongoing rumination may impact problem-solving skills, erode perceived control, and decrease motivation to manage ongoing challenges, including management of a chronic illness such as asthma. Caregivers who use ruminative coping strategies may experience greater stress and psychological comorbidity, especially depression, which, as noted previously, may directly influence the child. A caretaker’s psychological adjustment may affect the child’s asthma morbidity by contributing to less effective parenting style, inappropriate utilization of health care services, and poor medication adherence.

In a cohort study in Boston, Wright and colleagues retrospectively ascertained lifetime exposure to violence through a parental-report interview questionnaire administered to 416 caregivers and their children who were followed longitudinally for respiratory health outcomes including asthma. Preliminary analyses suggested a link between higher lifetime exposure to community violence and an increased risk of asthma and wheeze syndromes and prescription bronchodilator use.³³ In additional analyses, Wright’s research group examined the potential for exposure to community violence to interact with exposure to air pollution.³⁴ Geographic information systems (GIS)-based models were developed to retrospectively

estimate residential exposures to traffic-related air pollution for 413 children in an urban Massachusetts community-based pregnancy cohort recruited between 1987 and 1993, using monthly NO₂ measurements for 13 sites collected over 18 years. Merging pollution estimates with questionnaire data on lifetime exposure to violence (considered here as a chronic stressor) and prospectively collected repeated-measures data on asthma onset in these urban children, Wright's group explored the hypothesis that stress may enhance the susceptibility to air pollution in childhood asthma etiology. This approach could be justified given the potential spatial covariance across exposures, and the potential influence of stress and pollution on common physiological pathways (i.e., oxidative stress) and health outcomes (i.e., respiratory disease).²¹ After correcting for potential confounders including gender, SES, race/ethnicity, tobacco smoke exposure, and lower respiratory tract illnesses, the investigators found an elevated risk of asthma with a SD (4.3 ppb) increase in NO₂ exposure specifically among children with above-median violence exposures. Among children who had spent their entire life in the same community, this association was even stronger.

Similar hypotheses could be explored related to the psychological impact of other environmental conditions that are, in part, distributed differently based on SES. For example, housing conditions may result in both differential exposure to important physical environmental risk factors (e.g., allergens)²⁰ and an emotional dimension resulting in increased psychological stress.¹⁸

Racial Residential Segregation: the 8000-Pound Gorilla

Asthma is a disease of multi-factorial causation, and there appears to be a complex web of factors linking specific household and residential conditions to the risk of asthma. Effective long-term interventions in reducing asthma risk will require identification and extermination of the spiders that are spinning this complex web of causation.³⁵ As discussed below, evidence suggests that residential segregation is a central determinant of black/white disparities in SES at the individual, household, and neighborhood level, and thus a fundamental cause of racial disparities in health, in the US.⁵

Segregation: History and Current Status

Segregation refers to the physical separation of the races by enforced residence in restricted areas. It developed in the late 19th and early 20th centuries in the US to protect whites from residential proximity to blacks. One of the most striking features of segregation is its persistence over time in spite of dramatic societal changes with regards to race. In the 2000 US Census, the dissimilarity index (a widely used measure of segregation) was 66, meaning that two-thirds of African Americans would have to move in order to ensure an even distribution within the population.³⁶ Although there has been modest decline in segregation in recent decades, most of it has been due to a few blacks moving into formerly all-white residential areas; this decline in segregation has not reduced the number of very high percentage black census tracts, the residential isolation of most African Americans, and the concentration of urban poverty.³⁶ Table 1 highlights some of the challenges that segregation poses for children. The table presents socio-demographic information for the 10 most segregated and the 10 least segregated metropolitan areas with the largest child populations in the US. It shows the segregation score (dissimilarity index) for many of America's largest cities, including Detroit, Milwaukee, New York, Chicago, and Cleveland; as a point of comparison, the scores for these cities are only slightly lower than the score of 90 for South African cities in 1991, during apartheid.³⁷

