

Future Directions in Residential Segregation and Health Research: A Multilevel Approach

The authors examine the research evidence on the effect of residential segregation on health, identify research gaps, and propose new research directions.

Four recommendations are made on the basis of a review of the sociological and social epidemiology literature on residential segregation: (1) develop multilevel research designs to examine the effects of individual, neighborhood, and metropolitan-area factors on health outcomes; (2) continue examining the health effects of residential segregation among African Americans but also initiate studies examining segregation among Hispanics and Asians; (3) consider racial/ethnic segregation along with income segregation and other metropolitan area factors such as poverty concentration and metropolitan governance fragmentation; and (4) develop better conceptual frameworks of the pathways that may link various segregation dimensions to specific health outcomes. (*Am J Public Health*. 2003;93:215–221)

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PUBLIC HEALTH RESEARCH HAS uncovered significant racial/ethnic disparities in mortality and health outcomes.^{1–7} Spatial separation of population groups along racial/ethnic lines—and, to a lesser extent, along economic lines^{8–11}—is a key feature of the social organization of US urban areas. To date, several ecological studies conducted at the metropolitan area and city levels have shown positive associations between racial residential segregation and infant mortality rates,¹² adult mortality rates,¹³ and crime rates¹⁴ among African Americans.

Here we first review the sociological literature on residential segregation, focusing on the concepts and empirical evidence that can be applied to research on racial/ethnic health disparities. We then review the literature on the relationship between residential segregation and health outcomes, noting existing conceptual and research design gaps in relation to the sociological literature. We conclude by suggesting that, to assess the role of residential segregation in racial/ethnic health disparities, there is a need for a multilevel approach grounded in both the sociological and social epidemiology literatures on neighborhood effects¹⁵ and residential segregation.^{8,9,16}

SOCIOLOGY OF RESIDENTIAL SEGREGATION

Residential Segregation and Racial/Ethnic Discrimination

The US sociological literature suggests that residential segrega-

tion along racial/ethnic lines is not primarily a result of the residential preferences of minority groups. National and metropolitan area surveys have shown that, on average, African Americans and Hispanics would be more willing than Whites to live in relatively integrated neighborhoods.^{17–19} On the other hand, several studies, including audit studies involving experimental designs, have indicated that African Americans and Hispanics continue to face discrimination in housing and mortgage markets even after income has been controlled.^{20,21} Discrimination prevents upwardly mobile members of minority groups from becoming more spatially integrated with Whites.^{9,22}

Residential Segregation by Race/Ethnicity vs Income

Conceivably, racial/ethnic residential segregation could be a reflection of the large socioeconomic status (SES) gaps that exist between members of US minority groups and Whites at the individual level. However, this does not appear to be the case.¹⁸ The available evidence indicates that segregation by race/ethnicity is stronger than segregation by income; that is, race and ethnicity sort individuals of comparable SES into vastly different neighborhood environments. In 1980 and 1990, income segregation reached only “moderate” levels.⁸ Conversely, in the same years, African American segrega-

tion was at a “high” level (according to accepted sociological definitions).⁹

Residential Segregation and Poverty Concentration

A highly significant issue in the sociological literature is whether the increasing concentrations of neighborhood poverty documented since the 1970s can be primarily attributed to the high levels of residential segregation experienced by members of minority groups, to economic factors (e.g., increasing income inequality), or to the interaction of segregation and economic factors.^{8,9,23,24} Using 1970 to 1990 census data for 60 metropolitan areas, Massey and Fischer²⁵ showed that interactions between residential segregation and income inequality were exhibiting strong effects on the spatial isolation of the poor by 1990.

Dimensions of Segregation

Residential segregation refers to segregation in regard to the composition and spatial distribution of the population of an entire metropolitan area across its neighborhoods; thus, residential segregation is a multilevel concept that combines information on 2 geographic scales. It is also a multidimensional construct consisting of 5 distinct geographic patterns: dissimilarity, isolation, clustering, centralization, and concentration.^{26,27} Because racial residential segregation usually refers to the

separation of Blacks from Whites, we refer to the dimensions in terms of Black–White segregation. However, the dimensions apply equally to other racial/ethnic groups and subgroups as well as to income segregation (e.g., segregation of poor from nonpoor individuals).

