Historical neighborhood poverty trajectories and child sleep

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ABSTRACT

Objectives: To determine whether historical neighborhood poverty measures are associated with mothers' reports of their children's sleep duration and to compare results from historical neighborhood poverty measures to contemporaneous measures of neighborhood poverty.
Design: The Geographic Research on Wellbeing (GROW) study is a follow-up survey of mothers who gave birth between 2003 and 2007. GROW mothers assessed their own and their children's health and health behaviors 5-10 years later (2012-2013).
Setting: Urban Californian counties.
Participants: GROW respondents.
Measurements: We categorized children's sleep as adequate or inadequate using clinical age-specific guidelines and based on mothers' reports of their child's sleep duration. We conducted a latent class analysis to identify historical poverty classes for all California census tracts using data from 1970 to 2005-2009, and we categorized current neighborhood poverty based on data from 2005 to 2009 only. We then assigned children to different neighborhood exposure classes based on their neighborhood of residence at birth and follow-up.
Results: Logistic models indicated that net of controls for demographics, child behavior and health characteristics, mother characteristics, and household socioeconomic status, children who grew up in historically low (odds ratio: 0.64, 95% confidence interval = 0.45-0.92) or historically moderate poverty classes (odds ratio: 0.68, 95% confidence interval = 0.48-0.98) had lower odds of inadequate sleep duration compared with children who grew up in historically high poverty. We show that the historical specification of neighborhood poverty remained significant despite controls, whereas contemporaneous measures of neighborhood poverty did not.
Conclusions: Our findings indicate strong associations between historical neighborhood poverty and child sleep duration.

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Introduction

Mounting evidence stresses the critical importance of quality sleep for children and adolescents.[1] Indeed, empirical research has found that lower-quality or shorter-duration sleep is associated with worse physical,[2,3] behavioral,[4–6] emotional,[7] and academic[8] outcomes for children. The influence of sleep on developmental outcomes is not surprising given that other research stresses the importance of sleep for neurological connectivity and physical development.[9] As lower-quality sleep is disproportionately concentrated among economically and socially disadvantaged children[10] and leads to numerous detrimental outcomes, lower-quality sleep among disadvantaged children could be an important mechanism whereby *lifelong* social inequality is reproduced.

Like the consequences of sleep, the individual determinants of sleep for children are relatively well documented and include factors such as age, socioeconomic status, race/ethnicity, body mass index, daily routine, stress, physical activity, and screen time.[10–14] However,

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comparably less attention has been given to how neighborhoods may influence sleep for children. This omission is important because of the broad influences, both direct and indirect, that can occur through the characteristics of the surrounding neighborhood.[15] That is, neighborhoods can influence sleep through direct factors such as noise and indirect factors such as the ability to be physically active. Indeed, neighborhood factors can dampen or condition other individual or household determinants of sleep. This is especially relevant for neighborhood disadvantage as many threats to sleep are concentrated in disadvantaged neighborhoods. For example, low-income neighborhoods can be stressful environments with high rates of crime,[16] population density,[17] noise/air pollution,[18] and a climate that prompts vigilance to threats and discourages comforting night-time routines, including reading, bathing, and other activities shown to promote healthy sleep.[19,20]

Critically, the neighborhood factors that may inhibit healthy sleep for children are likely amplified in neighborhoods that have been impoverished for prolonged periods of time. For example, crime and the accompanying stress have become largely confined to specific impoverished neighborhoods over the past few decades.[21] As the socioeconomic profile of the neighborhood changes, the availability of healthy and unhealthy food changes as well, leaving impoverished neighborhoods with higher concentrations of corner stores and fast food restaurants and lower numbers of grocery stores.[17] When parks or outdoor areas are available, they are slowly degraded.[22] Therefore, despite having the exact same current level of poverty as measured by a census, a neighborhood that recently became economically impoverished may in fact have lower rates of crime, better access to healthy food, and safer outdoor play areas compared with a neighborhood that has been impoverished for decades. Thus, it may be important to measure a neighborhood's history of poverty longitudinally rather than simply measuring a neighborhood's current level of poverty. Implicitly, capturing neighborhoods' poverty histories or measuring neighborhood poverty longitudinally acknowledges that neighborhoods, like people, transform dynamically, and this facilitates quantifying meaningful dynamic neighborhood processes such as the concentration of poverty.[23]

