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Health in changing neighborhoods: A study of the relationship between gentrification and self-rated health in the state of California

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1. Introduction

The US faces persistent racial and socioeconomic health disparities. Poor and minority—and in particular black—populations experience disproportionately high rates of mortality (Franks et al., 2003), chronic disease (Cooper et al., 2000), and serious mental illness (Evans et al., 2016). Efforts to better understand these disparities suggest that they are perpetuated by social injustices (Braveman et al., 2011), including the downstream effects of discriminatory policy (Krieger et al., 2011), income inequality (Wilkinson and Pickett, 2009), and racism (Hudson et al., 2013).

Predictable geographic patterning of health inequality suggests neighborhoods are important health-differentiating urban environments (Sampson, 2003). The "neighborhood effect" has become a model for coalescing multiscale biological, psychological, and social processes by which places embody and replicate the social conditions leading to health disparities (Curtis, 2004; Izenberg and Fullilove, 2016; Sampson, 2012). The emerging awareness of this relationship between place and health has reignited interest in leveraging neighborhood improvements for health equity and understanding how urban political and social processes affect health. One such process stands out for being hotly-debated among urban policymakers, yet poorly-understood by practitioners of public health: gentrification.

Gentrification is often characterized as the influx of investment capital and wealthier residents into previously-disinvested neighborhoods (Smith, 2007). Many have argued that gentrification involves state-led initiatives and incentives, and should accordingly be viewed as a form of policy (Lees et al., 2008). Threatening increased housing costs and displacement for some and promising substantial capital gains for others, gentrification is a contentious topic. It is made more so by the fact that even when defined (as above) in socioeconomic terms, gentrification is intimately bound up with racial segregation and inequality, at least in the US, where it is frequently cast as a threat to minority communities.

When viewed through the neighborhood-effects lens, the potential impact of gentrification reaches beyond the physical displacement of low-income renters. Longtime residents of gentrifying neighborhoods may experience profound change and alienation, the breakdown of informal place-based networks of exchange, the loss of gathering spaces and institutions, symbolic manifestations of socioeconomic inequality, and the increased racialization of the public space (Freeman, 2006; Shmool et al., 2015; Werth and Marienthal, 2016). Lower income residents may face difficulty affording food and other necessities, or find themselves in overcrowded housing stock (Phillips et al., 2014). Renewed infrastructure, reduced community violence, access to improved schools, parks, and other community resources, or the cleanup of ecological hazards may bring benefits as well.

Available data suggest that associations between gentrification and health vary among different groups—particularly when comparing black populations to white. A 2014 study in New York City reported a correlation between gentrification and pre-term birth among black populations, with the inverse true for whites (Huynh and Maroko, 2014). A more recent study in Philadelphia found that self-rated health was worse among blacks in gentrifying neighborhoods, though this appeared to primarily be true in gentrifying neighborhoods experiencing increases in the black population, rather than those with an increasing relative percentage of white residents (Gibbons and Barton, 2016). Other findings have suggested that gentrification serves to further stratify public health risks along sociodemographic lines (Abel and White, 2011). Not all studies have reported negative effects of gentrification, with recent evidence from Montreal, Quebec pointing to an association between gentrification and collective efficacy (Steinmetz-Wood et al., 2017), a community factor often associated with positive health and social outcomes (Sampson, 2012). Notwithstanding these investigations, or the breadth of theoretical links, empirical research on the relationship between gentrification and health remains sparse.

With an eye toward gentrification's potential role in health inequalities, the goal of this study was to examine the association between gentrification and self-reported health, independent of individual-level confounders. Self-rated health is a well-established predictor of morbidity and mortality (Idler and Benyamini, 1997) that has been linked to a number of community-level factors potentially related to gentrification, such as social cohesion (Kim and Kawachi, 2006). We also sought to determine if associations are modified by

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several indicators of vulnerability (lower household income, ethnic minority status, tenancy, and longer duration of neighborhood residence). In secondary analyses, we examined four three-way interactions: 1) race, housing tenure, and gentrification, 2) race, income, and gentrification, 3) race, neighborhood residential duration, and gentrification, and 4) housing tenure, neighborhood residential duration, and gentrification. We also conducted a sensitivity analysis for respondents living in California's four largest metropolitan areas, given that large urban areas are generally where gentrification is felt to be most widespread and where policy discussions surrounding gentrification are most active.

2. Methods

2.1. Data

We obtained health outcomes and demographic data from the California Health Interview Survey (CHIS), the nation's largest statewide health survey. Annually since 2002, CHIS has collected a weighted sample of housed, non-institutionalized California residents, using landline and cellular phone random digit dialing (RDD) frames (each comprising approximately 50% of the total sample in 2015). Both frames divide the state's 58 counties into 44 geographic strata—39 single-county strata, 18 substrata within 2 populous counties (Los Angeles and San Diego), and 3 multi-county strata from 17 sparsely-populated counties. In 2015, surveys were conducted in six languages. The overall rate for screening and survey completion was 14.8% in 2013–2014 and 12.3% in 2015 for landlines, and 16.6% in 2013–2014 and 9.5% in 2015 for cell phones.