Dissimilarity, or *unevenness*, refers to the distribution of Blacks and Whites across neighborhoods in a given urban area, specifically the degree to which each neighborhood incorporates the same proportion of Blacks and Whites as the urban area overall. *Isolation* refers to the average probability of contact between Blacks and Whites at the neighborhood level. *Clustering* refers to “ghettoization,” that is, the degree to which Black neighborhoods are contiguous to each other as opposed to dispersed across the metropolitan area. *Centralization* refers to the degree to which Black neighborhoods are located near the metropolitan area’s central city as opposed to its suburbs. *Concentration* refers to the population density of the segregated group across the metropolitan area relative to the density of other groups.^{26,27}

Because of the multidimensional conceptualization of segregation, a group can face segregation on more than one dimension simultaneously. For example, Blacks residing in metropolitan areas with high levels of isolation might also experience high levels of clustering and concentration. Such patterns are referred to as *hypersegregation*.²⁸ A high level of segregation on any one dimension can have deleterious socioeconomic consequences for the segregated group, and as high levels of segregation accumulate across dimensions, the

negative effects increase. In the United States, not only do African Americans experience higher levels of segregation than Hispanics and Asians on each of these dimensions; they are also the only group to experience hypersegregation.^{28,29}

Racial/Ethnic Groups

Racial/ethnic segregation between African Americans and Whites has been considerably more prevalent than Hispanic and Asian segregation from Whites.^{10,28,30} Hispanic segregation from Whites is more frequent than Asian segregation from Whites.^{10,30} Sociologists have noted that this pattern reflects a racial/ethnic gradient in Whites’ self-reported acceptance of residential integration with various minority groups. Survey evidence indicates that Whites’ tolerance for residential integration is highest in the case of Asians, while tolerance for integration with African Americans is lowest.^{17,18}

Discrimination in housing and mortgage markets and prejudice have been important factors in shaping African American segregation.^{10,28} There is also evidence of housing and mortgage discrimination against Hispanics (albeit less pronounced than that against African Americans).²⁰ Hispanic and Asian segregation has been attributed to the preference that immigrants have for settling down in “ethnic enclaves” to ease their adjustment to US society.^{31–33} Hispanic and Asian segregation tends to diminish as immigrants assimilate.^{31,32}

The patterns and average levels of racial/ethnic segregation among various minority groups changed modestly from 1970 to 1990^{10,28} and from 1990 to 2000.³⁰ Although pat-

terns of income segregation are not as well documented, Jarrogowsky^{8,34} showed that, between 1970 and 1990, residential segregation according to income level increased, especially among African Americans and Hispanics.

Given the extensive treatment of residential segregation in the sociological literature and the significant disparities in health outcomes between members of minority groups and Whites, it is not surprising that social epidemiologists have examined whether racial residential segregation can account for such disparities. We review the empirical evidence resulting from this line of inquiry in the next section.

RESIDENTIAL SEGREGATION AND HEALTH

Using the OVID search engine, we searched MEDLINE for the period 1966 to September 2002 using *segregation* as a keyword, and we searched SOCIOFILE for the period 1974 to March 2002 using *residential segregation* as a keyword. We included studies with the term *segregation* in the title or abstract, restricting our search to articles in which residential segregation was analyzed. We included studies that involved mortality and health outcomes. We also reviewed the references from these studies to identify studies published before 1966. We identified 29 relevant studies.^{2,12–14,22,35–58}

The majority of studies examined the effect of racial residential segregation on the health outcomes of African Americans. LaVeist^{12,55} and Polednak^{49,50,54} showed a positive association between Black–White dissimilarity and Black infant mortality rates

after controlling for metropolitan area poverty rates. After the initial focus on infant mortality, several authors examined the association between racial residential segregation and mortality in other age groups. Their general finding was that Black mortality is positively associated with residential segregation^{2,44–46,53,590,28} and with residence in predominantly Black areas.^{13,41}

Another set of studies originating in the sociological literature has shown a positive association between segregation (dissimilarity, isolation, or both) and Black homicide rates.^{14,43,52} Potter² found that racial isolation, through its effect on homicide, had a strong effect on the life expectancy differential between Blacks and Whites. This finding was particularly important in that homicide was the cause of death exhibiting the largest impact on racial differentials in life expectancy.