The level of residential segregation for African Americans is distinctive; historically and currently, blacks are more segregated than any other racial/ethnic group in the US.³⁸

Moreover, while segregation is inversely related to income for Latinos and Asians, it is high at all levels of income for blacks. The most affluent blacks (those with household incomes > \$50,000) are more segregated than the poorest Latinos and Asians (those with household incomes <\$15,000).³⁷ Importantly, the residential segregation of African Americans does not simply reflect their preferences for residence in segregated areas; both national and regional studies find that African Americans manifest a higher preference for residing in integrated areas than any other racial groups.³⁹

Observers of American society have long noted that segregation plays a key role in shaping socioeconomic opportunities for blacks. In his seminal 1944 treatise on race in America, Myrdal argued that although its influence was indirect and impersonal, residential segregation was nonetheless fundamental to understanding racial inequality in America.⁴⁰ After the urban riots of the 1960s, the Kerner Commission noted that residential segregation was the “linchpin” of American race relations and the source of the large and growing racial inequality in SES.⁴¹ Historian John Cell argued that residential segregation was one of the United States’ most successful domestic policies of the 20th century⁴², and sociologists Massey and Denton have amassed evidence indicating that residential segregation is “the key structural factor for the perpetuation of black poverty in the United States” and “the missing link” in efforts to understand urban poverty.³⁸

Segregation and Health: Multiple Mechanisms

Research reveals that segregation may affect health in general, and asthma in particular, in multiple ways. As a key determinant of racial differences in SES, segregation produces a concentration of poverty and social isolation, and creates pathogenic conditions in social and residential environments.

Segregation, Discrimination, and Socioeconomic Status

“Audit studies in which trained black and white job applicants with identical resumes applied for employment found that, rather than being equally likely to get the job regardless of race, white applicants were 20% more likely to be chosen over black applicants.”⁴³ In addition to this employment discrimination at the individual level, institutional discrimination based on residential segregation also restricts access to jobs. In the last several decades, low-skilled, high-pay jobs have migrated from the urban, segregated areas where blacks are concentrated to suburban areas.⁴⁴ Negative racial stereotypes of African Americans and the areas where they are concentrated have been shown to play a role in this migration. A *Wall Street Journal* analysis of more than 35,000 U.S. companies found that during routine corporate restructuring, relocation, and down-sizing during the economic downturn of 1990-1991, jobs were systematically moved from urban areas with a high concentration of blacks to suburban and rural areas where the proportion of blacks in the labor force was low.⁴⁵ For example, because Sears relocated inner-city distribution centers to suburban communities, blacks accounted for 54% of the job losses at this company, although they were only 16% of the workforce. As a consequence of similar actions across corporate America, blacks were the only racial group that experienced a net loss of jobs during 1990-1991. Other research reveals that corporations explicitly use the racial composition of areas in their decision-making process regarding the location of new plants and the relocation of existing ones.⁴⁶ A study of the effects of segregation on young African American adults found that the elimination of segregation would completely erase black/white differences in income, education, and unemployment, and reduce racial difference in single motherhood by two-thirds.⁴⁷

The legacy of segregation is strikingly evident in Table 1. While the average poverty rate for white children stays relatively constant at around 7% in both high- and low-segregation

areas, the black child poverty rate is greater in high-segregated areas (average of 36%) than in low-segregated areas (average of 28%). More importantly, the poverty rate for blacks even in the relatively low-segregation areas is still four times higher than the poverty rate for whites in those areas. The overrepresentation of black children in areas of concentrated poverty is also alarmingly high. Defining high-poverty areas as neighborhoods where 40% or more of the residents live in poverty, Table 1 shows that a staggering 60% of black children in highly segregated metropolitan areas live in high poverty areas, compared with 5.6% of white children. In low-segregated metropolitan areas, the percentage of black children in high-poverty neighborhoods is 29%, while the rate for white children is 4.1%.

