



What explains the concentration of off-premise alcohol outlets in Black neighborhoods?

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ARTICLE INFO

Keywords:

Alcohol availability
Racial segregation
Urban policy
Redlining
Health inequities

ABSTRACT

Introduction: Greater availability of commercial alcohol is associated with increased alcohol use and related public health problems. Greater alcohol outlet density, a marker of alcohol availability, is associated with poorer and predominantly minority neighborhoods. However, poorer populations, African Americans, and Latinxs report using less alcohol compared to Whites and wealthier groups. We consider the role of structural racism in the social ecology of alcohol availability. Specifically we examine racist urban land use practices in the USA which became codified in the 1930s through Federal Home Owner Lending Corporation (HOLC) designations for assigning parcel values, known as “redlining.” Redlining demarcated low-density residential zones for wealthy Whites which excluded poor and non-White people as well as certain businesses, including alcohol retailers. We assessed the impacts of historic redlining on present day risks for exposure to retail alcohol availability in urban Northern California.

Methods: For six contiguous and demographically diverse Northern California cities we obtained digital renderings of HOLC maps (1937) which demarcated exclusions of people and businesses for 119 neighborhood areas across four land valuation zones. We then identified the most prevalent HOLC rating for each of 520 current Census block groups in the six cities, including a residual category for areas not rated by HOLC. We geolocated all current (2016) off-premise alcohol sales outlets operating in the six cities (N = 401). We used Bayesian spatial Poisson models to relate current alcohol outlet densities and Census-based estimates of neighborhood characteristics to historic HOLC classifications.

Results: Spatial Poisson analyses found far greater contemporary off-premise outlet densities in the lowest-valued HOLC zones than in the highest (median relative rate [RR] 9.6, 95% CI 4.8–22.1). The lowest-valued HOLC zones were also characterized by far higher current percentages of both Black residents (RR 30.4, 95% CI 17.0–54.6) and Hispanic residents (RR 9.7, 95% CI 7.2–12.9).

Conclusions: Present day risks for exposure to retail alcohol availability were delimited by historic exclusionary land use practices. Current inequitable health risks may be founded on racist spatial projects of past decades.

Introduction

Increased availability of commercial alcohol for off-premise consumption through higher density of off-premise outlets has been associated with increased public health risks, including intimate partner violence (Cunradi et al., 2011; Livingston, 2011; Roman & Reid, 2012), sexual assault (Scribner et al., 2010), underage drinking (Azar et al., 2016) and suicide (Giesbrecht et al., 2015), as well as crime (Jennings et al., 2014; Quick et al., 2017; Snowden & Freiburger, 2015). Community members in USA cities have identified off-sales outlets (e.g.,

“liquor stores”) as sources of neighborhood problems, contributing to blight and crime as well as youth violence and alcohol abuse for people living near these outlets (Alaniz, 2000; Dambreville, 2012; Herd, 2011; Maxwell & Immergluck, 1997). Numerous studies have found higher densities of alcohol retailers in poorer and predominantly race/ethnic minority neighborhoods (Alaniz, 1998; Berke et al., 2010; Bluthenthal et al., 2008; Franklin et al., 2010; Hippensteel et al., 2018; Jones-Webb & Karriker-Jaffe, 2013; LaVeist & Wallace, 2000; Truong & Sturm, 2009).

From an economic perspective, alcohol retailers might be expected to

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<https://doi.org/10.1016/j.ssmph.2020.100669>

Received 3 July 2020; Received in revised form 19 September 2020; Accepted 21 September 2020

Available online 24 September 2020

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locate in areas of higher consumer demand. However, in the USA African Americans and Latinxs report lower prevalence of drinking compared to Whites (Chartier & Caetano, 2010; Herd, 1985, pp. 149–170; Zapolski et al., 2014). In addition, higher alcohol use is reported among higher income populations (Galea et al., 2007; Scribner et al., 2000) and in higher income neighborhoods (Mair et al., 2020). Consumer demand, therefore, does not explain the concentration of alcohol retailers in neighborhoods whose residents are predominantly people of color and less wealthy. A recent study suggests that to maximize profits alcohol outlets tend to be located in areas with low retail rents (generally with poorer and more non-White residents) that are near to communities with high alcohol demand (generally with higher-income and more White residents) (Morrison et al., 2015). How did such demographically diverse and yet interconnected urban spaces come to be? In post-industrial societies, spaces are socially produced (Lefebvre, 1991), meaning differing land values result from specific social processes. We consider the socio-historic processes through which present-day concentration of off-premise alcohol retail outlets may be associated with non-White neighborhoods.