For the most part, segregation research has focused on mortality outcomes. However, a few more recent studies have examined a variety of non-mortality-related outcomes such as teenage childbearing,⁴⁷ tuberculosis,³⁹ cardiovascular disease,³⁸ availability of food establishments serving healthy fare,³⁶ and exposure to toxic air pollutants.³⁷

Racial/Ethnic Groups

A majority of the studies that we reviewed revealed a detrimental effect of Black–White segregation on African American mortality outcomes or on Black–White mortality differentials. A few of the studies also examined the effect of Black–White segregation on White mortality rates. The findings for Whites were mixed, however. As summarized by Collins and Williams,^{47(p503)}

“the consequences of segregation, if any, for the health of whites are not well understood.” Only one study analyzed the effect of segregation on Hispanic mortality rates.⁵⁹ A recent study examined the effects of segregation, redlining (operationalized as census tracts where Asian home mortgage loan applicants were disfavored by 40% in comparison with White applicants), and self-perceived discrimination on various health outcomes among Chinese Americans residing in Los Angeles.⁶⁰

Income Segregation and Other Metropolitan Area Variables

Because of the preeminent status of racial/ethnic segregation, US research has focused on the relationship between this type of segregation (as opposed to income segregation) and health outcomes. Among the studies reviewed here, only 2 examined income residential segregation^{35,61} and found it to be positively associated with mortality. However, these studies examined mortality only among all racial/ethnic groups combined (rather than mortality rates according to race/ethnicity), and they did not examine racial/ethnic segregation vis-à-vis income segregation. Cooper et al.⁵⁷ analyzed the roles of (race-specific) income inequality and racial segregation and found that, in the case of African Americans, both variables were positively associated with mortality.

Studies of segregation and health have focused little attention on other characteristics of the spatial organization of metropolitan areas. Only 2 of the studies^{43,46} reviewed examined the role of residential segregation vis-à-vis other metropolitan-level

processes. Hart et al.⁴⁶ showed that metropolitan areas characterized by metropolitan governance forms had lower Black mortality rates than metropolitan areas characterized by municipal fragmentation and that residential segregation mediated the effect of metropolitan governance on Black male mortality. Peterson and Krivo⁴³ found that concentrated disadvantage (measured via an average of 4 exposure indexes) mediated the effect of segregation on Black homicide rates.

Segregation Dimensions

Most of the studies reviewed involved the use of segregation indexes described in the sociological literature. However, health research has largely overlooked the complexity of residential segregation. In general, most of our sample of studies included only dissimilarity indexes and lacked a conceptual justification for focusing on this segregation dimension.

Research has only recently begun to address the relationship between health outcomes and segregation dimensions other than dissimilarity.^{40,44} In several of the present studies, isolation indexes were used, providing a conceptual justification for focusing on this dimension.^{14,39,44} For example, Shihadeh and Flynn¹⁴ hypothesized that because Black isolation concentrates multiple disadvantages into a single ecological space, it would be positively associated with Black homicide rates. Only a few studies have involved other measures of segregation, such as centralization⁴⁸ and concentration.³⁹ Similarly, few studies have addressed the issue of hypersegregation.^{14,44,62}

Pathways Between Residential Segregation and Health

Studies focusing on segregation and health have incorporated a framework that is largely based on the sociological evidence relating segregation to the formation of extremely different neighborhood environments, as well as to restricted socioeconomic opportunities for minority individuals.^{58,62,63} Therefore, in general, it is hypothesized that segregation affects health indirectly through quality of neighborhood environment, concentration of poverty, or shaping of the socioeconomic attainment of minority group members.^{58,62,63}

However, most study designs have not been suitable for testing these pathways. Only one of the studies reviewed⁴³ tested whether poverty concentrations mediate the effect of segregation on health, while a few studies misspecified this pathway by controlling for metropolitan aggregate poverty rate as opposed to poverty concentration (i.e., race/ethnicity-specific exposure to poverty across neighborhoods). No multilevel studies have addressed the relationship between segregation and health through the use of indicators of neighborhood environment quality.

NEW DIRECTIONS IN SEGREGATION AND HEALTH RESEARCH

Current sociological research underscores the continued significance of race in shaping inequality in urban areas.⁶⁴ In the health field, there is increasing awareness and documentation of racial/ethnic health disparities. Therefore, continued exploration of racial residential segregation as a factor contributing to health

inequalities is clearly warranted. The focus on segregation as an expression of institutional racism is also warranted but, as discussed subsequently, could be strengthened with a multilevel framework and attention to other forms of urban inequality.

Multilevel Research Designs

Segregation and health studies have mostly relied on aggregate data, and improving ecological research designs remains an important task (later we discuss possible extensions of previous studies). However, ecological studies cannot untangle the pathways, including metropolitan area, neighborhood, and individual-level factors, through which segregation may influence health.⁶³ To date, the neighborhoods and health literature and the segregation and health literature have intersected only minimally.⁶² Integrating these 2 lines of research into a multilevel framework may help place neighborhoods in the context of their metropolitan areas, with the attending implications for social and public health policy.

