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Long-term neighborhood poverty trajectories and obesity in a sample of california mothers

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ABSTRACT

Neighborhoods (and people) are not static, and are instead shaped by dynamic long-term processes of change (and mobility). Using the Geographic Research on Wellbeing survey, a population-based sample of 2339 Californian mothers, we characterize then investigate how long-term latent neighborhood poverty trajectories predict the likelihood of obesity, taking into account short-term individual residential mobility. We find that, net of individual and neighborhood-level controls, living in or moving to tracts that experienced long-term low poverty was associated with lower odds of being obese relative to living in tracts characterized by long-term high poverty.

1. Introduction

Obesity has reached epidemic levels in the United States. Recent estimates indicate that more than one in three American adults have a Body Mass Index (kg/m^2: hereafter BMI) of 30 or greater, the clinical threshold for obesity (Ogden et al., 2014). Being obese has serious implications for health such as elevated risks for diabetes, hypertension, and ultimately premature death (Masters et al., 2013; Mokdad et al., 2003; Surgeon General 2001; Thompson et al., 1999). The obesity epidemic also has serious economic implications, as a recent meta-analysis estimated that direct health care costs associated with obesity totaled more than $149.4 billion dollars in 2014 alone (Kim and Basu, 2016).

Women are more likely to be obese than men (Ogden et al., 2014), potentially due to biological differences in fat storage (Karastergiou et al., 2012). In addition to higher prevalence rates, the consequences and implications of being obese are generally more severe for women. For example, women have increased perception of weight-based discrimination (Puhl, Andreyeva and Brownell, 2008) and face a disproportionate burden of obesity-related disease than men (Hu, 2003; Muennig et al., 2006). Obesity is not equally distributed among women as women of color and women with low socioeconomic status have significantly higher levels of obesity than non-Hispanic white women and women with higher socioeconomic status (Wang and Beydoun, 2007). Additionally, women's obesity and its behavioral proximate determinants, dietary habits and physical activity, are strongly correlated with their offspring's risk of obesity, making it especially important to understand the factors related to obesity among mothers (Catalano and Ehrenberg, 2006; Drake and Reynolds, 2010). Due to substantial and unequal obesity rates among women and the implications of being obese for women and their children, it is critical to improve our understanding of the determinants of obesity among women in general and mothers in particular in order to stem the epidemic.

As obesity rates have continued to climb, researchers have turned to more distal or “upstream” determinants of obesity such as neighborhood environments (Black and Macinko, 2008). Indeed, while much of the previous research and policy initiatives have focused on individual-level risk factors for obesity such as diet and physical activity, these factors have proven difficult to change, partially because neighborhoods can not only restrict behavioral health decisions but also dampen the potential impact of behavioral responses to individual health conditions (Gordon-Larsen et al., 2006; Morland, Roux, and Wing 2006). For example, neighborhoods can be obesogenic when they are comprised of unhealthy, calorie-dense, food options (Mirowsky and Ross, 2015), when they limit the access to healthy food (Black et al., 2010), when they limit the ability to be physically active or because of more distal factors (for an overview see Black and Macinko, 2008).

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Women in particular have been shown to be especially vulnerable to neighborhood factors in relation to obesity risk (Alvarado, 2016; Lippert, 2016; Robert and Reither, 2004).

While the existing neighborhood effects research on obesity has produced compelling results and delineated plausible pathways between neighborhood environments and obesity (Berke et al., 2007; Black et al., 2010; Larson et al., 2009), several key gaps in the existing literature prevent our understanding of the impact of neighborhoods on obesity. First, prior work has almost exclusively measured neighborhood disadvantage and other characteristics using single point-in-time (i.e., cross-sectional) measures. This work has shown that those who live in disadvantaged neighborhoods have higher odds of being obese after accounting for important individual-level confounding factors (for an overview see: Black and Macinko, 2008). Neighborhoods, however, are by no means static and as such, cross-sectional measures of neighborhood characteristics may not accurately reflect dynamic obesogenic neighborhood circumstances which have been unfolding over the course of decades. For example, using only cross-sectional measures of neighborhood characteristics makes it difficult, if not impossible, to capture meaningful and dynamic urban processes (Kirk and Laub, 2010) such as "white flight," gentrification, or a concentration of poverty– and their influence on obesity. Indeed, research examining other health outcomes such as self-reported health (Do, 2009), atherosclerosis (Murray et al., 2010), and preterm birth (Margerison-Zilko et al., 2015) has found strong evidence that long-term neighborhood poverty is associated with negative health outcomes. As such, we propose that long-term socioeconomic factors shape a neighborhood's obesogenic characteristics, and thus the propensity of mothers to be obese, and should be measured accordingly.