Segregation and Neighborhood Quality

Residential segregation has led to unequal access to a broad range of services provided by municipal authorities. Segregated residential areas are typically characterized by a disinvestment of economic resources in these neighborhoods that tends to be predictive of poor quality of life on multiple dimensions. Since residents of these areas tend to be less active politically and have little economic clout, elected officials are less likely to encounter vigorous opposition when services are reduced in these areas. One study of the 171 largest metro areas in the US concluded that the worst urban context in which whites reside was better than the average context of black communities.¹⁶ These distinctive ecological environments can adversely affect asthma on multiple dimensions. For example, segregation may lead to poor residential conditions such as crowding, which may predispose residents to viral illnesses⁴⁸; and deteriorating housing stock, which could increase exposure to indoor allergens.²⁰

Segregation is also associated with elevated exposure to physical and chemical risks, as well as to social disorder.^{1, 49} Research reveals that segregated, inner-city areas have higher rates of air pollution, such as ozone and ambient particulate matter, which can exacerbate asthma symptoms.^{50, 51} A longitudinal study of asthmatic school-age children in Detroit—one of the nation's most segregated cities—found that where levels of air pollution were above the National Ambient Air Quality Standards, lung function was adversely impacted.⁵² Residence in highly segregated areas is also associated with increased personal and property crime. As shown in Table 1, the average murder and robbery rates in high-segregation metro areas were roughly 24% higher than in low-segregation areas. The risk of exposure to stress, violence, financial strain, family separation, chronic illness, death, and family turmoil are also higher among poor persons in segregated areas; and as noted earlier, there is a link between violence exposure and asthma as well as a link between stress exposure and asthma.

Research also reveals that the conditions in segregated areas can affect the practice of healthy behaviors.⁵³ Poor health behaviors can increase both asthma morbidity and susceptibility.^{54, 55} Segregated areas are less likely to have recreational facilities such as playgrounds and swimming pools. They are also more likely to have retail outlets for tobacco, alcohol, and fast foods, and to be the targets of marketing campaigns for these substances. Table 1 shows that black women in highly segregated areas are more likely to smoke while pregnant. A study of multiple communities found that wealthy neighborhoods had three times as many grocery stores as low-income neighborhoods, and white neighborhoods had four times as many food stores as black ones.⁵⁶ African American neighborhoods also had fewer grocery stores within a 5-minute travel distance.⁵⁷ A Detroit study found that among the most impoverished neighborhoods, majority African American neighborhoods were on average 1.1 miles further from the nearest supermarkets than were white neighborhoods.⁵⁸

Other research reveals that the available food in grocery stores tends to be of lesser quality in poor segregated areas. A report by the U.S. Select Committee on Hunger concluded that grocery stores located in inner city neighborhoods offer a poorer selection and less fresh food.⁵⁹ The scarcity of quality food sources serves as a significant barrier to healthy eating. For example, a study of grocery stores in 12 communities found a significant relationship between the availability of healthful grocery products and a healthy individual diet.⁶⁰ A major study of 10,000 adults in North Carolina, Mississippi, Minnesota, and Maryland concluded that black Americans living in a census tract with at least one supermarket were more likely to meet national dietary health guidelines for fruit and vegetable consumptions and fat intake than blacks living in neighborhoods with no supermarkets. Moreover, for every additional supermarket, produce consumption increased by 32%.⁵⁶ Thus, the lack of local supermarkets may significantly hinder inner city residents from accessing nutritious food.

