

Life Course Indicator: Racial Residential Segregation, by Community

The Life Course Metrics Project

As MCH programs begin to develop new programming guided by a life course framework, measures are needed to determine the success of their approaches. In response to the need for standardized metrics for the life course approach, AMCHP launched a project designed to identify and promote a set of indicators that can be used to measure progress using the life course approach to improve maternal and child health. This project was funded with support from the [W.K. Kellogg Foundation](#).

Using an RFA process, AMCHP selected seven state teams, Florida, Iowa, Louisiana, Massachusetts, Michigan, Nebraska and North Carolina, to propose, screen, select and develop potential life course indicators across four domains: Capacity, Outcomes, Services, and Risk. The first round of indicators, proposed both by the teams and members of the public included 413 indicators for consideration. The teams distilled the 413 proposed indicators down to 104 indicators that were written up according to three data and five life course criteria for final selection.

In June of 2013, state teams selected 59 indicators for the final set. The indicators were put out for public comment in July 2013, and the final set was released in the Fall of 2013.

Basic Indicator Information

Name of indicator: Racial Residential Segregation, by Community (LC-16)

Brief description: Racial residential segregation as measured through the Dissimilarity Index, the differential distribution of individuals by race or other social or income factors.

Indicator category: Discrimination and Segregation

Indicator domain: Risk/Outcome

Numerator: Number of counties with dissimilarity index (DI) > 0.6 (very segregated)

Denominator: Total number of counties

Potential modifiers: race, ethnicity, sex, age, socioeconomic status (SES) make up of counties, geographic region

Data source: U.S. Bureau of the Census, American Community Survey

Notes on calculation:

$$D = .5 * \sum_{i=1}^n \left| \frac{x_i}{X} - \frac{y_i}{Y} \right|$$

Where n is the number of tracts (or smaller geographic area) in a metropolitan area, x_i is the population size of the minority group of interest in tract i , X is the population of the minority group in the metropolitan area as a whole, y_i is the population of the reference group (usually non-Hispanic Whites) in tract i , and Y is the population of the reference group in the metropolitan area as a whole. It is standard to view cities or other geographic areas with a DI under 0.3 as well integrated, those with a DI value between 0.3 and 0.6 as moderately segregated, and those with values above 0.6 as very segregated (10). This may also be calculated for various racial and ethnic groups.

Similar measures in other indicator sets: None

Life Course Criteria

Introduction

In the United States, racial/ethnic disparities across multiple health outcomes continue to persist (45). The failure to fully account for poorer health outcomes in racial/ethnic minority populations through individual-level factors such as genetics and socioeconomic status, highlights the need to look at social and environmental factors (29). Exposure to neighborhood or community level stressors, such as concentrated poverty, can influence health behaviors, risks, and, in turn, health outcomes (56). Racial residential segregation is the degree to which two or more racial groups live separately from one another in a geographic area (62). Racial residential segregation creates differential exposure to neighborhood stressors (29), making this indicator a marker for racial and urban inequality. Racial residential segregation in U.S. metropolitan areas has often emphasized segregation between Black and White households. Segregation may be generated by Black self-segregation, collective action to exclude Black households from White neighborhoods, or individual moves by White households away from integrated neighborhoods (46). While segregation is generally associated with negative outcomes, some studies have demonstrated positive effects, perhaps shielding residents from the impacts of racism, stimulating healthy social networks, or promoting political solidarity (13, 14).

The racial residential segregation indicator is consistent with current life course science; the effects of discrimination contribute to cumulative exposure over the life course (1-3) and across a number of health outcomes. Racial residential segregation affects health outcomes through a variety of pathways including constraining the socioeconomic advancement of minority groups by limiting education quality and employment, as well as by diminishing the benefits of home ownership because disadvantaged neighborhoods have lower school quality, fewer job opportunities, and diminished property values (25). Additionally, racial residential segregation increases the exposure of minority groups to unfavorable neighborhood environments, including crime, environmental hazards, inferior municipal services, and food deserts (25). While neighborhood conditions may influence health outcomes in all age groups, exposure to neighborhood disadvantage during childhood may be particularly harmful, as the effects of this exposure may continue into adolescence and adulthood (27, 41). Minority children have limited access to neighborhoods with opportunities such as good schools and after-school programs, safe streets and playgrounds, and positive role models (27).

