Invited Commentary

Invited Commentary: Integrating a Life-Course Perspective and Social Theory to Advance Research on Residential Segregation and Health

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Research on racial residential segregation and health typically uses multilevel, population-based, slice-in-time data. Although research using this approach, including that by Kershaw et al. (Am J Epidemiol. 2013;177(4):299–309), has been valuable, I argue that to advance our understanding of how residential segregation influences health and health disparities, it is critical to incorporate a life-course perspective and integrate social theory. Applying a life-course perspective would entail modeling transitions, cumulative risk, and developmental and dynamic processes and mechanisms, as well as recognizing the contingency of contextual effects on different social groups. I discuss the need for analytic methods appropriate for modeling health effects of distal causes experienced across the life course, such as segregation, that operate through multiple levels and sequences of mediators, potentially across decades. Sociological theories of neighborhood attainment (e.g., segmented assimilation, ethnic resurgence, and place stratification theories) can guide effect-modification tests to help illuminate health effects resulting from intersections of residential processes, race/ethnicity, immigration, and other social determinants of health. For example, nativity and immigration history may crucially shape residential processes and exposures, but these have received limited attention in prior segregation-health literature.

neighborhood effects; place; racial residential segregation; social epidemiology; social theory

In this issue of the Journal, the article by Kershaw et al. (1) exemplifies a burgeoning body of research documenting that racial residential segregation is associated with health among racial minority groups. Kershaw et al. found that high segregation is associated with lower obesity prevalence among Hispanic women but higher obesity prevalence among black women. Their article contributes to our growing understanding of causes of obesity by assessing an important distal cause of racial/ethnic disparities in obesity—racial residential segregation.

Racial residential segregation is high in the United States and represents a powerful engine of racial stratiﬁcation and urban inequality. According to the 2010 dissimilarity segregation measure, in order to attain racial neighborhood integration with whites, on average across the United States, 59% of blacks, 48% of Hispanics, and 41% of Asians would have to move from their current neighborhoods (2). This stark separation of residential contexts, especially in highly segregated regions like Detroit, Michigan, Milwaukee, Wisconsin, and Chicago, Illinois, means that segregation exposes different racial groups to vastly different health resources and risks across the life course (3–5).

Over the past decade, segregation-health hypotheses have typically been tested using multilevel, population-based, slice-in-time (cross-sectional) methods (6–13). Such an approach utilizes hierarchical modeling, often among minority groups only, using prevalent (rather than incident) health outcome measures. A typical analysis uses 2 racial/ethnic group indices of residential segregation at the metropolitan area unit (approximating housing markets) and nationwide population-based (generalizable) survey or vital statistics data of metropolitan dwelling populations. Although this approach has contributed to our understanding of the relationship between segregation and health, the epidemiologic literature would beneﬁt from incorporating additional concepts, theories, and methods to help us understand whether, how, and why racial residential segregation is associated with health.
APPLYING A LIFE-COURSE PERSPECTIVE TO SEGREGATION RESEARCH

Adopting a life-course perspective represents an important future direction for segregation-health research. Life-course epidemiology focuses on how exposures throughout life, especially during biologically or socially vulnerable periods, influence health at later ages (14–16). Life-course approaches model developmental and dynamic processes across time and suggest that the impact of an exposure may depend on the age or developmental period at which the person was exposed. A cornerstone of life-course epidemiology is to model mechanisms linking exposure at each life-course period to subsequent health outcomes. Modeling mediation of distal exposures like segregation, which operate through multiple levels and sequences of mediators across long periods of time, requires challenging analytic methods. Another critical advance for segregation research derived from life-course principles is to recognize and model the contingency of contextual effects, whereby social vulnerability may modify segregation effects on health. In particular, heterogeneity in nativity and immigration residential processes may reflect varying degrees of residential choice, grounded in theories such as those of segmented assimilation, ethnic resurgence, and place stratification.

Static versus dynamic segregation exposures

A central challenge in segregation-health research is modeling segregation as a cause of disease, given that metropolitan segregation is so stable across time. Segregation is a “ubiquitous” exposure (17); everyone in a metropolitan area is exposed to it because segregation is conceptually defined as a disproportionate distribution of racial groups across neighborhoods within housing markets (5, 18). Although it is sometimes thought that metropolitan-level residential segregation is simply a proxy for only neighborhood-level exposures of racial composition, this is not the case. Although segregation has neighborhood-level analogs of racial composition, segregation is distinct as a measure of inequality or dispersion (19). Metropolitan segregation represents a range of other exposures, including structural barriers or risks that may not operate at exclusively the neighborhood level, like socioeconomic opportunities (education, employment) or discrimination (3, 4), in addition to neighborhood environment.

Although some households move frequently, most prior evidence treats racial residential segregation as a static construct modeled as a point-in-time exposure (20) rather than a source of risk or protection that can vary over time. Most moves occur within a metropolitan area, however, and given the stability of segregation, cross-sectional designs may provide a reasonable proxy for cumulative segregation exposure operating over a long period of time.