In this analysis, we therefore examine how historical or longitudinal latent trajectories of neighborhood poverty spanning 4 decades are associated with child sleep and compare our results to current measures (or cross-sectional specifications) of neighborhood poverty. We also build on previous research showing that children who grow up in disadvantaged neighborhoods have lower-quality sleep[15,24] by using multiwave data, which encapsulate greater levels of exposure to neighborhood conditions than cross-sectional studies allow. We additionally use objective measures rather than subjective reports of neighborhood conditions, as although subjective reports of neighborhood conditions can be predictive of concurrent perceptions of health, conclusions about causal effects are vulnerable to alternative explanations, especially mental health or other dispositional factors.[25] We finally compare the historical classification of neighborhood poverty to traditionally used current measures of neighborhood poverty.

Participants and methods

Participants

The participants for this investigation came from the Geographic Research on Wellbeing (hereafter GROW) study. GROW was a population-based study conducted in 2012-2013 as a follow-up to those surveyed in the California Maternal and Infant Health Assessment (henceforth, MIHA) from 2003 to 2007. MIHA is a statewide annual survey of about 3500 Californian women who have recently given birth. MIHA focuses on questions about the pregnancy and birth outcomes of a specific child. GROW, conducted 5-10 years after, examines responses to health-related questions regarding the mother and the index child along with questions concerning their experience with certain social factors and their neighborhood. Detailed information regarding the sampling techniques and frame, response rates, methodology, and other factors relating to GROW has been published elsewhere.[26] The survey responses and georeferenced addresses of the mother from MIHA and GROW constitute the individual measures of our analysis; however, the *only* variable that uses information from MIHA is the residential location. Originally, GROW sampled 3016 mothers, but 229 mothers were dropped because of issues with the reported address, such as inaccurate geocodes or moves from California; 49 mothers were dropped because of death of their child, the child living with someone else, or completing the survey regarding a different child, and 18 were dropped because of nonresponse on questions about their child's sleep. These criteria led to the analytic sample of 2720 (90.2% of the original sample) mothers and their children.

Neighborhood-level information came from a latent trajectory analysis conducted on the reported percentage of residents who lived in poverty for every Californian census tract from 1970 to 2009. More detailed information regarding this analysis has been published elsewhere[27] and can be found in Appendix Fig. 1 and Appendix Tables 1 and 2. As an overview, the data came from the decennial censuses from 1970 to 2000, obtained from the neighborhood change database (Geolytics, Inc), which harmonized census tract boundaries over time. We also used data from the 2005 to 2009 American Community Survey (ACS). Unfortunately, income/poverty was not collected in the 2010 census. Therefore, we chose the 2005-2009 estimates from the ACS to be a midpoint between the 2 waves and that represents an "average" level of historical poverty in the midpoint of the child's life, to be consistent with previous research.[27] Including this measure was important because it allowed us to extend our longitudinal classification of neighborhood poverty histories but before the dependent variable was measured. To examine how current specifications of neighborhood poverty compare with the longitudinal latent class specification, we also used data from the 2005-2009 ACS to analyze the association between current or cross-sectional specifications of poverty (ie, the percentage of residents in the tract who live in poverty) and child sleep.

Measures

Our dependent variable for this analysis was a dichotomous measure of the mother's report of their child's sleep per night on weeknights. Specifically, we used clinically based consensus recommendations for children's sleep duration by age.[28] Children aged 4-5 years were coded as having adequate sleep if they slept 10-13 hours and inadequate sleep if they slept less than 10 or more than 13 hours. Children aged 6-10 were coded as having adequate sleep if they slept 9-12 hours and inadequate sleep if they slept less than 9 or more than 12 hours. For each age group, we coded inadequate sleep as "1" and adequate sleep as "0." Although sleeping for long durations can indicate health problems or lower-quality sleep,[28] we also performed analyses using alternative specifications, such as defining inadequate sleep as 8 or fewer hours for all children, which yielded substantively similar results. Albeit not objective measures of sleep, mothers' reports of children's sleep have been shown to have moderately strong concordance with objective measures of sleep duration.[29,30]

Our key independent variable was designed to measure exposure to the long-term neighborhood poverty trajectories at both time points. We operationalized neighborhoods as census tracts out of convenience and to be consistent with previous research.[31] We then conducted a latent trajectory analysis that identified 3 unique historical poverty trajectory classes (Appendix Fig. 1). We linked