Many have hypothesized that racial discrimination may play a large role in disparities in birth outcomes in the United States (59,60,61). While poverty is a significant contributor to racial and ethnic disparities in birth outcomes, higher SES does not confer the same protection for Black women as for White women (12). While research on infant mortality and racial residential segregation has produced mixed results, possibly due to the complex, multidimensional nature of racial residential segregation, studies have found positive associations between segregation and maternal smoking as well as low birth weight among Black women. Racial residential segregation is associated with unequal access to health care resources including health care settings and quality of treatment (25). A study in Milwaukee, WI found Black mothers, regardless of income level, were almost eight times as likely as all White mothers to have inadequate prenatal care, which may have in part been due to living in less desirable areas than White mothers (61).

Implications for equity

The origins and persistence of U.S. racial residential segregation are rooted in manifestations of discrimination and racism (25,45,46), making this indicator a potential marker of institutionalized racism. Patterns of segregation among Black residents in the United States remain the highest of all racial/ethnic groups and higher than levels of economic segregation (38). Though recent national trends suggest that patterns of Black/White segregation have declined between 1980 and 2000, the declines occurred in areas with small Black populations, such as Portland, OR; whereas levels of high segregation in Northeastern and Midwestern metropolitan areas like New York City and Milwaukee have not abated over time(40). One way to quantify racial residential segregation is to examine the evenness of the distribution of the subject population using the Dissimilarity Index (DI). In the United States, non-Hispanic Black residents had an average level of Black residential DI of 0.67 in 2000 (values above 0.6 are considered very segregated), compared with Hispanics (DI = .52) and those who are foreign-born (DI = .44) (30). The dissimilarity index also may be used to examine segregation by income, e.g., residential segregation of the poor from the affluent. However, segregation by income level appears to be much lower than segregation by either race or ethnicity (11).

Similar trends in racial residential segregation hold true when looking specifically at children. Black and Latino children consistently live in more disadvantaged neighborhoods than White children, even the worst-off White children(25). About 74 percent of poor Black children and 60 percent of poor Hispanic children live where poverty rates are higher than those found in the neighborhoods of the worst-off poor White children(25). Further, less common among White children, a large fraction of Black and Latino children consistently experience “double jeopardy,” living in poor families and in poor neighborhoods (25). Children living in and educated in predominantly poor neighborhoods have lower health literacy compared to those in White communities (26, 37). Minority children manifest higher rates of asthma, elevated lead levels, and learning disabilities (27). Neighborhood factors, such as pervasive violence common in low-income communities, also are associated with high rates of obesity, accidental death and increased susceptibility to infectious diseases in youth(2). Racism negatively affects the psychosocial development of racial/ethnic minority children and is associated with lower self-efficacy and higher levels of hopelessness in Black male adolescents; these feelings can lead to both internalized behavior, such as anxiety, depression, and withdrawal, and externalized behavior, such as anger and aggression (47,48,49).

According to Williams & Collins (2001), segregation is a main source of racial and ethnic differences in SES because segregation has truncated socioeconomic mobility for non-Hispanic Black residents, which has in turn created inequitable access to education and employment opportunities (45). Racial residential segregation also exposes minority populations to environmental conditions that impact health (e.g., health care access, healthy food or physical activity)and contribute to racial/ethnic health disparities(45). Policies employed by federal housing, neighborhood organizations, banking institutions, and the real estate industry that deliberately discriminated by race historically restricted non-Hispanic Black residents to undesirable locations(45). Although these policies are now illegal, racism continues to operate internally, interpersonally, and institutionally to contribute to poorer health outcomes (16-23) and to likely account for part of the socioeconomic disadvantage in which many people from certain ethnic and racial groups are concentrated (23, 28).

Public health impact

While it is difficult to predict what actual outcomes may result from changes in racial residential segregation, a decrease in the amount of segregation may result in a decrease in a variety of public health indicators, as illustrated below. Research has linked segregation with higher rates of all-cause adult and infant mortality (29). Positive changes in health may differ based on a multitude of characteristics such as age, gender, socioeconomic status, etc. It is, however, also important to remember some of the potentially protective outcomes associated with segregation mentioned above(15).