Structural racism provides a macrosocial framework for investigating land use patterns as these impact health inequities in urban areas (Powell, 2007). Structural racism has been defined as “explicit and nonexplicit unjust ‘rules of the game’ (laws, policies, and rules), as well as area-based or institutional legacies and indicators of injustice,” based on erroneous beliefs in biologically discrete human “races,” hierarchically ordered from inferior to superior (Krieger, 2020). As a social determinant of health, racism is hypothesized to affect health inequities through biopsychosocial exposure mechanisms, for example, worse health outcomes related to allostatic load resulting from stress response to experiences of discrimination (Clark, 2001; Clark et al., 1999; Schulz et al., 2000). As a structural determinant of health, racism is hypothesized to impact health inequities through racialized socio-political processes which limit access to social goods including health care, food, and employment on the one hand (Bailey et al., 2017; Institute of Medicine Staff, 2004; Rose, 2011), and increase risks for social harms including incarceration (Barnert et al., 2017; Wildeman & Wang, 2017) and police violence (Bor et al., 2018) on the other.

In the USA a key structure of racism has been the creation of racial spaces. By racial spaces, we mean geographic areas of human activity defined by the presence or absence of people according to their purported races, with the overt aim of creating spatial patterns of subordination: “a social reality created by and experienced through patterns of mobility and immobility that have been organized around the historical practices and logic of white supremacy,” (Iglesias, 2000). Racial spaces in USA cities were created and institutionalized in the early to mid-20th century CE through practices of residential segregation, which overtly aimed to spatially separate people identified as White from people identified as Black and other non-White races. Residential segregation was legitimated and adjudicated through structures of government, finance, home sales, and zoning referred to as “redlining” (Rothstein, 2017). Although struck down as a legal practice in the 1960s, residential segregation created racial spaces which underlie observed patterns of inequity in health.

Study aims

Historic zoning codes which resulted in urban redlining have been proposed as a means to measure the impacts of structural racism (Krieger, 2020). We consider the role of redlining in the construction of neighborhood alcohol environments across a six-city region in Northern California. Because urbanization in this area occurred during the period of institutionalized residential segregation, our study area offers an opportunity to examine how segregation established the foundation of land valuation. We first review the historical processes through which relative land values were assigned to parcels, including the exclusions of people and businesses. We then examine whether these specific

exclusions are maintained in present-day neighborhoods.

Study area

Our study area consists of the six contiguous Northern California East Bay cities of Oakland, Berkeley, Albany, Emeryville, Alameda, and Piedmont. Compared to other parts of the USA, this area was only recently urbanized. Spanish colonizers created ranches in the early 19th century CE (Friends of Peralta Hacienda Historical Park, 2019). The western Gold Rush of 1849 brought a wave of migrants to the region, both White Europeans and Euro-Americans and others (largely from China) (Writers' Program, 1941). The six cities in our study area were established and incorporated between 1852 and 1908. Urbanization in the area quickened after the 1906 earthquake and massive fires in San Francisco. Increased migration followed the expansion of intercontinental railroad, shipping, and industrial development in the area, coinciding with the massive migration of African Americans out of the post-Civil War South (Writers' Program, 1941). USA involvement in World War II (1941–1945) brought many more migrants for work in steel production and war-related industries. Oakland's African American population increased nearly six-fold during these war years (Bagwell, 1982).

Population exclusions: Practice to policy

During the early phases of urbanization, wealthy Whites built grand houses on large lots in the interior East Bay hills where they “enjoyed ... a pleasant isolation,” (Writers' Program, 1941, p. 63). Poorer people and people of color were relegated to residence in the industrialized flatlands by practice and policy. Early Oakland ordinances restricted Chinese residence to what would become the city's Chinatown (Bagwell, 1982). African American settlement in the East Bay initially developed around the end of the rail line in what is now West Oakland. In Berkeley, by 1930 African Americans and Asian Americans were reported as concentrated in the “industrial” western and southern districts.

In 1880 the mayor of Oakland observed that proximity to the “nuisances” of the Chinese district reduced property values (Bagwell, 1982, p. 87). Premised on this same notion of “value,” real estate developers began using deed restrictions and covenants to exclude non-Whites, except as servants in White households. For example, a Declaration of Restrictions issued in 1917 by the Lakeshore Highlands Company for their new Oakland hills development entailed that “No person of African, Japanese, Chinese, or of any Mongolian descent shall be allowed to purchase, own or lease said property or any part thereof except in the capacity of domestic servants of the occupant thereof,” (Bagwell, 1982, p. 205).

East Bay developers used formal city zoning and planning processes to institutionalize these spatial exclusions and establish low residential density in White neighborhoods. In 1916 the City of Berkeley established a planning and zoning commission, one of the first in the USA, heavily influenced by real estate developers. After studying zoning regulations in other cities, the commission established an 8-class zone system designed to give property owners, especially home-owners, protections against possible “encroachment” of undesirable types of structures in their districts. This zoning system explicitly created zones of residential density as well. Perceived higher property values for single family dwellings in wealthy neighborhoods were protected by excluding multi-family dwellings from these zones; while higher density was promoted in middle-income and mixed-used zones by allowing multi-family apartment buildings. (Weiss, 1986).