Recent directions in urban inequality studies⁶⁴ and neighborhoods and health research^{65,66} suggest the potential, in terms of providing an understanding of the dynamics of health inequalities, of multilevel health surveys of household members from neighborhoods in several major metropolitan areas with various types of racial/ethnic diversity and segregation patterns. Multilevel designs may allow researchers to determine

- whether neighborhood characteristics have an effect on health after taking into account individual-level factors and, in turn, ex-

amining whether metropolitan area characteristics have an effect on health after controlling for both individual- and neighborhood-level factors (i.e., compositional vs contextual effects). For example, minority group members may experience worse health outcomes in residentially isolated neighborhoods in relatively poor metropolitan areas than in similarly isolated neighborhoods that belong to relatively affluent areas.

- whose health is negatively affected by segregation. Segregation may have health consequences for members of the segregated group living both within and outside isolated neighborhoods (i.e., cross-level interactions). For example, what is the impact of segregation on minority individuals living in primarily White neighborhoods? Are middle-class minority individuals negatively affected by living in racially isolated minority neighborhoods?
- whether and how segregation is related to other experiences of discrimination (at various scales) thought to influence health outcomes. For instance, in the United States, there are strong disparities in hypertension between African Americans and Whites. Some studies have shown a positive association between individual experiences of racial discrimination and hypertension.^{67,68} Combining information on personal experiences of discrimination with indicators of neighborhood population composition and residential segregation would allow examination of whether residence in primarily minority neighborhoods buffers (exacerbates) perceptions of discrimination, whether residence in highly segregated metropolitan

areas influences perceptions of discrimination above and beyond the effect of neighborhood population composition, and how levels of racism relate to hypertension. Gee's recent, innovative article appearing in the *Journal* constitutes an example of this type of research.⁶⁰

Additional Racial/Ethnic Groups

The saliency of race in the United States and the negative health outcomes experienced by African Americans have led to an almost exclusive focus on Black–White segregation in the health literature. Previous sociological research suggests that both the levels of segregation and the causes of segregation experienced by US minority groups vary considerably.^{69,70} Future studies should explore whether segregation across various minority groups has similar effects on health outcomes. Different segregation levels across various racial/ethnic groups may have differing effects on health; that is, segregation may have a negative impact on African Americans' health because African American segregation is more prevalent. Studying segregation across different racial/ethnic groups and subgroups can help elucidate thresholds above which segregation may have a detrimental effect on health outcomes.

Studies that examine African American segregation vis-à-vis Hispanic/Asian segregation may also shed light on the role played by various causes of segregation. African American segregation may have a negative effect on health outcomes because it is largely the result of discrimination, whereas Hispanic/Asian segregation may be the result of

immigrants' residential preferences for settling in areas where co-ethnic social networks are available. To our knowledge, the effect of residential segregation on the health status of Native Americans (residing on reservations or trust lands or in metropolitan areas) remains to be studied.⁵⁸

Income Segregation and Other Metropolitan Area Variables

Future research should simultaneously explore the relationship between racial segregation and health and the relationship between income segregation and health, including the issue of whether residential segregation by income mediates or moderates the effect of racial segregation. Recent US social history constitutes a good natural experiment to examine such issues. For instance, did the 1970 to 1990 increase in income segregation described earlier compound the effect of racial segregation on mortality? A longitudinal examination of the relationships between racial/ethnic segregation and mortality and between income segregation and mortality would seem to be a promising approach.

Research has suggested that neighborhood effects are linked to factors affecting the metropolitan area as a whole.^{78,16,71,72} Future studies will require conceptual and empirical exploration of other metropolitan area processes that may mediate the relationship between segregation and mortality/morbidity. Poverty concentrations, social inequalities between central cities and suburbs, and metropolitan governance fragmentation deserve special attention.^{71,72}

Segregation Dimensions and Possible Pathways to Health

Much of the conceptual complexity present in the sociological literature has yet to be incorporated into the social epidemiological research on residential segregation and health. Future research should emphasize the conceptualization of specific pathways through which various segregation dimensions may be positively associated with both overall and cause-specific mortality and morbidity in various age groups and operationalize such pathways through the use of multiple (conceptually justified) segregation indexes. Previous empirical research on the association between specific segregation dimensions and socioeconomic outcomes²⁹ may guide the identification of causal pathways between segregation and health. In the paragraphs to follow, we propose some mechanisms through which various segregation dimensions may influence health.