A goal of the U.S. Department of Health and Human Services’ *Healthy People 2020* initiative is “to achieve health equity, eliminate disparities, and improve the health of all groups”(50). Reducing racial residential segregation could potentially reduce health disparities through decreasing racial/ethnic socioeconomic disparities and improving conditions in the physical and social environment (45). Economic mobility is affected by access to schools in youth and employment opportunities in adults. Due to the high correlation between poverty concentration and racial residential segregation, public schools highly populated with Black and Hispanic children are often also highly populated with low-income children and cannot afford to put the same resources into school quality as middle-class and high-income communities (45). Segregated, high minority population schools have lower test scores, fewer students in advanced placement courses, more deteriorated buildings, higher dropout rates, and higher levels of teen pregnancy when compared to schools in middle-class areas (45). As an adult, racial residential segregation, particularly in urban areas, can limit employment opportunities through a lack of high-paying, entry level jobs in urban, Black neighborhoods as well as through social isolation from positive employment role models and networking opportunities (46). Differences in SES account for portions of health disparities between black and white adults. Overall, Black adults are more likely to experience activity limitations due to chronic conditions and to rate their health as fair or poor compared to whites. However, when these indicators are stratified by economic status, the rates of both activity limitations and fair or poor health ratings are nearly equal between race groups (45).

Racial residential segregation contributes to poor health in minority populations, not just through SES differences but also through neighborhood effects (45,51). Differences in quality of neighborhood exist at all SES levels between Black and White families (45). Segregated, urban residential areas are less conducive to health due to reduced access to civic services, substandard housing conditions, higher exposure to pollutants and allergens, and reduced access to high-quality medical care (45). Reducing racial residential segregation could lead to creation of environments more conducive to the

practice of healthy behaviors in racial/ethnic minority groups. Lack of recreational facilities and personal safety concerns limit physical exercise in economically disadvantaged areas (45). Communities with high concentrations of minority populations are exposed to more targeted advertising by tobacco and alcohol companies and the stressors of these neighborhoods may also make residents more susceptible to using these products (45).

The positive effects on actual health outcomes gained by reducing racial residential segregation may vary by demographic characteristics. A study examining gender when assessing the impacts of racial residential segregation found while there was no relationship between segregation and obesity among men, the same does not hold true for women. Among Black women, in age-, nativity-, and metropolitan demographic-adjusted models, high segregation was associated with a 1.29 (95 percent confidence interval (CI): 1.00, 1.65) times higher obesity prevalence than was low segregation; medium segregation was associated with a 1.35 (95 percent CI: 1.07, 1.70) times higher obesity prevalence (15). Such data suggests that reducing racial residential segregation could lead to a decrease of obesity among Black women. Similar trends may hold true for breast cancer. Breast cancer mortality disparities were largest in racially mixed tracts located in high metropolitan statistical area (MSA)/micropolitan statistical area (MiSA) segregation areas (RR = 2.06, 95 percent CI 1.70, 2.50). For Black but not White women, as MSA/MiSA racial residential segregation increased, there was an increased risk for breast cancer mortality (HR = 2.20, 95 percent CI 1.09, 4.45). In this particular study, for all-cause mortality, MSA/MiSA segregation was not a significant predictor, but increasing tract percent black population was associated with increased risk for white but not Black women (HR 1.29, 95 percent CI 1.05, 1.58)(33).

When specifically considering an older population, a decrease in racial residential segregation may lead to a decrease in major decline and death. Sudano, et al found that after adjusting for demographic characteristics, residence in low, moderate and high location quotient for racial residential segregation (LQRRS) census tracts was associated with greater likelihood of major decline/death compared to those in minimal LQRRS tracts(43).

Leverage or realign resources

Issues of racial residential segregation traditionally rest outside of the public health domain, landing more frequently in the fields of housing and civil liberties. A wider range of sectors are now involved in such issues, including but not limited to representatives from: public health, food policy and justice, environmental justice, and urban planners. Discrimination takes many forms and may occur at multiple levels (8), impacting all facets of the socioecological model (i.e., individual, interpersonal, organizational, community, and public policy levels) (1, 2) and therefore the potential to leverage or realign resources is high. Reducing racial residential segregation will be a complex, long-term process, indicating there also is need for interventions that reduce the negative health impacts of segregation in the short term.

The Fair Housing Act of 1968 makes it illegal to discriminate when renting, selling, or negotiating for housing according to race, color, national origin, religion, sex, or familial status (54). Although the degree of differential treatment of Black buyers compared to White buyers by the real estate industry has declined since the Fair Housing Act, multiple studies indicate Black buyers face continued subtle discrimination by real estate agents and access to mortgages (46). Anyone who believes their rights under this act have been violated can file a complaint with the U.S. Department of Housing and Urban Development (HUD) through a Housing Discrimination Complaint Form available on the [HUD website](#) (54).