A second important limitation in some previous research on neighborhoods and obesity is that it is unable to account for residential mobility of individuals (i.e., moving to a new home). Specifically, it is difficult for cross-sectional research designs to account for residential mobility, and as such cross-sectional analyses may implicitly assume equal neighborhood effects for differential lengths of exposure to neighborhoods (Smoyer-Tomic et al., 2008). Researchers are aware of exposure, or duration lived in a neighborhood, and residential mobility, or moving between neighborhoods, and their potential influence on obesity and other health outcomes (Kravitz-Wirtz, 2016; Lippert, 2016; Powell-Wiley et al., 2015; Richardson et al., 2014), however to the best of our knowledge, no previous research has examined the influence both of long-term neighborhood poverty *and* residential mobility on obesity. Critically, even when research has accounted for inter-neighborhood moves, it is impossible using cross-sectional specifications of neighborhood characteristics to distinguish between individuals who are exposed to poor neighborhoods (that have been persistently poor) because they remain in these neighborhoods or because they moved to a neighborhood which just became poor. Thus, we build on previous research by analyzing the influence of long-term neighborhood poverty trajectory classes on obesity while accounting for short-term (5–10 years) inter-neighborhood residential mobility among a sample of Californian mothers.

1.1. Long-term neighborhood poverty and obesity

Many of the proposed direct mechanisms through which impoverished neighborhood environments may be obesogenic do not develop overnight or instantaneously before a decennial census. Instead, these mechanisms take years, if not decades, to emerge and are more likely to be concentrated in neighborhoods that are *consistently* impoverished. For example, food availability and retail offerings respond to perceived or real demand, often in congress with the shifting socioeconomic-demographic profile of a neighborhood (Filomena, Scanlin, and Morland 2013; Maguire, Burgoine and Monsivais, 2015). Compared with more affluent neighborhoods, poorer neighborhoods that have seen decades of "disinvestment" have more fast food restaurants which serve energy-dense food (Zenk et al., 2005), food that is engineered to be cheap, easily shipped, marketed, and cooked quickly with little attention given to the nutritious quality or implications for the weight of the consumers (Mirowsky and Ross, 2015). Impoverished neighborhoods also have fewer options for fresh nutrient-rich food from grocery stores than more advantaged neighborhoods (Sharkey et al., 2009; Smoyer-Tomic et al., 2008), and when healthy food is available, it is generally more expensive in disadvantaged neighborhoods (Zenk et al., 2005).

Notably, over time, neighborhoods that are *consistently* impoverished evolve to have few food options except for calorie-dense fast food or corner shops (Taylor et al., 2006). Indeed, in a 20-year study of CARDIA participants, researchers found that those who consistently lived in socioeconomically disadvantaged neighborhoods had fewer restaurant options but more convenience store options over time compared to those who lived in more advantaged neighborhoods (Richardson et al., 2014). Other researchers found that after Hurricane Katrina grocery stores reemerged less quickly in disadvantaged neighborhoods of New Orleans (Mundorf, Willits-Smith and Rose, 2015) and that grocery stores experienced greater long-term instability in poorer neighborhoods of Brooklyn (Filomena et al., 2013). In other words, previous research has found that obesogenic food environments emerge *dynamically* especially in neighborhoods which are consistently impoverished, findings which stress the importance of using longitudinal neighborhood socioeconomic characteristics when investigating neighborhood determinants of obesity.

The ability to burn calories through exercise within a neighborhood is also somewhat contingent upon dynamic *long-term* socioeconomic processes. Just as food options respond to shifting demand based on the sociodemographic profile of neighborhoods so too do facilities where physical activity can take place, such as outdoor spaces, gyms, parks, or dance studios (Cohen, 2008). Previous research finds less access to such places and lower levels of physical activity in impoverished neighborhoods (Gordon-Larsen et al., 2006; Powell et al., 2006; Yen and Kaplan, 1998). Consistently impoverished neighborhoods also lack the four major components of walkability: functionality, safety, aesthetics and destinations (Neckerman et al., 2009). For example, Pikora et al. (2003) research in New York City showed that poorer neighborhoods had fewer landmarked buildings, restaurants, and trees, but more crime, pollution, and vehicle crashes than more advantaged neighborhoods. The factors which encourage or discourage walking take time to develop (e.g. trees take time to grow). Other research has shown that impoverished neighborhoods are more likely to lack developed walking infrastructure such as sidewalks (Gibbs et al., 2012); and when impoverished neighborhoods have sidewalks, they are lower quality and more likely to be damaged (Kelly et al., 2007). This prolonged under-investment in the built environment may deter walking and outdoor exercise in impoverished neighborhoods (Papas et al., 2007; Taylor et al., 2006), and because these factors take time to emerge or be degraded, presumably more so in *consistently* impoverished neighborhoods.

There are also more distal reasons to anticipate greater prevalence of obesogenic factors in neighborhoods that have been consistently impoverished. Neighborhoods which have seen chronic poverty for decades can also have higher levels of crime (Stretesky et al., 2004). Previous research has suggested crime is concentrated most heavily in areas of cities which have been consistently impoverished (Freeman, Grogger and Sonstelie, 1996; Massey, 1995). Crime may not only deter exercise and time spent outside (For inconsistent findings please see Foster and Giles-Corti, 2008) but may also elevate stress leading to unhealthy coping mechanisms such as drinking alcohol and overeating (Boardman et al., 2001; Dallman, Pecoraro, and la Fleur 2005; Vicennati et al., 2009). While tautological, poorer neighborhoods also have higher concentrations of obesity, potentially due to more permissive social norms around being overweight (Boardman et al., 2005). All