Researchers usually contrast residence in different metropolitan areas to test the impact of segregation exposures. However, one could also contrast within-person moves across time, and such improved measures of exposure would recognize the dynamic nature of residence and might strengthen causal inferences about the effects of segregation. The stability of segregation across time for populations within a given metropolitan area (21) introduces challenges with this approach, however. Given this slow pace of change in metropolitan segregation, modeling longer periods of time may be necessary to achieve meaningful variation. Few individuals experience substantial changes in segregation within the time scale of typical cohort studies, although residential mobility is notably higher for young adults (22). Despite the fact that incorporating time-varying exposures may not change associations for the majority of the population, contrasting within-person changes among those individuals who move across metropolitan areas, that is, conducting migration studies, may provide valuable information supporting segregation as a cause of illness.

Time, age, and developmental stage. Incorporating time, age, and developmental stage into segregation studies is important for assessing the impact of segregation exposures. There is strong evidence that childhood and adolescence are developmentally sensitive periods for the establishment of long-term health risks. Therefore, understanding whether segregation effects are differential when experienced during different developmental stages or ages (6) may be a particularly important research question for unpacking how segregation is associated with health (23). Given the relative stability of segregation across time and limited knowledge about typical residential trajectories across metropolitan areas with varying segregation levels, it is uncertain whether it would be possible to disentangle the impact of segregation by developmental period. However, examining the interaction of segregation levels and age may allow us to examine cumulative effects across time that may indicate weathering (6, 24).

Transitions and cumulative exposures. Within the broader frame of mediation, a focus on transitions would highlight the simultaneous or sequential exposure to racial segregation across domains of life (e.g., neighborhoods, schools, workplaces) (23). For example, minority children are much more likely than are white children to experience multiple disadvantages at family and community levels, with a gradient by segregation (4).

Mechanisms

Key proposed mechanisms linking segregation and health involve neighborhood context, as well as socioeconomic pathways like education, employment, and occupation trajectories that begin in childhood or adolescence (25). Indeed, mediation analyses are a crucial need for segregation research; identifying mechanisms is likely to facilitate translation into beneficial population health interventions. Yet, there are analytic challenges to modeling the effects of distal causes that operate across many levels, through multiple sequences of mediators, throughout a long period of time.

Traditional analytic approaches, based on cross-sectional regression modeling, or analyses within one metropolitan area or big city may be problematic for understanding mediators of residential segregation effects on health disparities, including the potentially central role of neighborhood.
contexts. First, the magnitudes of distal causes like segregation may be small when modeled with traditional methods because they are operating through multiple mediators that may interact in complex ways (26). Second, there are serious methodological challenges to modeling how neighborhoods contribute to racial health disparities, given the pervasive hypersegregation in the United States that results in separate neighborhoods of residence for different racial/ethnic groups (5, 27). This vast racial neighborhood separation threatens internal validity because of positivity and exchangeability violations. Although there are some solutions to these problems that improve internal validity, they come at a cost to external validity (5).

Methods that accommodate variables that are both confounders and mediators may be necessary to understand how a distal cause, such as segregation, impacts trajectories of neighborhood moves and types of destination neighborhoods across time to ultimately influence health. Methods such as inverse probability weighting and marginal structural modeling, as well as G-estimation, have been applied for understanding neighborhood exposures (28, 29) and are appropriate for parsing direct effects from indirect effects (30).

Agent-based models or other system-dynamics models may be appropriate for simulating the health effects of distal causes at the macro level, particularly if there are emergent properties of the system, feedback loops, or dynamic interdependent processes (31). Schelling’s model of residential segregation illustrates the power of agent-based models to demonstrate how macro-level patterns of residential segregation can emerge over time from the residential preferences of individuals (32). The dynamic iterative processes by which individuals shape their communities and by which communities have feedback effects on individuals may be difficult to predict or model with traditional approaches (32–34). Some research applies agent-based models to understand neighborhood residential processes on health (35, 36), which may be particularly useful for understanding social contagion or social contact hypotheses (37).

Leveraging exogenous shocks that influence moves could also strengthen causal inference regarding residential segregation effects on health, manipulating the mechanisms of segregation. Housing voucher experiments (like the Moving to Opportunity Study) (38–40), lotteries (41), or civil rights legal remedies (42) may inform how specific types of moves from high-poverty, high-minority neighborhoods to lower-poverty, more racially integrated neighborhoods influence health within an experimental or natural experiment design. This type of research on neighborhood changes can help us understand the ways in which constraining specific neighborhood choices (e.g., to low-poverty neighborhoods) along one neighborhood dimension of segregation may affect health. However, this research does not directly assess the effects of metropolitan-level segregation. On the other hand, certain policy changes may generate opportunities for exogenous change in segregation (natural experiments). For example, American courts are slowly dismantling their court-ordered desegregation orders that have been in place since the 1970s, which is causing resegregation of schools, particularly in the South. At least one study linked these changes to health outcomes using difference-in-difference methods (43).