Federal housing programs are a key partner in addressing this indicator. The federal Housing Choice Voucher Program, formerly known as Section 8, provides subsidized housing vouchers to low-income families with the goal of allowing poor families to move out of high-poverty, predominantly Black neighborhoods (52). Although the HUD has tried to make vouchers acceptable to private landlords and has encouraged housing authorities to spread vouchers over a range of neighborhoods (52), beneficiaries of the program have often ended up limited in housing choices to areas of high economic and racial segregation (53). Housing mobility programs that work in conjunction with the Housing Choice Voucher Program can assist in eliminating barriers to using vouchers in higher opportunity urban neighborhoods and suburban communities. The Baltimore Housing Mobility Program aims to expand fair housing choice among recipients of the Housing Choice Voucher Program through financial counseling, housing counselors, and employment and transportation assistance (53). Since 2003 the Baltimore Housing Mobility Program has helped 1,522 families move to low-poverty, racially integrated suburban and city neighborhoods (53). Families in the program have experienced drastic changes in neighborhood quality, school quality, and enhanced quality of life (53). Nearly 80 percent of the Baltimore

Housing Mobility Program participants said they felt safer, more peaceful, and less stress after their move, while nearly 60 percent felt more motivated and nearly 40 percent felt healthier (53).

Addressing issues such as health care access, healthy food availability, and living wage jobs in areas of high racial residential segregation could work to reduce negative health outcomes resulting from segregation. A possible intervention to address health service availability in high minority population communities is increasing federally qualified health centers (FQHC) in these neighborhoods. Ko et al. found that in 2000, counties with a high non-White dissimilarity index and a high percentage of minority residents were more likely to have a federally qualified health center (FQHC). When the addition of new FQHCs from 2000 to 2007 was examined, the effects of both poverty and non-white dissimilarity indices were positive and significant (26). Residential segregation likely produces geographic segregation of health services, such that provider mal-distribution may explain the association between residential segregation and FQHC supply. Metropolitan areas that fail to achieve greater integration of poor and minority communities may require FQHCs to compensate for provider shortages (29).

An example of food policy work intersecting with racial residential segregation is the Pennsylvania Fresh Food Financing Initiative which provides economic incentives for supermarket chains to locate in underserved low and middle-income communities by providing financing options for them from a combination of public and private funds(26). The program aims not only to provide healthy food to low-wealth communities but also to create living wage jobs and train a qualified workforce. In 2010, more than 88 fresh food projects had been financed throughout Pennsylvania and were expected to bring 5,023 jobs into these communities (55).

Predict an individual's health and wellness and/or that of their offspring

The association between racial discrimination and poor physical and mental health outcomes, morbidity, and mortality has been solidly established in the general population (4-8). Racial residential segregation has implications for the health of individuals at various points in their lives. Experiences of different forms of perceived discrimination, whether racial or other, contribute to poor health outcomes via multiple physiological and psychological mechanisms, such as impaired immune function, chronic activation of the hypothalamic-pituitary-adrenal axis, lowered perceived self-efficacy, as well as an increase in risk-taking and unhealthy behaviors (6, 24). A study examining residential segregation and mortality in 107 U.S. major cities found racial isolation was directly related to all-cause mortality for Black adults even after adjusting for SES. There also are associations of racial residential segregation on health at critical periods in life with the potential for impact on the health of future generations. For example, studies focusing on smoking, specifically smoking behaviors and smoking during pregnancy, both demonstrated a positive association between segregation and smoking (25,59). A 2011 study found a composite measure of segregation had a positive predictive relationship with low birth weight for Black and Hispanic infants, as well as mortality for Black infants (58). There also is evidence that racial residential segregation impacts the health of individual at critical transitional life stages, such as adolescents. Voucher-induced moves to lower poverty neighborhoods benefited adolescent girls' mental health but harmed the mental health of adolescent boys, particularly when they had baseline health/ developmental issues or a recent history of violent crime victimization (31, 32).

Even at comparable levels of access, racial and ethnic minority groups may receive poorer quality health care than their White counterparts (34). Black pregnant women are less likely to receive medical advice, common prenatal treatments, and information about health risks and complications (35, 36). Lack of cultural sensitivity by providers at multiple levels continues to be a major issue in efforts to address discrimination and its consequences. Recent research suggests racial residential segregation is an important factor in place-based health care disparities. Where health care organization, financing, and availability are all related to community socioeconomic conditions, urban, poor neighborhoods do not have the health care infrastructure of middle-class to upper-class suburban neighborhoods (57). Health care institutions for the poor and uninsured serving segregated, disadvantaged neighborhoods have higher rates of adverse patient safety events (such as retained surgical objects, postoperative sepsis, and catheter-related bloodstream infection) and limited resources (57,63).