In the 1930s the work of exclusionary zoning was taken up by the U. S. Federal Housing Authority (FHA), established as part of the progressive New Deal. The language of encroachment, invasion, and infiltration recurred in the property valuation process established under the FHA's Home Owner Lending Corporation (HOLC), which provided mortgage and home improvement loans at longer terms and lower

interest rates than commercial lenders in order to reduce foreclosures. Between 1933 and 1936 HOLC made loans on 1,017,821 properties in all but 64 of the 3000 counties in the USA (Hillier, 2003). Although the program did not necessarily exclude homeownership by poor and non-White people, the HOLC program’s assessment of parcels effectively articulated and reified spatial race- and class-based segregation which developed prior to, and was to be maintained through, the federal lending program.

HOLC agents established relative mortgage risks by field assessments across urban areas. Estimation of “value” which “depends on the production of future benefits” (U.S. Federal Housing Administration, 1936, Pt I 320-303), included assessment of the location’s “Protection from Adverse Influences,” specifically “value-destroying influences” including an “infiltration” or “influx of people of lower living standards” (U.S. Federal Housing Administration, 1936, I 306; I 326). “The Valuator should investigate areas surrounding the location to determine whether or not incompatible racial and social groups are present, to the end that an intelligent prediction may be made regarding the possibility or probability of the location being invaded by such groups. If a neighborhood is to retain stability it is necessary that properties shall continue to be occupied by the same social and racial classes” (U.S. Federal Housing Administration, 1936, II 266). Assessors were to note the potential for homebuyers’ children to attend schools with students of “a far lower level of society or an incompatible racial element” (U.S. Federal Housing Administration, 1936, II 266). The survey form included an item explicitly noting presence of “Negroes” in a parcel. The instructions noted that zoning regulations might ensure “a homogenous and harmonious neighborhood” but that 20-year deed restrictions were required to limit the types and number of buildings on a highly-valued lot (i.e., one building, single family dwelling only), prohibit resubdividing lots, and protect against “occupancy of the properties except by the race for which they are intended” (U.S. Federal Housing

Administration, 1936, II 266).

Using the HOLC valuation system, urban areas were scored and color-coded as being first class (green), second class (blue), third class (yellow), or fourth class (red). Green and blue zones were estimated to be at no or low risk of infiltration by poor and non-White residents; yellow indicated some infiltration, and red indicated infiltration has already occurred. Urban core areas were excluded as ineligible for the FHA mortgage programs “as well as the slum and blighted areas which almost invariably surround downtown sections of cities” (U.S. Federal Housing Administration, 1936, II 208). The 1937 HOLC map for the East Bay Area, shown in Fig. 1, shows the region neatly bifurcated by “the hills” (green and blue) and “the flats” (yellow and red). This redlining resulted in systematic divestment in urban areas, such that people excluded from wealthy White residential areas were also locked into areas with deteriorating structures (Massey & Denton, 1993; Woods II, 2018) and higher residential density, as well as co-location with businesses.

Alcohol sales exclusions: Practice to policy

At the same time that wealthy Whites used urban zoning polices to protect their residential areas from proximity to poor people and people of color, they also sought protection from proximity to non-residential land uses. Industrial development in the East Bay aggregated around railway and shipping lines and hubs. Early zoning and planning policies aimed to protect elite White residential areas from these and other “nuisance” businesses and institutions, including alcohol retailers. Urban development in the East Bay area occurred during an era of heightened ambivalence about alcohol in the USA. This period of ambivalence, elevated by the Temperance movement, culminated in National Prohibition of alcohol (1920–1933). The Temperance movement brought attention to alcohol sales and use as moral, health, and

