

## Introduction

Extant observational studies generally support the existence of a link between neighborhood context and health (Yen & Syme 1999; Kawachi & Berkman 2003; Pickett & Pearl 2001; Robert 1999). Most of the existing literature has focused on neighborhood demographic or socioeconomic characteristics, particularly neighborhood poverty and disadvantage (Robert 1999). The various health outcomes that have been linked to neighborhood context include, among others, mortality, infectious disease, low birthweight, cigarette smoking, and diet. These associations between health and place remain statistically significant even after adjusting for various individual-level socioeconomic characteristics (c.f., Oreopoulos 2003; Reijneveld & Schene 1998; Sloggett & Joshi 1994).

However, causal inference has been difficult to establish. In addition to the common concerns of measurement error in the individual-level variables, omitted individual-level variables, and off-support inferences, one important limitation which is perhaps less frequently noted in the neighborhood-health literature is that variables such as income and employment status may themselves be affected by prior neighborhood conditions and may consequently be simultaneously confounders and mediators of neighborhood health effects. Adjusting for these factors may produce biased estimates (Robins, Hernan, and Brumback 2000). However, with longitudinal data, Robins, Hernan, and Brumback show that appropriate adjustments for the effects of time-dependent confounders (e.g., education, income) to recover causal estimates of time-dependent treatments (e.g., neighborhood poverty) can be achieved by using marginal structural modeling (MSM).

We postulate that cross-sectional analyses that measure the contemporaneous associations between health and neighborhood context may be underestimating the influences of neighborhoods on health. For example, exposure to poor socioeconomic environments during

childhood and adolescence are known to detrimentally impact educational outcome (e.g., Harding 2003). Given the strong linkage between educational attainment and adult health, adjusting for educational attainment prohibits recovering the indirect effect of neighborhoods on health via education. Other similarly important mediators include marital status, income, and employment status, which, when collectively controlled for in neighborhood-health models, may result in non-trivial bias of neighborhood effects. Only by accounting for both indirect and direct effects of neighborhood context can we appropriately measure the full impact of neighborhood context on health.

This study applies a marginal structural modeling strategy to appropriately adjust for factors that are simultaneously confounders and mediators to recover estimates of neighborhood poverty on health.

### **Analytical Strategy**

We use data from the 1996-2007 years of the biennial Panel Study of Income Dynamics (PSID). The analytical sample is restricted to approximately 8,000 respondents who are non-Hispanic black or non-Hispanic white.

Our outcome variable consists of three categories reflecting health status as measured in 2007: good health, poor health, and death. Good and poor health is derived from a five-point measure dichotomized to poor (fair, poor) and good (excellent, very good, good) health. Given the significant mortality rate within the timeframe of our study, we include not surviving up to 2007 as the third health state.

Our neighborhood context of interest is a continuous measure of neighborhood poverty specified as a piece-wise linear spline with a knot at the 20% poverty rate. The time-varying

covariates that are possible mediators as well as confounders include individual-level income, labor force status, female-headed household, and marital status. 1996 baseline adjustments include baseline age, wealth, race, and gender.

We estimate a marginal structural model that generates stabilized inverse probability treatment (IPT) weights, as a function of the aforementioned time-varying and baseline characteristics, to recover the effect of neighborhood poverty on 2007 health status.

## **Results**

Preliminary estimates from the marginal structural modeling strategy reveal statically significant larger effects of neighborhood poverty on poor health and mortality than conventional "naïve" regression stratification adjustments. Results suggest that conventional strategies have been underestimating neighborhood effects on health.

## References

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