Surprisingly, despite the reliance on measures of dissimilarity in health studies, this is the segregation dimension involving the least clear conceptual relevance for health outcomes. If not accompanied by high levels of segregation along other dimensions, such as isolation and density, uneven distribution of minorities may not have a negative impact on health. Empirically, dissimilarity is less associated with neighborhood quality and SES indicators than other segregation dimensions.²⁹

Isolation may affect certain health outcomes by limiting contact (i.e., exposure) between the segregated group and the other members of the population. For instance, in metropolitan areas where a given group is highly residentially isolated (and other

conditions for sustained transmission exist), infectious diseases may be confined to isolated neighborhoods.^{40,73} Similarly, in the presence of other social conditions that induce violent behavior, high levels of isolation may be associated with high rates of intraracial (as opposed to interracial) homicide among the segregated group.⁵² Research evidence suggests the possibility that environmental hazards are more likely to be located in predominantly minority (or poor) neighborhoods.^{74,75} In areas where isolation is high, it may be politically more feasible to locate hazards in minority communities, because the risk for the majority (nonpoor) population may be lower.

Clustering of disadvantaged neighborhoods may further constrain social and economic opportunities for the segregated group. The social (e.g., crime) and health effects of one's neighborhood of residence can be mitigated or exacerbated depending on the socioeconomic characteristics of the surrounding neighborhoods.^{76,77} In a metropolitan area with a high level of racial/ethnic "ghettoization," it may be more difficult for ghetto residents to access other parts of the metropolitan area in search of, for example, retail outlets or social and health services. Also, social groups at high risk for transmission of infectious diseases (e.g., sexually transmitted diseases) may cluster in "core" census tracts.^{73,78}

The spread of infectious diseases from US inner-city disease epicenters to the surrounding suburbs may be a function of degree of centralization (e.g., dispersal of poor populations from the central city).⁷⁹ A similar pattern of "diffusion" from

central city epicenters to the surrounding areas exists in regard to other social and health outcomes as well, such as crime and low birthweight.^{80,81} It remains to be tested whether this pattern responds to a spatial social gradient in the concentration of disadvantage from higher levels in central cities to lower levels in outer suburbs. In the case of outcomes that may respond to transmission/diffusion (e.g., infectious diseases or crime), an alternative mechanism may be the interaction between central city and suburban residents.

Concentration or density of marginalized populations may be an important determinant of infectious disease transmission,^{40,79} in that it may increase contact between infectious and susceptible individuals. High degrees of concentration (and isolation) of ethnic/racial minority groups or disadvantaged populations may also facilitate geographic targeting on the part of anti-public health entities such as the tobacco and alcohol industries.^{82,83} Finally, in empirical terms, concentration is the segregation dimension most clearly linked to indicators of lower SES among African Americans.²⁹

SUMMARY AND CONCLUSIONS

A large body of sociological and policy literature strongly suggests that residential segregation has been a key factor in creating substantial inequalities in opportunity across space (i.e., neighborhoods) and across individuals along racial/ethnic lines.^{9,25,34,58,64,71} Ecological health studies have shown that segregation is positively associated with mortality rates and

certain health outcomes among African Americans. However, only multilevel research designs will allow us to examine the effects of individual, neighborhood, and metropolitan area factors on health outcomes.

We should continue to address the health effects of residential segregation on African Americans but also initiate comparative studies examining segregation of Hispanics and Asians. Racial/ethnic segregation is a key factor, but one that should be considered along with other metropolitan area characteristics such as income segregation, poverty concentration, and metropolitan governance fragmentation. It will also be important to develop better conceptual frameworks of the pathways that may link various segregation dimensions to specific health outcomes. ■

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Contributors

D. Acevedo-Garcia conducted the literature review and took primary responsibility for the conceptualization and writing of the article. K. A. Lochner and T. L. Osypuk participated in the literature review and the editing of the manuscript. S. V. Subramanian participated in conceptualizing the multilevel framework proposed in the article.