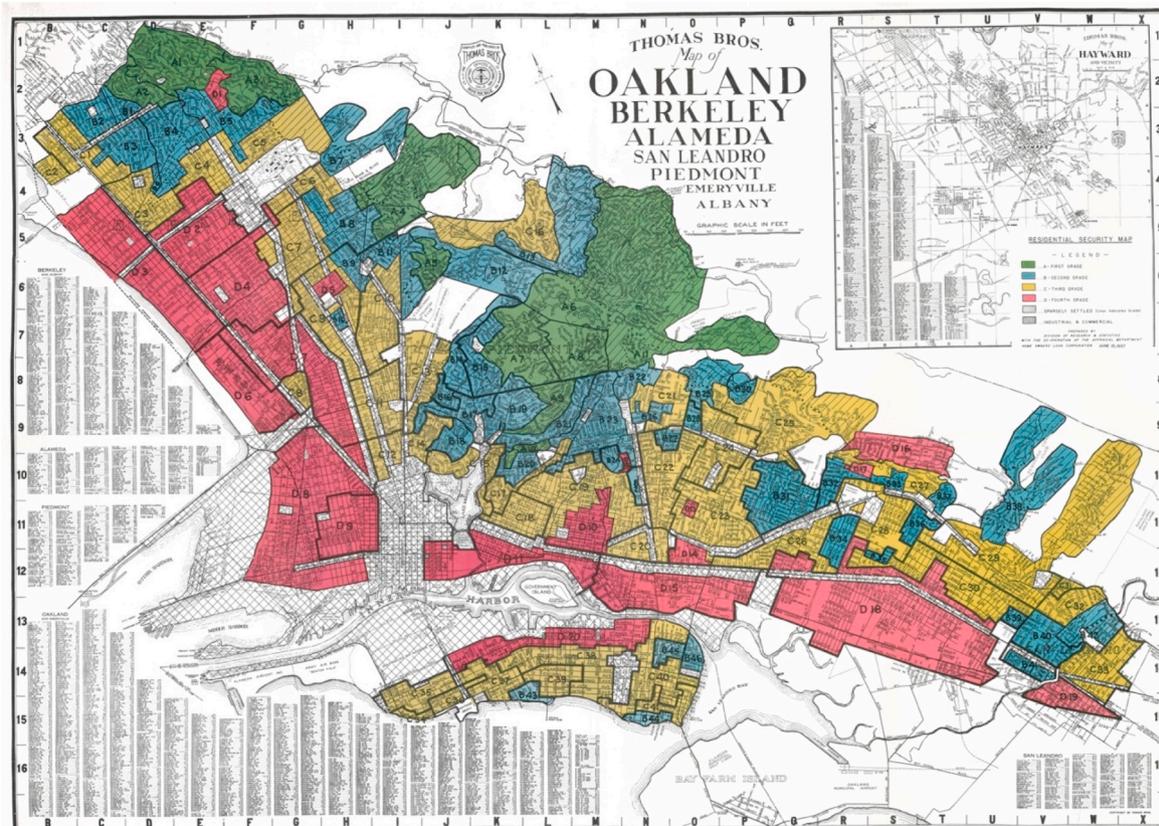


Fig. 1. Historic HOLC map.

safety issues. In the newly-urbanizing East Bay, the social construction of racialized spaces coincided with the social construction of alcohol spaces.

Alcohol production and use was not historically noted among Indigenous populations in the area (Amerine, 1969; Lightfoot & Parrish, 2009). Wine production was introduced to Northern California by Spanish colonizers in the 18th century CE (Amerine, 1969) and continued to flourish to present times (Lender & Martin, 1987). Brewing was one of the East Bay's earliest industries; by 1876 there were 10 breweries in the area (Bagwell, 1982). In the city of Oakland saloons were concentrated around the waterfront and near the railroad terminal. An observer in 1900 described the West Oakland area as a crowded working class district, with 21 nationalities and 35 saloons (Praetzellis et al., 1996). Alcoholic drinks were also available at upper-class Oakland hotels. The city of Emeryville was known for "night clubs, lottery dens, bars, and bordellos" and, during Prohibition, for speakeasies and bootleg operations (City of Emeryville, 2020). Among the founders of the city of Berkeley, however, were many Temperance advocates. Alcohol was banned by state law (1876) within one mile of the newly-created University of California campus to "shield college students from the temptations of alcohol," although numerous saloons clustered just outside this buffer zone at the west end of town (Writers' Program, 1941). To eliminate these saloons, citywide alcohol prohibition was enacted in 1899, but repealed the next year. In the small wealthy hillside city of Piedmont, known as the "City of Millionaires" in the 1920s, Temperance-minded residents petitioned the city to block sales of alcohol at its grand hotel (Swift, 1998).

As part of the development of wealthy White East Bay neighborhoods, twenty-year deed restrictions developed in 1910 prohibited "any trade, business, or manufacturers of any kind," in particular "any saloon," (Lorey, 2013). The federal HOLC valuation systems further institutionalized the exclusion of alcohol retail outlets from upper-class neighborhoods. Valuers were instructed to assess proximity to "nuisances," which were "defined as anything ... which is considered objectionable to any or all of the occupants of residential structures" including "billboards, undesirable domestic animals, stables, chicken coops and runs, liquor dispensing establishments ..." The instructions noted that "the rating in this instance should severely penalize the location, perhaps to the point of rejection" (U.S. Federal Housing Administration, 1936, I 232).

Zoning laws in East Bay cities specifically excluded and empowered the removal of businesses owned by or serving specific non-White populations. Berkeley's new zoning laws circa 1918, for instance, enabled residents to successfully petition for the removal of laundries operated by Japanese and Chinese Americans, and blocked plans for a "negro dance hall" in the newly-designated Elmwood district (Weiss, 1986).

Enduring segregation and its impact on off-premise alcohol retail locations

Racial exclusions in covenants and deed restrictions were challenged and struck down in 1948, in the Supreme Court's ruling on *Shelley v. Kraemer* (Rothstein, 2017). Racial discrimination in housing more broadly was challenged and fair housing rights first affirmed in the State of California's Fair Housing Act of 1963. The bill was put forth by William Byron Rumford, California's first African American assemblyman, who represented redlined South Berkeley (Barber, 2018). The overturn of a Fair Housing Law in the city of Berkeley the year before, passed by City Council but repealed by referendum vote (Powell, 1963), helped Rumford and his supporters better shape the state law (Rumford, 1976). The US Civil Rights Act of 1968 includes the Fair Housing Act as Title VII. However, these legislative acts were not effective in undoing the structures of racial segregation in USA urban areas (Rothstein, 2017).