Substantial evidence indicates that purchasing power is less in segregated areas because the costs of a broad range of goods and services, including food, are higher in these areas. Chung and Myers conducted a study of grocery store access and prices in the Minneapolis and St. Paul metropolitan area by examining 50 items in 526 stores in inner city and suburban neighborhoods.⁶¹ They found that although chain grocery stores charged similar prices in poor and non-poor neighborhoods, such stores were significantly less likely to be located in poor neighborhoods. Only 22% of the chain grocery stores were located in the inner city areas, while nearly half of the convenience and small grocery stores (in which prices were higher than in convenience stores) were located in the inner city areas. Since residents in low-income areas have less access to healthy foods like fruits and vegetables, they often select the least expensive and most filling foods, often at a cost to their health.⁶⁰

The lack of accessible healthy food may influence asthma through an increased risk of obesity. Recent studies indicate that low SES neighborhoods and areas lacking healthy food sources exhibit higher rates of obesity⁶², whereas areas with supermarkets have lower rates.⁶³ Obesity, in turn, is a documented risk factor for asthma etiology and morbidity for both children and adults.⁶⁴⁻⁶⁷ Additionally, there is some evidence that inadequate dietary antioxidant intake may increase the risk of asthma and/or decrease children's pulmonary function.⁶⁸⁻⁷¹

Segregation and Medical Care

Segregation can also adversely affect access to medical care and to high-quality care. Pharmacies in segregated neighborhoods tend to have inadequate medication supplies⁷², and hospitals in these areas are often characterized by limited resources, overcrowding, staff shortages, and outdated equipment—and are more likely to close.⁷³ Greene and colleagues determined that in areas where the poor are nonwhite and in racially segregated areas, physicians are significantly less likely to participate in Medicaid.⁷⁴ Other research indicates that the overall quality of care is lower in residentially segregated areas⁷⁵, with African Americans receiving most of their care from a small group of physicians who are less likely than other doctors to be board-certified and are less able to provide high-quality care and referral to specialty care.⁷⁶ Table 1 shows that while the receipt of prenatal care is similar for white women in both high- and low-segregation areas, black women in high-segregation areas are significantly less likely to receive prenatal care than their counterparts in low-segregation areas.

The challenges of access to care linked to segregation are intensified by racial disparities in the quality of care. A report from the Institute of Medicine documented that blacks and other minorities face considerable challenges in the receipt of high-quality care.⁷⁷ This report

found that across virtually every therapeutic intervention ranging from high technology procedures to the most elementary forms of diagnostic and treatment interventions, minorities receive fewer procedures and poorer medical care than whites. These racial differences in the quality and intensity of care received persisted even after adjusting for SES, insurance status, stages and severity of disease, comorbidity, and the type of medical facility.

Studies on asthma have repeatedly found that minorities are less likely to receive appropriate asthma medications for preventive care or acute exacerbations.⁷⁸⁻⁸¹ For example, Finkelstein and colleagues found that young children of racial minorities admitted for asthma exacerbations were less likely than white patients to have taken anti-inflammatory medications and were much less likely to be prescribed a nebulizer for home use upon discharge.⁷⁹ Another study found that black and Hispanic children received fewer beta2 agonists, and Hispanic children received fewer inhaled corticosteroids (ICS) than white children after adjusting for a range of potential confounders.⁷⁸ In addition, investigations of federally funded community health centers (CHCs) and inner-city hospitals report significant levels of noncompliance with the National Asthma Education and Preventions Program (NAEPP)-recommended care, including under-use of ICS, peak flow meters, spacers, and written action plans.^{82, 83} One study, for instance, found that a mere 14% of CHCs followed the NAEPP's recommended guidelines of having a documented asthma management plan and only 27% performed asthma severity assessments.⁸³

Segregation and Collective Efficacy

Finally, the concentration of social disadvantage linked to segregation has degraded not only physical and material resources, but also social and communal resources historically employed by African American communities. Researchers have noted the adaptive capacity of African Americans to utilize indigenous community resources such as informal control, collective efficacy, and community empowerment to survive years of oppression.^{9, 16, 52, 84-86} For example, in their examination of differences in resource networks and experiences of community life in black and white communities, Mitchell, Barbarin, and Hurley found that in the absence of formal community resources members of the black community relied more heavily on informal resource networks to meet their needs.⁸⁵