Institutional forms of racism are also evident outside the health care setting. The unequal distribution of resources, especially financial resources, is evident across the United States and can account for a substantial proportion of the racial and ethnic variation in health outcomes. Institutionalized racism, as evidenced by racial residential segregation, is still in existence, and Black families remain the most highly segregated racial group regardless of SES (30, 39). Neighborhood segregation leads to a concentration of crime, poverty, overcrowding, pollution, and decreases

opportunities for quality education, employment, health care, parks, and healthy food options (42). Different dimensions of segregation may have a differential impact on health outcomes (44), however, given that segregation itself is a multifactorial construct (e.g., clustering may represent social capital or social support factors that may be beneficial vs. detrimental to health).

Data Criteria

Data availability

The American Community Survey (ACS) is an ongoing nationwide survey that collects and provides data annually on demographic, social, economic, and housing in the United States. The survey is administered by the U.S. Census Bureau and replaced the decennial census long form starting in 2010. The ACS is sampled each year, resulting in three million addresses selected and approximately two million final interviews. However, the sample drawn is substantially smaller than the one used for the previous Census long form; as a result, data must be pooled across years in order to provide reliable estimates for some geographic units. The ACS provides yearly estimates for all states, as well as all cities, counties, metropolitan areas, and population groups of 65,000 people or more. For smaller areas, multiple survey years are combined to obtain reliable estimates: three survey years in areas with 20,000 to 65,000 people, and five survey years in areas with fewer than 20,000 people. ACS data are released the year following the year in which they were collected, making the estimates extremely timely. Data are available for all states and available in all 51 jurisdictions.

The data utilized to calculate the indicators are widely available, for every state and for varying geographies (i.e., census tract, zip code tabulation area, county, place or city-level), based on U.S. Census data. The necessary data files must be downloaded and the indicator requires calculation.

Data quality

Since the ACS is a sampled survey, there is uncertainty in the estimates. The Census Bureau takes steps to minimize the error associated with non-sampling error (reporting, coding, sampling frame, survey questionnaires, non-response, and interviewer bias) through the use of trained interviewers and careful review of all questionnaire design, sampling, and analytic steps. In addition, the Census Bureau began releasing margin of error data for ACS estimates starting in 2006; these estimates allow data users to calculate 90 percent confidence limits for all point estimates released from the ACS.

To account for the complex sampling design, the ACS employs an equally complex weighting scheme. The weighting process is well-documented in the survey methodology handbook, accessible on the web. Response rates for the ACS are calculated for housing units and group quarters (person). From 2000 to 2011, the housing unit response rate ranged from a low of 93.1 percent in 2004 to a high of 98 percent in 2009. Between 2006 and 2011, the group quarter response rate ranged from a low of 97.4 percent in 2006 to a high of 98 percent in 2008 and 2009. The quality of the data is excellent and consistent across all jurisdictions. Reliability is high. Sensitivity, specificity, positive predictive value and negative predictive value will vary by outcome of interest.

While different measures can capture certain aspects of segregation, none of them alone is sufficiently robust to depict segregation comprehensively and we must consider the modifiable areal unit problem (MAUP) in segregation examination (9). Both empirical and simulation results have shown that it is sensitive to scale and zoning. Wong (2008) has shown that dissimilarity may increase when the size of the enumeration unit becomes smaller and using smaller areal units produces relatively high segregation measures (9).

Simplicity of indicator

There are at least 20 different indices that can be used to examine segregation. These have been classified by Massey and Denton into five key dimensions of segregation: 1. evenness, 2. exposure, 3. concentration, 4. centralization, 5. clustering. Evenness involves the differential distribution of the subject population, exposure measures potential contact, concentration refers to the relative amount of physical space occupied, centralization indicates the degree to which a group is located near the center of an urban area, and clustering measures the degree to which minority group members live disproportionately in contiguous areas. Within each dimension, there are numerous indices that may be employed.

One of the most common measures of Evenness is the Dissimilarity Index, calculated as:

$$D = .5 * \sum_{i=1}^n \left| x_i / X - y_i / Y \right|$$

Where n is the number of tracts (or smaller geographic area) in a metropolitan area, x_i is the population size of the minority group of interest in tract i, X is the population of the minority group in the metropolitan area as a whole, y_i is the population of the reference group (usually non-Hispanic Whites) in tract i, and Y is the population of the reference group in the metropolitan area as a whole.