Studies have pointed to the enduring effects of racial segregation in USA metropolitan areas including continued segregation and

concentrated poverty (Aaronson et al., 2017; Darden, 1995; Massey & Denton, 1993; Woods II, 2018) as well as concentrated violence (Jacoby et al., 2018) and poor health outcomes (Beyer et al., 2016; Krieger et al., 2020a, 2020b; McClure et al., 2019). In the East Bay area, as recently as 2016 residential patterns of White and non-White concentration have been found to be delineated by HOLC zoning codes (Aulston, 2017). We investigate whether historic racial residential segregation as articulated in HOLC maps may be associated with the concentration of off-premise alcohol outlets in neighborhoods also characterized by concentration of non-wealthy, non-White residents in areas of higher population density.

Methods

Sample and archival data

Using publicly-available California Alcoholic Beverage Control (ABC) license data for 2015, we identified 486 alcohol retailers in the six cities with off-premise sales licenses (license types 20 and 21). During on-site assessments of each store in 2016 project staff identified and excluded 83 outlets which were non-operational or not publicly accessible, for a final sample of 403 outlets. Demographic and economic estimates for the 520 Census 2010 block groups (CBGs) in which the outlets were located were obtained from GeoLytics, Inc. (GeoLytics, 2016). GeoLytics' between-Census estimates are updated yearly using the ACS as well as other Census publications.

We obtained digital renderings of the six-city HOLC maps from public domain (Nelson et al., 2020). These 1937 maps identify 119 HOLC-defined neighborhood areas across the four land valuation levels (green, blue, yellow, and red in descending order). The maps excluded portions of the six cities that were originally deemed by HOLC staff to be non-residential or sparsely-settled. In order to have complete geographic coverage across the six cities and access to contemporary demographic characteristics, we categorized each CBG by the HOLC rating with the greatest geographic coverage within its boundaries. We created a residual "HOLC unrated" category for CBGs in which more area was excluded from HOLC ratings than was in any of the system's four valuation tiers.

Analyses

We used Bayesian spatial models to relate historic HOLC ratings to alcohol outlet densities as well as Census-based estimates of block-group characteristics. We used categorical variables to identify differences across HOLC zones. Each model includes four indicator variables to identify differences in outcomes between the second through fourth-class HOLC CBGs (Census Block Groups) as well as the HOLC-unrated CBGs versus the excluded first-class (green) HOLC category.

Bayesian spatial Poisson analyses were used to examine the relationship between historic HOLC ratings and the following count outcomes at the CBG level: Black and Hispanic populations (using Census terms and definitions) and off-premise outlets. The analyses predicting Black and Hispanic population were calculated against an expectation that each minority group's population is distributed across CBGs in proportion to total population, whereas the models predicting off-premise outlet counts used an expectation based on square miles in each CBG. The exponentiated median estimate for each HOLC group's Poisson coefficient represents the estimated relative rate with which it affects the outcome. A relative rate above 1.0 indicates that a given HOLC group's CBGs have a greater-than-average share of the minority population or relatively more off-premise outlets relative to land area than does the excluded (green) HOLC category. Conversely, a HOLC category with a relative rate below 1.0 indicates it is associated with reduced rates of minority population or off-premise outlet density than is the excluded HOLC class. A linear spatial model was used to relate HOLC categories to the excluded green HOLC group in analyses predicting median household income. The models predicting off-premise

outlets were run both with and without controls for contemporary indicators predicting demand for alcohol (population and income, locally and in adjacent areas) (cf. Morrison et al., 2015).

Neither the HOLC ratings nor the contemporary outcome measures are randomly distributed across the six-city region. As noted above, affluent areas are disproportionately located in the hills along the eastern edge of these cities, while poor and minority areas are disproportionately found in the flat areas to the west. Because spatial autocorrelation can cause bias in uncorrected models, we employed Bayesian spatial analysis methods that control for spatial dependence. This spatial-smoothing approach combines a conditional-autoregressive random effect modeling autocorrelation between adjoining spatial units (queen’s contiguity) with an exchangeable random effect that allows for unexplained spatially-unstructured variation (Besag et al., 1991). This approach has also been demonstrated to improve estimates in local areas by “borrowing strength” from neighboring spatial units while also addressing overdispersion approximately as well as negative binomial methods (Lord et al., 2005; Waller & Gotway, 2004). The analyses were performed using the R-INLA package run under R version 3.6.0 (Blangiardo & Cameletti, 2015; Rue et al., 2009).

Results

Fig. 2 shows the block-group-level HOLC classifications as well as the locations of the 403 off-premise outlets within the six cities. Fig. 3 illustrates block-group percentages of Black and Hispanic populations and median household income, which all show similar spatial distributions to HOLC classifications.