Residential segregation and the increasing concentration of poverty in recent decades has led to unprecedented areas of concentrated disadvantage where lower income, minority, and single-parent residents are isolated from key resources that support collective social control. The resulting racial and economic exclusion have produced a decline of social control and an increase in violent crime.^{16, 28, 29, 87, 88} This undermining of community resiliency and social cohesion has implications for asthma. Collective efficacy has been shown to be protective of asthma and other breathing problems,⁸⁹ perhaps through facilitating health promoting communication, eliminating environmental hazards, and reducing stress through social support networks. In contrast, areas of high mistrust are associated with a tendency to remain indoors, leading to asthma-inducing risk factors such as increased allergen-exposure, a sedentary lifestyle, and social isolation.³⁰ Thus, segregation that results in a "socially toxic" neighborhood environment can exact a physical toll on residents that leaves them vulnerable to asthma.

Implications of Segregation for Childhood Asthma

The social determinants of childhood asthma have important implications for the effective delivery of medical care as well as future research on asthma.

Health Care Delivery Implications

In the delivery of care and the treatment of asthma, health care providers must take the social context seriously. A study of trends over time highlights the importance of redoubling efforts to ensure that poor and minority children receive the appropriate treatment for asthma: between 1989 and 1996, the gap in the use of ICS narrowed for blacks compared to whites, but did not change for Hispanics.⁹⁰ Additionally, minority patients and children experienced a slower increase in the number of ICS prescriptions during this time period. Moreover, minority children had the smallest increase in prescribed ICS and were still disadvantaged in 1996. These data suggest that the use of prescribed ICS may still be too low in the minority patient population, given that asthma is more prevalent and more severe in this population.

Studies of asthma education interventions in low-income inner city children and their families have documented the need to address multiple contextual and psychosocial issues not targeted by more traditional educational or asthma intervention programs such as the Neighborhood Asthma Coalition and the Asthma Coach programs in St. Louis, Missouri.⁹¹ This need is often brought to the investigators' attention through anecdotal reports from nurse home visitors and educators as well as research field staff. Reflecting the emphasis on the complex and diverse relationships among community-level factors and the pathways of their impacts, both the Neighborhood Asthma Coalition and the Asthma Coach programs reported the need to address topics that might seem to have little pertinence to asthma management.² Reflecting the diverse stressors that may undermine asthma management, the Asthma Coaches worked with parents not only on key asthma management practices, but also on the stressors in their lives, including problems with landlords or welfare benefits, domestic disputes and community violence; they also addressed safety issues so that participants could attend community education programs planned around asthma and seek employment. In a breastfeeding intervention study among mothers in Baltimore enrolled in the Women, Infants and Children (WIC) program, interviewers also discovered a preoccupation with issues of personal safety among African American mothers living in neighborhoods with high levels of crime and violence.⁹² Some participants indicated that they considered breastfeeding impractical because their everyday lives were full of danger and they were very concerned about their safety. Notably, breastfeeding may be an important protective factor related to asthma morbidity.⁹³ This example highlights the multiple intertwined pathways through which social conditions can influence asthma risks.

A model that has been shown to be effective in improving the care of low-income children in general, including the management of asthma, is the Medical-Legal Partnership for Children (MLPC) developed by Boston Medical Center.⁹⁴ This model has integrated on-site lawyers into the network of specialists to whom primary care providers can refer their patients. With a strained safety-net in the real world, laws and regulations that foster the health and safety of kids and can facilitate the management of childhood asthma are not uniformly implemented. More than half of poor and moderate income families face serious civil and legal challenges that are often not perceived as legal issues. The addition of lawyers to the medical team can promote health, prevent disease, and addresses barriers to the effective care of asthma by screening patients and their families for social problems that can affect asthma management; assisting in the resolution of specific social problems; and enhancing the effectiveness of advocacy by the entire health care team. This team includes physicians and social workers, and ensures that patients receive all the needed services to which they are entitled. The MLPC has enhanced the medical center's ability to address patient stressors in the areas of housing, immigration, income support, health insurance, education access, and disability and family law by thwarting the illegal denial of various

benefits and helping patients navigate the intricacies of bureaucratic regulations that have shifted in recent years from an emphasis on helping families to one of preventing fraud.