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References

- Geronimus AT. Excess mortality among blacks and whites in the United States. *Bull N Y Acad Med.* 1995;72:470–482.
- Potter LB. Socioeconomic determinants of white and black males' life expectancy differentials, 1980. *Demography.* 1991;28:303–321.
- Schneider D. Violence as a public health priority for black Americans. *J Natl Med Assoc.* 1992;84:843–848.
- Jackson JS, Brown TN, Williams DR, Torres M, Sellers SL, Brown K. Racism and the physical and mental health status of African Americans: a thirteen year national panel study. *Ethn Dis.* 1996;6:132–147.
- Geronimus AT. The weathering hypothesis and the health of African-American women and infants: evidence and speculations. *Ethn Dis.* 1992;2:207–221.
- Geronimus AT. Black/white differences in the relationship of maternal age to birthweight: a population-based test of the weathering hypothesis. *Soc Sci Med.* 1996;42:589–597.
- Geronimus AT, Bound J, Waidmann TA, Hillemeier MM, Burns PB. Excess mortality among blacks and whites in the United States. *N Engl J Med.* 1996;335:1552–1558.
- Jargowsky PA. *Poverty and Place: Ghettos, Barrios, and the American City.* New York, NY: Russell Sage Foundation; 1997.
- Massey DS, Denton NA. *American Apartheid: Segregation and the Making of the Underclass.* Cambridge, Mass: Harvard University Press; 1993.
- Farley R, Frey WH. Changes in the segregation of whites from blacks during the 1980s: small steps towards a more racially integrated society. *Am Sociol Rev.* 1994;59:23–45.
- Hajnal ZL. The nature of concentrated urban poverty in Canada and the United States. *Can J Sociol.* 1995;20:497–528.
- LaVeist TA. Segregation, poverty, and empowerment: health consequences for African Americans. *Milbank Q.* 1993;71:41–64.
- Fang J, Madhavan S, Bosworth W, Alderman MH. Residential segregation and mortality in New York City. *Soc Sci Med.* 1998;47:469–476.
- Shihadeh ES, Flynn N. Segregation and crime: the effect of black isolation