This indicator is not very simple to calculate across geographic regions, but simplicity is improved with appropriate code. This indicator may be calculated at different geographies and averaged up to state level (e.g., at census tract level, then average across counties and then state; or at county-level and average across state). Depending on the intended application, it may make more sense to calculate the indicator at the census tract level, which would entail using five-year ACS estimates; a county level calculation could be done annually. The ability to explain the meaning of the indicator is moderate.

References

1. Carty DC, Kruger DJ, Turner TM, Campbell B, DeLoney EH, Lewis EY. Racism, health status, and birth outcomes: results of a participatory community-based intervention and health survey. *J Urban Health* 2011;88(1):84-97.
2. Dominguez TP. Race, racism, and racial disparities in adverse birth outcomes. *Clin Obstet Gynecol* 2008;51(2):360-70.
3. Messer LC, Vinikoor LC, Laraia BA, Kaufman JS, Eyster J, Holzman C, et al. Socioeconomic domains and associations with preterm birth. *Soc Sci Med* 2008;67(8):1247-57.
4. Williams D, Neighbors H, Jackson J. Racial/ethnic discrimination and health: findings from community studies. *American journal of public health* 2008;98(Supplement 1):S29.
5. Borrell LN, Jacobs DR, Williams DR, Pletcher MJ, Houston TK, Kiefe CI. Self-reported Racial Discrimination and Substance Use in the Coronary Artery Risk Development in Adults Study. *American Journal of Epidemiology* 2007;166(9):1068-1079.
6. Mays VM, Cochran SD, Barnes NW. Race, race-based discrimination, and health outcomes among African-Americans. *Annual Review of Psychology* 2007;58:201-225.
7. Gee G, Spencer M, Chen J, Yip T, Takeuchi D. The association between self-reported racial discrimination and 12-month DSM-IV mental disorders among Asian Americans nationwide. *Social Science & Medicine* 2007;64(10):1984-1996.
8. Williams D, Mohammed S. Discrimination and racial disparities in health: evidence and needed research. *Journal of behavioral medicine* 2009;32(1):20-47.
9. Wong DWS. Spatial dependency of segregation indices. *The Canadian Geographer/Le Géographe canadien* 2008;41(2):128-136.
10. Massey DS, Denton NA. American Apartheid: Segregation and the Making of the Underclass. *American Journal of Sociology* 1990;96(2):329.
11. Massey DS. Residential Segregation and Neighborhood Conditions US Metropolitan Areas. In: Smelser NJ, Wilson WJ, Mitchell F, editors. *American Becoming: Racial Trends and Their Consequences*. Washington, DC: National Academy Press; 2001.
12. Lu MC, Halfon N. Racial and Ethnic Disparities in Birth Outcomes: A Life-Course Perspective. *Maternal and Child Health Journal* 2003;7(1):13-30.
13. Osypuk TL, Acevedo-Garcia D. Beyond individual neighborhoods: A geography of opportunity perspective for understanding racial/ethnic health disparities. *Health Place* 2010;16(6):1113-1123.
14. Laveist TA. The Political Empowerment and Health-Status of African-Americans - Mapping a New Territory. *American Journal of Sociology* 1992;97(4):1080-1095.
15. Kershaw KN, Albrecht SS, Carnethon MR. Racial and ethnic residential segregation, the neighborhood socioeconomic environment, and obesity among blacks and mexican americans. *Am J Epidemiol* 2013;177(4):299-309.
16. Brown TN, Williams DR, Jackson JS, Neighbors HW, Torres M, Sellers SL, et al. "Being black and feeling blue": the mental health consequences of racial discrimination. *Race and Society* 2000;2(2):117-131.