TESTING SOCIAL THEORIES TO EXPLAIN CONTINGENCY OF CONTEXTUAL EFFECTS BY SOCIAL CATEGORY

Social epidemiologic analyses are concerned with the social distribution and social determinants of health (44). Theories of locational attainment (45), intersectionality (46), and developmental and life-course science (16, 47) suggest that effects of racial residential segregation may be differential by social factors, including race/ethnicity, nativity, gender, socioeconomic status, baseline health, or developmental stage/age (6, 7, 38, 39, 48). Therefore, the testing of effect modification may be guided by such theories. Specifically, effect modification may indicate that some groups are more vulnerable to toxic conditions introduced by residential segregation or that some groups have less residential choice than others. However, apparent effect modification may also arise as an artifact of measurement issues, such as differential validity or reliability of specific measures across subgroups (49), or by chance as a result of not preserving type 1 error (50).

Gender

Gender is one candidate effect modifier of segregation-health effects; indeed, Kershaw et al. found an association between segregation and obesity only among women (1). Some of the strongest evidence that contexts matter differentially by gender derives from the Moving to Opportunity experimental study of housing vouchers. 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, striking qualitative effect modification (38, 39). The gendered context of neighborhoods is not well understood, but contexts navigated by low-income minority adolescents may be gender-specific (51, 52).

Race/ethnicity

Race/ethnicity is typically examined as an effect modifier in segregation-health studies, as in the one by Kershaw et al., in which the authors found opposite segregation-health associations for black and Hispanic women (1). There is a range of different theories that explain why different racial/ethnic groups may exhibit different residential-health patterns. Most segregation-health studies have focused on the experience of native-born African-American versus white populations and were generally grounded in the place stratification theory. This theory states that race is central to residential patterns; despite socioeconomic gains, neighborhood attainment for blacks and black Hispanics is limited by housing discrimination, racial prejudice, and white avoidance of black areas, all of which concentrate blacks into poor areas (45, 53, 54). Segregation is therefore often
hypothesized to be harmful for black Americans because of concentrated poverty (in high-segregation areas, the black distribution of neighborhood poverty is entirely separate and vastly worse than the white distribution (55)) and exposure to high crime, physical and social disorder, and poor-quality public services (such as schools and police response) in the inner city (13). In some situations, segregation could have positive effects for blacks, if black enclaves were to shield black residents from racism (5), foster salubrious social networks, or promote political solidarity (56). Segregation evidence for whites is mixed, with many studies finding no impact. Theoretically, segregation might be beneficial for whites if it allows whites to command a greater share of fixed resources. The few studies of residential segregation health effects for Hispanics and Asians report both positive and adverse associations (1, 7, 12), which may relate to immigrant composition (discussed below); for Native Americans, evidence is sparse (13).

**Immigrants and immigration**

Immigrants and their children now comprise 24% of the US population (57); this rising population is therefore of substantial public health importance, suggesting a demographic imperative for examining whether immigrant health is patterned by segregation. In social epidemiology research, race/ethnicity is often conflated with nativity (foreign place of birth), despite the fact that these constructs are distinct dimensions of inequality that influence population health differently (58). Sociological research has shown that immigrants originating from different countries, even within racial/ethnic groups, exhibit distinct patterns of assimilation (59, 60). In most social epidemiologic research, however, the narrow construct of acculturation—the behavior of immigrants—is often used to explain immigrant health differences in lieu of understanding richer contextual, social, and human capital determinants of successful incorporation as framed by a social epidemiologic lens and sociological theory (61–63).

Studies reporting harmful effects of segregation on health for Hispanic and Asian immigrants or their children may illustrate the spatial assimilation theory; according to this theory, newly arrived, socioeconomically constrained immigrants initially reside in poor city enclaves but eventually convert socioeconomic gains into locational attainment to move from city enclaves into higher-quality, whiter suburban neighborhoods (64, 65). The handful of studies reporting protective effects of segregation on health among Hispanics and Asians (including that of Kershaw et al. (1)) may provide support for ethnic resurgence theory and/or segmented assimilation theory (7, 12, 66). Ethnic resurgence theory posits that certain immigrant groups settle in immigrant enclaves not out of economic constraint but because they prefer to reside with their own group in part to preserve ethnic identity. These enclaves are increasingly in affluent suburban communities (45, 65). Segmented assimilation theory recognizes that there is not a uniform assimilation into American society and immigrants assimilate into different segments of the racialized American society. For example, black- and brown-skinned immigrants with low human capital may exhibit downward assimilation over time into disadvantaged segments of society populated by US-born minority populations, whereas white immigrants assimilate into US-born majority white populations (59, 67, 68). In sum, contrasting these different segregation theories may help test different reasons for residential mobility and selection to illuminate why and how segregation is associated with health and inform how to improve health.

**CONCLUSION**

The article by Kershaw et al. (1) advances our understanding of how racial residential segregation may impact the health of different social groups differently, as life-course theory would suggest. Future segregation-health work would benefit from incorporating additional concepts, theories, and methods framed by a life-course approach. Advancing the literature may also be spurred by contrasting different sociological theories of residential patterns and understanding that place-related exposures may influence health differently for different social groups, particularly by race/ethnicity and nativity, depending on how dimensions of inequality interact.

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