In 2015, off-premise alcohol outlets tended to locate in areas historically zoned for non-Whites, i.e., red and yellow HOLC zones. Areas historically zoned to exclude non-Whites continued to show majority White populations, higher median household incomes, and fewer off-premise alcohol outlets.

Table 1 presents descriptive statistics for the 520 CBGs as well as for each of the five HOLC categories (33 green, 81 blue, 202 yellow, 120 red, and 84 not rated). The highest-rated green HOLC class had the fewest off-premise alcohol outlets per square mile, the lowest minority concentrations and population density, and the highest median household incomes. Conversely, the lowest-rated red HOLC class had the highest off-premise outlet concentrations and minority concentrations as well as the lowest median household incomes. The statistics for the intermediate HOLC classes (blue and yellow) generally fell between these two extremes, as did the CBGs that were primarily not included in

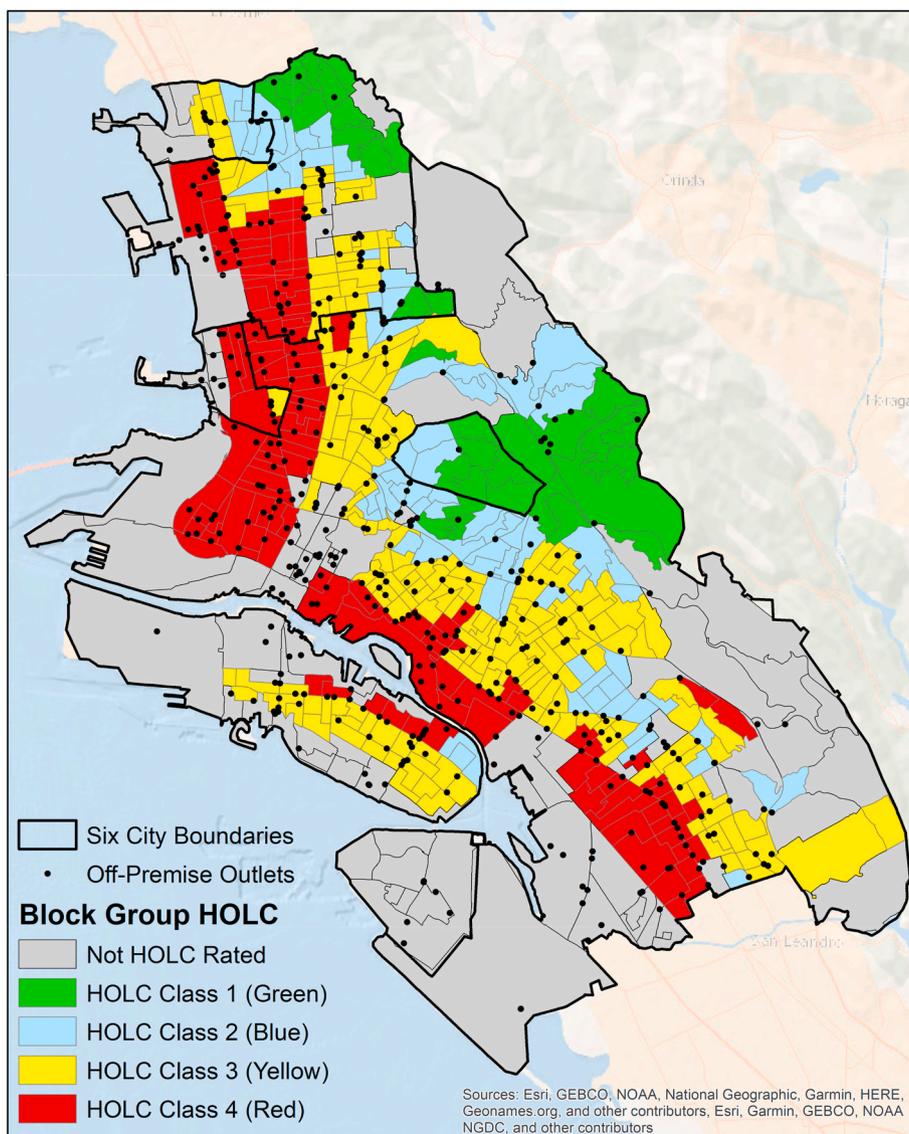


Fig. 2. Map of best-matched HOLC rating for each of 520 Census 2010-defined block groups, with locations of off-premise alcohol outlets.