17. Karlsen S, Nazroo JY. Relation Between Racial Discrimination, Social Class, and Health Among Ethnic Minority Groups. *American journal of public health* 2002;92(4):624-631.
18. Krieger N. Epidemiology, racism, and health: the case of low birth weight. *Epidemiology* 2000;11(3):237.
19. Krieger N. Does racism harm health? Did child abuse exist before 1962? On explicit questions, critical science, and current controversies: an ecosocial perspective. *Journal Information* 2003;93(2).
20. Krieger N. Stormy weather: race, gene expression, and the science of health disparities. *American journal of public health* 2005;95(12):2155.
21. Krieger N, Sidney S. Racial discrimination and blood pressure: the CARDIA Study of young black and white adults. *American journal of public health* 1996;86(10):1370-1378.
22. Krieger N, Sidney S, Coakley E. Racial discrimination and skin color in the CARDIA study: implications for public health research. *Coronary Artery Risk Development in Young Adults*. *American journal of public health* 1998;88(9):1308-1313.
23. Krieger N. Discrimination and Health. In: Berkman LK, I., editor. *Social Epidemiology*. Oxford: Oxford University Press; 2000. p. 36-75.
24. Sanders-Phillips K, Settles-Reaves B, Walker D, Brownlow J. Social inequality and racial discrimination: Risk factors for health disparities in children of color. *Pediatrics* 2009;124(Supplement 3):S176-S186.
25. Acevedo-Garcia D, Osypuk TL, McArdle N, Williams DR. Toward a policy-relevant analysis of geographic and racial/ethnic disparities in child health. *Health Affairs* 2008;27(2):321-333.
26. Ko M, Ponce NA. Community Residential Segregation and the Local Supply of Federally Qualified Health Centers. *Health Serv Res* 2013;48(1):253-270.
27. Acevedo-Garcia D, McArdle N, Osypuk TL, Lefkowitz B, Krimgold BL. Children Left Behind: How Metropolitan Areas Are Failing America's Children diversitydata.org: Harvard School of Public Health Center for the Advancement of Health; 2007.
28. Nazroo JY. Genetic, cultural or socio-economic vulnerability? Explaining ethnic inequalities in health. *Sociology of Health & Illness* 1998;20(5):710-730.
29. White K, Borrell LN. Racial/ethnic residential segregation: Framing the context of health risk and health disparities. *Health & Place* 2011;17(2):438-448.
30. Iceland J, Scopilliti M. Immigrant residential segregation in US metropolitan areas, 1990–2000. *Demography* 2008;45(1):79-94.
31. Osypuk TL, Schmidt NM, Bates LM, Tchetgen-Tchetgen EJ, Earls FJ, Glymour MM. Gender and Crime Victimization Modify Neighborhood Effects on Adolescent Mental Health. *Pediatrics* 2012;130(3):472-481.
32. Osypuk TL, Tchetgen EJT, Acevedo-Garcia D, Earls FJ, Lincoln A, Schmidt NM, et al. Differential Mental Health Effects of Neighborhood Relocation Among Youth in Vulnerable Families Results From a Randomized Trial. *Archives of General Psychiatry* 2012;69(12):1284-1294.
33. Russell EF, Kramer MR, Cooper HL, Gabram-Mendola S, Senior-Crosby D, Jacob Arriola KR. Metropolitan area racial residential segregation, neighborhood racial composition, and breast cancer mortality. *Cancer Causes Control* 2012;23(9):1519-27.
34. Smedley BD, Stith AY, Nelson AR, Understanding IoMCo, Racial E, Ethnic Disparities in Health C. *Unequal treatment : confronting racial and ethnic disparities in health care*. Washington, D.C.: National Academy Press; 2003.
35. Paul DA, Locke R, Zook K, Leef KH, Stefano JL, Colmorgen G. Racial differences in prenatal care of mothers delivering very low birth weight infants. *J Perinatol* 2006;26(2):74-8.
36. Kogan MD, Kotelchuck M, Alexander GR, Johnson WE. Racial disparities in reported prenatal care advice from health care providers. *Am J Public Health* 1994;84(1):82-8.
37. Goodman MS, Gaskin DJ, Si XM, Stafford JD, Lachance C, Kaphingst KA. Self-reported segregation experience throughout the life course and its association with adequate health literacy. *Health Place* 2012;18(5):1115-1121.
38. Massey DS, Rothwell J, Domina T. The Changing Bases of Segregation in the United States. *Annals of the American Academy of Political and Social Science* 2009;626:74-90.
39. Massey DS, Denton NA. Hypersegregation in US Metropolitan Areas: Black and Hispanic Segregation along Five Dimensions. *Demography* 1989;26(3):373-91.
40. Iceland J, Weinberg DH, E. S. Racial and Ethnic Residential Segregation in the United States: 1980–2000 US Census Bureau, Census Special Report, CENSR-3; 2002.