Research Implications

They are also important research implications related to the distinctive residential environments in which socially disadvantaged children live. A research approach that focuses on the relationship of individual risk factors related to asthma is unlikely to capture the complex and multidimensional factors that contribute to the variation in asthma prevalence and morbidity. Research is needed that incorporates a life course, cumulative risk perspective and that seeks to integrate how multiple risks and resources linked to the individual, family, housing, neighborhood, and societal level relate to each other and combine to affect childhood asthma. Researchers also need to seriously grapple with the extent to which distinctive residential environments can affect normal physiological processes. Biological adaptations to these residential environments could lead to biological profiles that are different for persons residing in deprived residential areas and possibly to distinctive patterns of interactions between biological and psychosocial factors for African Americans. Importantly, this suggests that the observation of distinctive biological profiles is not necessarily reflective of inherent genetic differences, but could in part reflect adaptations to unique residential environments.

Research on the role of residential conditions clearly suggests that a strategy for improving asthma outcomes on a long-term basis requires policies and interventions that focus on improving the quality of housing and neighborhood conditions for poor children in general and minority children in particular. That is, policies to reduce social disparities in asthma, and in other health outcomes, need to address those factors that coincide with segregation: the concentration of economic disadvantage and the lack of an infrastructure that promotes opportunity. Thus, eliminating the negative effects of segregation on SES, neighborhood conditions, and asthma is likely to require a major infusion of economic resources to improve the social, physical, and economic infrastructure of disadvantaged communities. It is important to recognize that nothing is inherently negative about living in close proximity to persons of one's own race. The issue is not a problem of segregation per se, but the accumulation of social problems that coincide with the concentration of poverty in high segregation areas in the US.

Conclusions

The research reviewed suggests that the distribution of asthma by race and SES is created by larger inequalities in society of which residential segregation (an institutional legacy of racism) is one determinant. Future research must seek to understand how innate and acquired biological factors interact with conditions in the psychological, social, and physical environment to affect asthma risks and the patterns of asthma distribution. At the same time, eliminating disparities in asthma and asthma care requires acknowledging and documenting the health consequences of social policies, and developing the political will and commitment to implement new strategies to ameliorate the negative effects of these policies by dismantling the structures of racism that created them and establishing programs and strategies that can counteract the pervasive negative effects of institutional discrimination on health. The care of children with asthma can play an important role in this regard by addressing the social determinants of their health as a part of the delivery of medical care.

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Abbreviations

CARDIA	Coronary Artery Risk Development in Young Adults
CHC	community health center
GIS	geographic information systems
HUD	Department of Housing and Urban Development (US government)
ICAS	Inner-City Asthma Study
ICS	inhaled corticosteroids
MLPC	Medical-Legal Partnership for Children
MTO	Moving to Opportunity
NAEPP	National Asthma Education and Preventions Program
ND	neighborhood disadvantage
SES	socioeconomic status