- on the rates of black urban violence. *Soc Forces*. 1996;74:1325–1352.
15. Kawachi I, Berkman LF, eds. *Neighborhoods and Health*. New York, NY: Oxford University Press Inc. In press.
16. Sampson RJ, Morenoff JD. Ecological perspectives on the neighborhood context of urban poverty: past and present. In: Brooks-Gunn J, Duncan GJ, Aber JL, eds. *Neighborhood Poverty*. New York, NY: Russell Sage Foundation; 1997:1–22.
17. Farley R. Neighborhood preferences and aspirations among blacks and whites. In: Kingsley GT, Turner MA, eds. *Housing Markets and Residential Mobility*. Washington, DC: Urban Institute Press; 1993:161–191.
18. Charles CZ. Processes of racial residential segregation. In: O'Connor A, Tilly C, Bobo LD, eds. *Urban Inequality: Evidence From Four Cities*. New York, NY: Russell Sage Foundation; 2001: 217–271.
19. Leachman M, Nyden P, Peterman B, Coleman D. *Black, White, and Shades of Brown: Fair Housing and Economic Opportunity in the Chicago Region*. Chicago, Ill: Leadership Council for Metropolitan Open Communities; 1998.
20. Yinger J. *Closed Doors, Opportunities Lost: The Continuing Costs of Housing Discrimination*. New York, NY: Russell Sage Foundation; 1995.
21. Logan JR, Alba RD. Who lives in affluent suburbs? Racial differences in eleven metropolitan regions. *Social Focus*. 1995;28:353–364.
22. Massey DS, Condran GA, Denton NA. The effect of residential segregation on black social and economic well-being. *Soc Forces*. 1987;66:29–56.
23. Wilson WJ. *The Truly Disadvantaged: The Inner City, the Underclass, and Public Policy*. Chicago, Ill: University of Chicago Press; 1987.
24. Wilson WJ. *When Work Disappears: The World of the New Urban Poor*. New York, NY: Alfred A Knopf; 1996.
25. Massey DS, Fischer MJ. How segregation concentrates poverty. *Ethnic Racial Stud*. 2000;23:670–691.
26. Massey DS, Denton NA. The dimensions of residential segregation. *Soc Forces*. 1988;67:281–315.
27. Massey D, White M, Phua V. The dimensions of segregation revisited. *Sociol Methods Res*. 1996;25:172–206.
28. Massey DS, Denton NA. Hypersegregation in U.S. metropolitan areas: black and Hispanic segregation along five dimensions. *Demography*. 1989;26: 373–391.
29. Denton N. Are African Americans still hypersegregated? In: Bullard RD, Grigsby JE, Lee C, Feagin JR, eds. *Residential Apartheid: The American Legacy*. Los Angeles, Calif: CAAS Publications; 1994:49–81.
30. *Ethnic Diversity Grows, Neighborhood Integration Lags Behind*. Albany, NY: Lewis Mumford Center for Comparative Urban and Regional Research; 2001.
31. Alba RD, Logan JR. Variations on two themes: racial and ethnic patterns in the attainment of suburban residence. *Demography*. 1991;28:431–453.
32. Logan JR, Alba RD, Leung S-Y. Minority access to white suburbs: a multi-regional comparison. *Soc Forces*. 1996; 74:851–881.
33. Fernandez Kelly MP, Schauffler R. Divided fates: immigrant children and the new assimilation. In: Portes A, ed. *The New Second Generation*. New York, NY: Russell Sage Foundation; 1996: 30–53.
34. Jargowsky PA. Take the money and run: economic segregation in U.S. metropolitan areas. *Am Sociol Rev*. 1996;61:984–998.
35. Lobmayer P, Wilkinson RG. Inequality, residential segregation by income and mortality in US cities. *J Epidemiol Community Health*. 2002;56: 183–187.
36. Morland K, Wing S, Diez-Roux A, Poole C. Neighborhood characteristics associated with the location of food stores and food service places. *Am J Prev Med*. 2002;22:23–29.
37. Lopez R. Segregation and black/white differences in exposure to air toxics in 1990. *Environ Health Perspect*. 2002;110(suppl 2):289–295.
38. Cooper R. Social inequality, ethnicity and cardiovascular disease. *Int J Epidemiol*. 2001;30(suppl 1):S48–S52.
39. Acevedo-Garcia D. Zip code level risk factors for tuberculosis: neighborhood environment and residential segregation, New Jersey, 1985–1992. *Am J Public Health*. 2001;91:734–741.
40. Acevedo-Garcia D. Residential segregation and the epidemiology of infectious diseases. *Soc Sci Med*. 2000;51: 1143–1161.
41. Jackson SA, Anderson RT, Johnson NJ, Sorlie PD. The relation of residential segregation to all-cause mortality: a study in black and white. *Am J Public Health*. 2000;90:615–617.
42. Lester D. Does residential segregation in cities predict African-American suicide rates? *Percept Mot Skills*. 2000; 91:870.
43. Peterson RD, Krivo LJ. Racial segregation, the concentration of disadvantage, and black and white homicide victimization. *Sociol Forum*. 1999;14: 465–493.
44. Collins C, Williams DR. Segregation and mortality: the deadly effects of racism. *Sociol Forum*. 1999;14: 495–523.
45. Guest AM, Almgren G, Hussey JM. The ecology of race and socioeconomic distress: infant and working-age mortality in Chicago. *Demography*. 1998;35: 23–34.
46. Hart KD, Kunitz SJ, Sell RR, Mukamel DB. Metropolitan governance, residential segregation, and mortality among African Americans. *Am J Public Health*. 1998;88:434–438.
47. Sucoff CA, Upchurch DM. Neighborhood context and the risk of child-bearing among metropolitan-area black adolescents. *Am Sociol Rev*. 1998;63: 571–585.
48. Shihadeh ES, Maume MO. Segregation and crime: the relationship between black centralization and urban black homicide. *Homicide Stud*. 1997;1: 254–280.
49. Polednak AP. Trends in US urban black infant mortality, by degree of residential segregation. *Am J Public Health*. 1996;86:723–726.
50. Polednak AP. Segregation, discrimination and mortality in U.S. blacks. *Ethn Dis*. 1996;6:99–108.
51. Bird ST. Separate black and white infant mortality models: differences in the importance of structural variables. *Soc Sci Med*. 1995;41:1507–1512.
52. Peterson RD, Krivo LJ. Racial segregation and black urban homicide. *Soc Forces*. 1993;71:1001–1026.
53. Polednak AP. Poverty, residential segregation, and black/white mortality ratios in urban areas. *J Health Care Poor Underserved*. 1993;4:363–373.
54. Polednak AP. Black-white differences in infant mortality in 38 standard metropolitan statistical areas. *Am J Public Health*. 1991;81:1480–1482.
55. LaVeist TA. Linking residential segregation to the infant mortality race disparity in U.S. cities. *Sociol Soc Res*. 1989;73:90–94.
56. Yankauer A. The relationship of fetal and infant mortality to residential segregation. *Am Sociol Rev*. 1950;15: 644–648.
57. Cooper RS, Kennelly JF, Durazo-Arvizu R, Oh HJ, Kaplan G, Lynch J. Relationship between premature mortality and socioeconomic factors in black and white populations of US metropolitan areas. *Public Health Rep*. 2001;116: 464–473.
58. Williams DR, Collins C. Racial residential segregation: a fundamental cause of racial disparities in health. *Public Health Rep*. 2001;116:404–416.
59. LeClere FB, Rogers RG, Peters KD. Ethnicity and mortality in the United States: individual and community correlates. *Soc Forces*. 1997;76:169–198.
60. Gee GC. A multilevel analysis of the relationship between institutional and individual racial discrimination and health status. *Am J Public Health*. 2002; 92:615–623.
61. Waitzman NJ, Smith KR. Separate but lethal: the effects of economic segregation on mortality in metropolitan America. *Milbank Q*. 1998;76: 341–373.
62. Acevedo-Garcia D, Lochner KA. Segregation and health. In: Kawachi I, Berkman LF, eds. *Neighborhoods and Health*. New York, NY: Oxford University Press Inc. In press.
63. Williams DR. Racism and health: a research agenda. *Ethn Dis*. 1996;6:1–8.
64. O'Connor A, Tilly C, Bobo LD. *Urban Inequality: Evidence From Four Cities*. New York, NY: Russell Sage Foundation; 2001.
65. Earls F, Buka SL. *Project on Human Development in Chicago Neighborhoods*. Washington, DC: National Institute of Justice; 1997.
66. Sastry N, Ghosh-Dastidar B, Adams J, Pebley A. *The Design of a Multilevel Longitudinal Survey of Children, Families and Communities: The Los Angeles Family and Neighborhood Survey*. Santa Monica, Calif: RAND Labor and Population Program; 2000.
67. Krieger N, Sidney S. Racial discrimination and blood pressure: the CARDIA study of young black and white adults. *Am J Public Health*. 1996; 86:1370–1378.
68. Williams DR, Neighbors H. Racism, discrimination and hypertension: evidence and needed research. *Ethn Dis*. 2001;11:800–816.
69. Galster G, Metzger K, Waite R. Neighborhood opportunity structures of immigrant populations, 1980 and 1990. *Housing Policy Debate*. 1999;10: 395–442.
70. Massey DS. Residential segregation and neighborhood conditions in U.S. metropolitan areas. In: Smelser NJ, Wilson WJ, Mitchell F, eds. *America Becoming: Racial Trends and Their Consequences*. Washington, DC: National Academy Press; 2001:391–434.
71. Altshuler A, Morrill W, Wolman H, Mitchell F. Committee on Improving the Future of U.S. Cities Through Improved Metropolitan Area Governance.