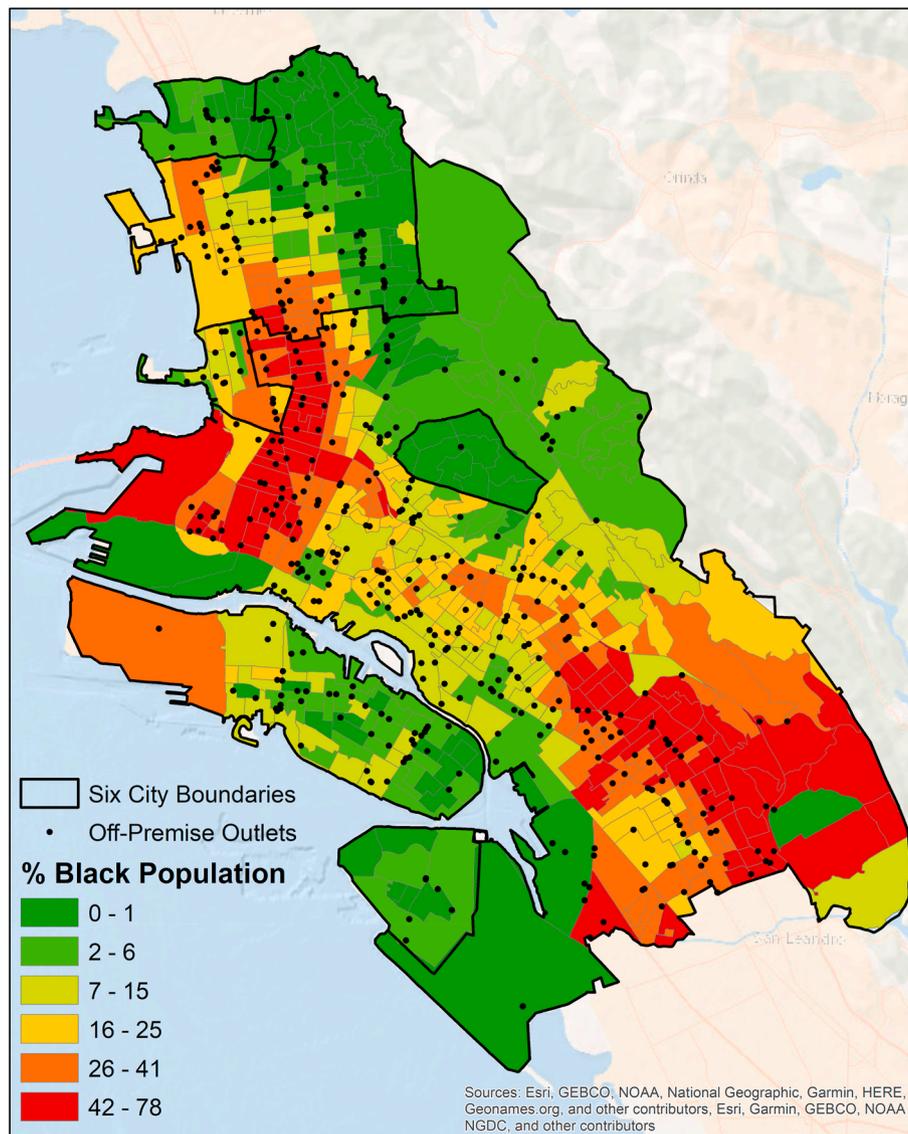


Fig. 3a. Percentages Black population, identifying locations of off-premise alcohol outlets.

any HOLC-rated zone.

Results of the Bayesian spatial analyses predicting non-White proportions and median household income are presented in Table 2. Model 1 presents estimated relative rates of Black residents relative to total population. Results in bold type indicate that the 95% credible interval excludes no relationship between a covariate and an outcome measure (i.e., the CI excludes one for the relative rates presented for Poisson models 1 and 2, while excluding zero for the linear coefficients shown for model 3). Such relationships are inferred to be well-supported by the data. Residents in CBGs within HOLC Class 2 (blue) through 4 (red) were 5.2, 13.5, and 30.4 times as likely to be Black as were those in the excluded HOLC Class 1 areas. The corresponding relative rates from Model 2 suggest that HOLC Classes 2–4 had Hispanic concentrations 2.6, 6.5, and 9.7 times that of Class 1. The HOLC-unrated areas tended to have Black and Hispanic concentrations most similar to those in HOLC Class 2 (blue). Model 3 indicates that HOLC classes 2 through 4 had predicted median household incomes \$6,493, \$10,706, and \$11,538, respectively, below those of the excluded HOLC Class 1. The HOLC-unrated CBGs had median household incomes most similar to those in those in HOLC class 3 (yellow).

Model 1 (Table 3) suggests that CBGs in HOLC classes 2 through 4 had 3.4, 8.7 and 9.6 times higher off-premise outlet densities as those in

reference class 1, while densities within the HOLC-unrated areas fell between those of classes 1 and 2. Model 2 adds covariates for total population and median income across both local and adjacent CBGs. Both local and adjacent income measures were well-supported negative predictors in this model, but there were no well-supported differences in predicted off-premise outlet densities across the HOLC classes.