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Table 1

Characteristics of Metropolitan Areas By Race and Levels of Segregation

Metro Area	D ^a	Pop size (1000)	Poverty Rate (%)		In High Poverty Areas (%) ^b		In Low Income Areas (%) ^c		Children's Exposure to Area Home Owner Rate (%) ^d		Prenatal Care (%) ^e		Pregnant Smoker (%) ^e		Crime (Per 100,000) ^f	
			Black Children	White Children	Black Children	White Children	Black Children	White Children	Black Children	White Children	Black	White	Black	White	Murder	Robbery
High Segregation																
Detroit, MI	85	4442	23.4	7.2	61.3	4.8	79.7	13.5	57.9	81.1	64.9	88.5	13.4	14.8	10	177.6
Gary, IN	84	631	19.8	7.1	64.9	3	76.9	9.2	54	78.3	63.2	81.8	12.2	19.7	13.1	141
Milwaukee, WI	82	1501	16	4.3	67	3.3	88.1	8.6	42	71.9	59.6	89.4	17.3	11.9	6.2	190.5
New York, NY	82	9314	23.8	13.3	65.3	20.7	60.2	16.1	27.5	52.7	54.3	73.4	4.3	2.7	6.4	273.4
Newark, NJ	80	2033	22.5	3.9	40.9	1.5	77.9	9.2	36.7	77.7	44.7	82.2	11.4	7.6	8	218.1
Chicago, IL	80	8273	19	3.9	52.5	1.4	72.8	6.8	48.8	79.2	64.4	86.2	12.1	7.8	14.3	491.3
Cleveland, OH	77	2251	18.9	7.8	59.3	6.2	73.2	12.4	50	77.3	69.5	86.3	12.6	15.9	4.6	189.5
Buffalo, NY	77	1170	12	44.3	85.8	9	87.7	13.8	44.6	73.5	46.5	77.2	19.6	17.9	5.6	166.4
Cincinnati, OH	74	1646	13.4	37.5	49	3	65.5	19.5	42.6	74.8	70.1	89.9	13.3	19	5.5	189.9
St. Louis, MO	73	2604	18.7	37.0	51.9	2.9	75.4	12.9	57.5	78.4	67.6	90.2	12.1	15.7	7.6	168.6
Average Score	79	3387	18.8	7.1	59.8	5.6	75.7	12.2	46.2	74.5	60.5	84.5	12.8	13.3	8.1	220.6
Low Segregation																
Jacksonville, FL	54	1100	21.9	29.1	34.5	2.6	50.8	14.8	61.1	73.3	72.5	88.0	4.7	15.6	9.5	202.9
Charlotte, NC	54	1499	20.7	24.0	26.3	1.6	50.4	13.8	56.6	76.5	71.3	86.7	9.7	14.8	6.1	233.0
Oklahoma City, OK	53	1083	11.2	39.4	50.7	13.4	59.6	21.2	55.9	71.2	65.9	79.2	15.6	19.7	4.8	127.4
Wilmington, DE	53	586	18.2	22.5	22.1	2.1	50.4	11.3	59.3	77.1	79.2	90.7	12.8	15.1	4.1	183.1
Columbia, SC	51	537	32.3	26.5	30.2	3.8	50.2	15.4	62.0	78.3	66.6	82.4	6.7	13.7	8.6	188.6
Vallejo, CA	51	519	12.5	19.3	4.8	1.4	35.2	17.0	62.7	67.3	64.8	77.3	-	-	5.5	133.9
Norfolk, VA	46	1570	31.5	28.8	32.6	3.6	51.5	14.8	53.1	70.8	72.7	88.7	4.6	9.1	6.8	164.5
Raleigh, NC	45	1188	23.0	23.3	22.3	2.4	50.2	13.5	58.6	74.4	69.3	89.4	9.6	7.8	6.1	151.1
Charleston, SC	44	549	31.1	31.0	28.4	5.3	46.3	12.9	63.0	71.4	73.0	88.9	5.7	13.7	4.3	163.8
Greenville, SC	44	962	17.7	36.0	35.7	5.2	46.8	12.8	62.3	76.8	63.1	79.7	9.8	17.2	6.8	111.0
Average Score	50	959	22.0	28.0	28.8	4.1	49.1	14.8	59.5	73.7	69.8	85.1	8.8	14.1	6.3	165.9

^aDissimilarity Index is the evenness s with which blacks are located within a metro area, with respect to whites.

^bHigh poverty areas are neighborhoods with 40% of residents at or below the poverty level.

^cLow income areas are neighborhoods in which the median family income for the census tract is less than 80% of the median family income of the metro area as a whole.

^dHome ownership rate in the average neighborhood in which each racial group lives.

Sources: US Census Bureau, Current Population Survey, 2000; National Center for Health Statistics, 2001-2002; FBI Uniform Crime Reporting Program, 2004. Accessed through the Diversity Data Web Resource, <http://diversitydata.sph.harvard.edu>.