Governance and Opportunity in Metropolitan America. Washington, DC: National Academy Press; 1999.

72. Iannotta JG, Ross JL, National Research Council. *Equality of Opportunity and the Importance of Place: Summary of a Workshop*. Washington, DC: National Academy Press; 2002.

73. Rothenberg RB, Potterat JJ. Temporal and social aspects of gonorrhea transmission: the force of infectivity. *Sex Transm Dis*. 1988;15:88–92.

74. Brown P. Race, class, and environmental health: a review and systematization of the literature. *Environ Res*. 1995;69:15–30.

75. Davidson P, Anderton DL. Demographics of dumping: II. A national environmental equity survey and the distribution of hazardous materials handlers. *Demography*. 2000;37:461–466.

76. Morenoff JD, Sampson R. Violent crime and the spatial dynamics of neighborhood transition: Chicago 1970–1990. *Soc Forces*. 1997;76:31–64.

77. Sampson RJ, Morenoff JD, Earls F. Beyond social capital: spatial dynamics of collective efficacy for children. *Am Sociol Rev*. 1999;64:633–660.

78. Potterat JJ, Rothenberg RB, Wood-

house DE, Muth JB, Pratts CI, Fogle JS. Gonorrhea as a social disease. *Sex Transm Dis*. 1985;12:25–32.

79. Wallace R, Wallace D. U.S. apartheid and the spread of AIDS to the suburbs: a multi-city analysis of the political economy of spatial epidemic threshold. *Soc Sci Med*. 1995;41:333–345.

80. Wallace R, Huang YS, Gould P, Wallace D. The hierarchical diffusion of AIDS and violent crime among U.S. metropolitan regions: inner-city decay, stochastic resonance and reversal of the mortality transition. *Soc Sci Med*. 1997;44:935–947.

81. Wallace R, Wallace D. Community marginalisation and the diffusion of disease and disorder in the United States. *BMJ*. 1997;314:1341–1345.

82. Luke D, Esmundo E, Bloom Y. Smoke signs: patterns of tobacco billboard advertising in a metropolitan region. *Tob Control*. 2000;9:16–23.

83. Stoddard JL, Johnson C, Boley-Cruz T, Sussman S. Targeted tobacco markets: outdoor advertising in Los Angeles minority neighborhoods. *Am J Public Health*. 1997;87:1232–1233.