2.2. Sample

Our sample included adults ≥ 18 from a combined 2013–2015 dataset. As CHIS imputed missing data, we had no missing responses. From an initial dataset of N = 61,274 observations, dropping 78 observations associated with excluded census tracts (see below) yielded an N = 60,196. Responses of “don’t know,” “not-applicable,” or “refused” were excluded from individual bivariate associations (see Table 1); the final analysis excluded all 375 such cases, yielding an analytic sample of N = 59,821 in logistic regression modeling.

2.3. Outcome

Our primary outcome of interest was self-rated general health. This CHIS survey asks, “would you say that in general your health is excellent, very good, good, fair, or poor.” We dichotomized this outcome as excellent/very good/good vs. fair/poor.

2.4. Additional variables

Additional variables included in our analysis were sex, age, race, educational attainment, national origin, household income, marital status, housing tenure, and length of time in the neighborhood. Recent psychological distress was measured using the Kessler 6, a well-validated scale for identifying serious psychiatric morbidity in community populations (Kessler et al., 2003). Income, based on federal poverty level (FPL), was dichotomized around the sample median (0–299% FPL vs. < 300% FPL). The lower range was felt to likely represent financial stress, particularly in gentrifying neighborhoods, given that FPL is not regionally-adjusted, and California has among the nation's highest costs of living.

2.5. Classifying census tracts

We categorized California census tracts (using 2010-defined boundaries) as gentrifying, stable, or not-gentrifiable over the 2006–2015 period, using a slightly-modified version of the approach developed by Lance Freeman (Freeman, 2005), chosen because of its reproducibility and theoretically-grounded criteria. In order to generate stable tract-level estimates, we obtained the demographic data necessary for this method from two non-overlapping 5-year American Community Survey (ACS) periods, 2006–2010 and 2011–2015.

We identified gentrifiable tracts as those which, as of the 2006–2010 ACS, had median household incomes below the median for the tract's metropolitan area as defined by the Census Based Statistical Area (CBSA), a proportion of pre-1980 building stock exceeding that of the median tract for the CBSA, and at least 50% of census block groups qualifying as urbanized. From among those considered gentrifiable, we classified a given census tract as gentrified based on the following demographic changes between the 2006–2010 and the 2011–2015 ACS: (1) The tract's median rent increased, as measured in 2015-adjusted dollars; (2) the percentage of adults with bachelor's degrees increased relative to the tract's CBSA. An extensive discussion of the theoretical basis for this approach can be found elsewhere (Freeman, 2005); in brief, the criteria for being considered gentrifiable are meant to reflect the lower income and disinvestment of urban neighborhoods that create the conditions for gentrification, while the criteria for gentrification itself are meant to reflect the influx of investment capital (leading to rising housing costs, and therefore rents) and higher-SES residents (bachelor's degrees)—the latter controlling for trends across a larger region or in the population as a whole. Figs. 1**a and** 1**b** provide maps of the census-tract designations in California's four largest metropolitan regions.

It is worth noting that we deviated from Freeman's method slightly, using rent increases instead of home values to mark the rising housing costs associated with gentrification. A sensitivity analysis conducted by Freeman found no difference in the two approaches, but we nevertheless chose rents in an effort to buffer the effects of the 2008 financial crisis. Also, our use of the 50% urban threshold contrasts with Freeman, who used a “central city” designation; this modification represented an effort rely on publicly-available data only, thereby making our measure more easily reproducible and generalizable.

Census tracts were dropped from the analysis in cases where data necessary to classify them were missing from the ACS data files; this included non-residential tracts, and those previously included in the 2010 Bishop, CA Micropolitan Area, for which no comparable 2015 CBSA was identifiable. Of California's 8057 2010-defined census tracts, we classified 7992 tracts, (range of observations per tract = 1–147).

2.6. Analysis

All analyses were conducted in Stata v.14.1. We used a Pearson chi-square to test for bivariate associations. To test our primary hypothesis that residence in a gentrifying tract would be associated with SRH, independent of pre-specified confounders, we built a survey-adjusted multivariable logistic regression model. To account for clustering of data, we used the Taylor Series Linearization (TSL) variance-estimation method, yielding robust standard errors. Additional covariates were specified a priori based on empiric or theorized relevance to general health and residential or socioeconomic vulnerability. We chose this approach over multilevel modeling (with a 2nd-level tract variable) because TSL more directly accounted for the design of the survey. CHIS is sampled according to 56 strata across the state of California, each containing numerous census tracts, which themselves are not assigned any weights. Multilevel modeling would have required us to reweight the data and ignore the original sampling approach employed by CHIS.

We tested for two-way interactions between gentrification and race, household income, neighborhood residential duration, and housing tenure, in each case adding a single interaction term to our base model. We also tested three-way interactions for gentrification by race by income, gentrification by race by housing tenure, gentrification by income by housing tenure, and gentrification by neighborhood residential