41. Powell DL, Stewart V. Children. The unwitting target of environmental injustices. *Pediatr Clin North Am* 2001;48(5):1291-305.
42. Acevedo-Garcia D, Lochner KA, Osypuk TL, Subramanian SV. Future directions in residential segregation and health research: a multilevel approach. *Am J Public Health* 2003;93(2):215-21.
43. Sudano JJ, Perzynski A, Wong DW, Colabianchi N, Litaker D. Neighborhood racial residential segregation and changes in health or death among older adults. *Health Place* 2013;19:80-88.
44. Bell JF, Zimmerman FJ, Almgren GR, Mayer JD, Huebner CE. Birth outcomes among urban African-American women: a multilevel analysis of the role of racial residential segregation. *Social Science & Medicine*; *Social Science & Medicine* 2006.
45. Williams, D.R. and Collins, C. Racial residential segregation: a fundamental cause of racial disparities in health. *Public Health Rep.* 2001 Sep-Oct; 116(5): 404–416.
46. Boustan, L.P. Social and Equity Issues: Racial Residential Segregation in American Cities. 2011, June; 319-339.
47. Nyborg VM, Curry JF. The impact of perceived racism: Psychological symptoms among African American boys. *Journal of Clinical Child and Adolescent Psychology* 2003;32(2):258-266.
48. Sanders-Phillips K. Assaultive violence in the community: psychological responses of adolescents and their parents. *J Adolesc Health.* 1997;21(6):356 –365
49. Grant KE, McCormick A, Poindexter L, et al. Exposure to violence and parenting as mediators between poverty and psychological symptoms in urban African American adolescents. *J Adolesc.* 2005;28(4):507–521
50. U.S. Department of Health and Human Services (USDHHS). Healthy People 2020: Disparities. Available at: <http://www.healthypeople.gov/2020/about/disparitiesAbout.aspx> Accessed on: July 15, 2014
51. Charles, CZ. The Dynamics of Racial Residential Segregation. Department of Sociology, University of Pennsylvania, Philadelphia, Pennsylvania. *Annu. Rev. Sociol.* 2003. 29:167-207.
52. Anderson L, St Charles J, Fullilove M, Scrimshaw S, Fielding J, Normand J. Providing affordable family housing and reducing residential segregation by income - A systematic review. *American Journal Of Preventive Medicine* [serial online]. April 2003.;24(3):47-67.
- 53 Engdahl, L, & Poverty and Race Research Action Council, (2009), 'New Homes, New Neighborhoods, New Schools: A Progress Report on the Baltimore Housing Mobility Program', *Poverty & Race Research Action Council*
54. U.S. Department of Housing and Urban Development. Fair Housing It's Your Right. Available at: http://portal.hud.gov/hudportal/HUD?src=/program_offices/fair_housing_equal_opp/FHLaws/yourrights Accessed on: July 15, 2014.
55. The Reinvestment Fund. Financing & Development: Pennsylvania Fresh Food Financing Initiative. Available at: <http://www.trfund.com/pennsylvania-fresh-food-financing-initiative/> Accessed on: July 15, 2014.
56. Clarke P, Morenoff J, Debbink M, Golberstein E, Elliott M, Lantz P. Cumulative Exposure to Neighborhood Context: Consequences for Health Transitions Over the Adult Life Course. *Research On Aging* [serial online]. January 2013.;36(1):115-142
57. White K, Haas J, Williams D. Elucidating the Role of Place in Health Care Disparities: The Example of Racial/Ethnic Residential Segregation. *Health Services Research* [serial online]. June 15, 2012;47(3pt2):1278-1299.
58. McFarland M, Smith C. Segregation, Race, and Infant Well-Being. *Population Research & Policy Review.* June 2011;30(3):467-493. Available from: Health Policy Reference Center
59. Yang T, Shoff C, Noah A, Black N, Sparks C. Racial segregation and maternal smoking during pregnancy: A multilevel analysis using the racial segregation interaction index. *Social Science & Medicine* [serial online]. April 15, 2014;107:26-36.
60. Hearst M, Oakes J, Johnson P. The Effect of Racial Residential Segregation on Black Infant Mortality. *American Journal Of Epidemiology.* 1193;168(11):1247-1254.
61. Sims M, Rainge Y. Urban poverty and infant-health disparities among African Americans and whites in Milwaukee. *Journal Of The National Medical Association.* 1993;94(6):472-479.
62. Massey DS, Denton NA. The Dimensions of Residential Segregation. *Social Forces* 1988;67:281–315.
63. Ly, D. P., Lopez, L., Isaac, T., & Jha, A. K. (2010). How Do Black-Serving Hospitals Perform on Patient Safety Indicators?: Implications for National Public Reporting and Pay-for-Performance. *Medical care*, 48(12), 1133-1137.

This publication was supported by a grant from the W.K. Kellogg Foundation. Its contents are solely the responsibility of the author and do not necessarily represent the official views of the W.K. Kellogg Foundation.

To learn more, please contact Caroline Stampfel, Senior Epidemiologist at cstampfel@amchp.org or (202) 775-0436.

Association of Maternal & Child Health Programs

2030 M Street, NW, Suite 350

Washington, DC 20036

(202) 775-0436 ▪ www.amchp.org

