Original article

Temporal Effects of Child and Adolescent Exposure to Neighborhood Disadvantage on Black/White Disparities in Young Adult Obesity

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A B S T R A C T

Purpose: This study investigates the effects of duration and timing of exposure to neighborhood disadvantage from birth through age 17 years on obesity incidence in early adulthood and black/white disparities therein.
Methods: Individual- and household-level data from the 1970–2011 waves of the Panel Study of Income Dynamics are merged with census data on respondents' neighborhoods (n = 1,498). Marginal structural models with inverse probability of treatment and censoring weights are used to quantify the probability of being obese at least once between ages 18 and 30 years as a function of cumulative exposure to neighborhood disadvantage throughout childhood and adolescence or during each of three developmental stages therein.
Results: Longer term exposure to neighborhood disadvantage from ages 0–17 years is more common among blacks than among whites and is associated with significantly greater odds of being obese at least once in early adulthood. Exposure to neighborhood-level deprivation during adolescence (ages 10–17 years) appears more consequential for future (young adult) obesity than exposure that occurs earlier in childhood.
Conclusions: The duration and timing of exposure to neighborhood disadvantage during childhood and adolescence are associated with obesity incidence in early adulthood for both blacks and whites. However, given inequalities in the likelihood and persistence of experiencing neighborhood disadvantage as children and youth, such adverse effects are likely to be more concentrated among black versus white young adults.

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IMPLICATIONS AND CONTRIBUTION

Experiencing neighborhood adversity throughout childhood and adolescence, and in particular from ages 10–17 years, increases obesity risk in early adulthood. Ongoing and developmentally appropriate investments in the social, economic, institutional, and physical structures of under-resourced communities and communities of color can have long-term benefits for population health and health equity.

The increased prevalence and associated health consequences of obesity have been called among the most burdensome public health issues facing the nation today [1]. Although interventions targeting individual dietary and exercise habits retain popular appeal, there is growing consensus among public health stakeholders that understanding and addressing obesity and racial disparities therein requires attention to factors in the broader environment [2,3]. Prior evidence suggests, for example, that residents of under-resourced neighborhoods characterized by the relative absence of healthy food stores, a preponderance of fast food and alcohol outlets, and systemic constraints on physical activity and social interaction tend to have higher body mass index (BMI) [4–11]. Numerous studies further document that exposure to disadvantaged neighborhoods is unequally distributed both in the population and across the life course. African-Americans, in particular, are not only more likely than statistically comparable whites to ever reside

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in areas characterized by high levels of social and structural adversity, but also more likely to do so for prolonged periods of time [12–16].

These findings point to the importance in neighborhood effects research of characterizing if, as well as when and for how long, residential exposures occur. For instance, persistent exposure may be necessary for young people to learn the skills associated with and to internalize preferences for healthier food and more active lifestyles [17]. In addition, there is research to suggest that the increasing desire for autonomy and expanding social interactions during the adolescent stage of the life course may make it a sensitive period for the development of obesity [18–21] and for the effects of neighborhoods on health-related outcomes more generally [22]. Until recently, however, most of the scholarship in this area measured neighborhood characteristics only once or over just a short window of observation, conflating persons who were recently exposed with those who have experienced residential adversity for sustained or during developmentally sensitive periods [23].

Such a conceptualization is inconsistent with most theories of neighborhood effects, which tend to specify mechanisms that are affected by the duration and timing of exposure [14,24,25], and with a life-course perspective in which experiences earlier in life are posited to have formative and enduring impacts on future outcomes even when controlling for more contemporaneous determinants [26]. This reliance on largely cross-sectional data has made it particularly difficult to account for the evolving and interrelated nature of individual and neighborhood characteristics over time and for the movement of individuals who already have physically active lifestyles and healthy diets into neighborhoods with characteristics that support such behaviors.

The small but developing body of longitudinal research in this area suggests that children and youth, particularly girls and young women of color, who experience more disadvantaged circumstances not only have higher BMI at baseline but also gain body mass at a faster rate over time compared with their more affluent counterparts [21,27–30]. Although these studies typically assess respondents' weights and heights at several points over the life course, they tend to measure neighborhood characteristics along with individual-level control variables at only one time point, usually the start of data collection or respondents' year of birth, or ignore time-varying confounding when such variables are measured repeatedly. As a result, the development and implementation of associated health promotion interventions continues to be hampered by challenges to causal inference, and most large-scale efforts still focus on the characteristics of people rather than the characteristics of places.

This study uses the 1970–2011 waves of the Panel Study of Income Dynamics (PSID) merged with census data on respondents' neighborhoods to investigate the effects of duration and timing of exposure to neighborhood disadvantage from birth through age 17 years on obesity incidence in early adulthood and black/white disparities therein. It uses a statistical approach that explicitly accounts for time-varying phenomena, allowing individual- and household-level characteristics to moderate the relationship between neighborhoods and BMI while also adjusting for potential confounding due to neighborhood selection bias at each wave of data collection. Findings, therefore, provide among the strongest evidence to date for the adverse effects on young adult obesity of more prolonged exposure to neighborhood disadvantage throughout the child and adolescent life course, and for the sensitivity of such effects to the developmental timing of exposure.

Methods

The PSID is a longitudinal survey of U.S. residents and their families conducted annually between 1968 and 1997 and every 2 years thereafter. The analytic sample for this study consists of the 4,334 black and white individuals born into PSID family units between 1970 and 1980. Respondents were dropped if they were not continuously present for every year from ages 0 to 17 years or if they did not respond to any questions about weight and height in young adulthood, leaving 1,498 individuals. Final sample members were more likely to be white, female, to be born to a married, slightly older mother, and into a household in which the head had attended at least some college. Adjustment for nonrandom attrition using censoring weights is discussed in the following sections.

Dependent variable

Obesity is determined using self-reported weight and height to calculate BMI, the ratio of weight in kilograms (kg) to height in meters squared (m^2). Previous research shows a strong correlation between self-reported and directly measured weight and height and no significant differences in reporting across gender or race/ethnicity [31,32]. Given this study's focus on obesity incidence in young adulthood, the outcome of interest is any report of weight and height amounting to a BMI ≥ 30 kg/m^2 between ages 18 and 30 years. A combined measure of overweight/obesity (BMI ≥ 25 kg/m^2) was also examined with similar results, although statistical significance was often attenuated. Results examining BMI as a continuous measure (average BMI between ages 18 and 30 years) were consistent with those presented for obesity.

Independent variable

Similar to most research in this area, census tracts are used to approximate neighborhood boundaries. Despite limitations to this operational definition (cf. [33]), there is broad consensus that census data at the tract level not only provide convenient access to considerable information over extensive time periods, but also serve as a reasonable proxy for, or are at least highly correlated with, the causally relevant definition of a neighborhood [34,35]. The measure of neighborhood disadvantage is based on the following census tract items derived from the Neighborhood Change Database (NCDB) [36] over the period 1970–2000: (1) proportion of residents below the poverty line; (2) proportion of residents in the civilian labor force and unemployed; (3) proportion of households with public assistance income; (4) proportion of households with children that are female headed; (5) proportion of residents with less than a high school diploma; (6) proportion of residents with a bachelors or graduate/professional degree; and (7) proportion of residents employed in managerial or professional/technical occupations.

Using principal components analysis, these seven items are combined to generate a composite index of neighborhood disadvantage. Specifically, the results of principal components analysis produce a set of factor loadings for each item for each principal component. Using the factor loadings from the first principal component as weights, a neighborhood disadvantage