Discussion

This study investigates the relationship between historic residential segregation practices and policies and current conditions within six communities in the East Bay region of Northern California. The results of our Bayesian spatial analyses indicate that 1930s HOLC ratings of mortgage qualifications across residential areas are highly predictive of local demographic, economic, and alcohol-availability measures nearly eight decades later. Census Block Groups primarily located within HOLC’s lowest-rated neighborhoods during the Depression era had much higher proportions of minority residents (relative rates of 30.4 and 9.7, respectively, for Black and Hispanic concentrations) than in the highest-HOLC rated areas, along with 2016 median household incomes estimated to be \$11,540 lower than in HOLC’s most highly-rated neighborhoods. The lowest-rated HOLC areas were also found to have

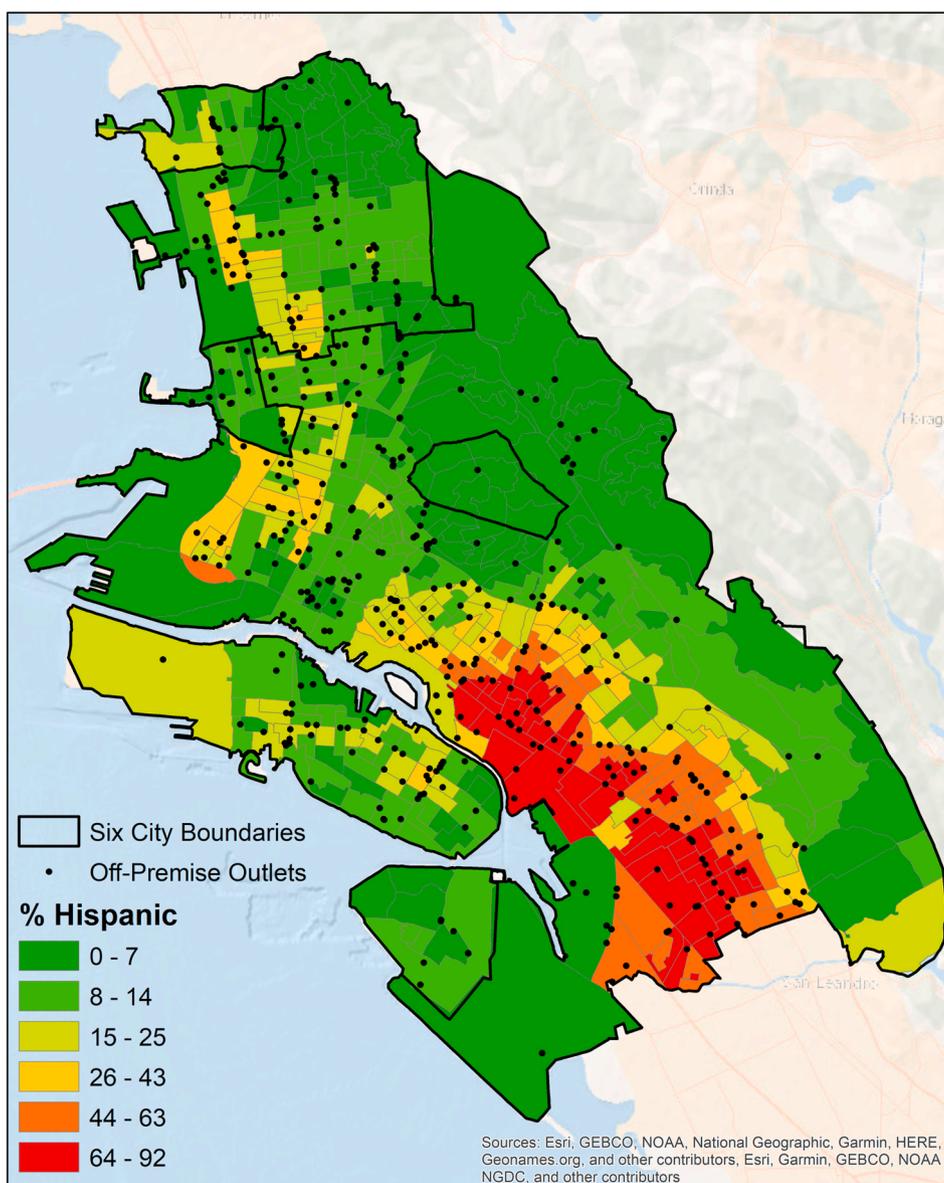


Fig. 3b. Percentages Hispanic population, identifying locations of off-premise alcohol outlets.

far higher concentrations of off-premise alcohol outlets (RR 9.6) than did the highest-rated HOLC communities. This outlet-density effect, however, was smaller and no longer well-supported in models introducing additional contemporary predictors of local alcohol demand.

The HOLC ratings represent a codification of segregated housing practices already developing in prior decades, and causality should not be attributed solely to the HOLC program. Most of the models presented above do not include contemporary covariates. For example, the current models do not test for an impact of current CBG racial proportions on local incomes. We generally avoided introducing contemporary predictors under the assumption that the latter are highly collinear with the historical HOLC ratings. This multicollinearity with current covariates may explain the lack of well-supported HOLC relationships with off-premise outlet concentrations as shown in Table 3. White neighborhoods were designed to exclude nuisance businesses, as well as exclude non-White and lower income residents and at the same time maintain low residential density. That the collinearity of this set of geographic features endures to the present day is a testament to the long-term impacts of racialized spatial projects established in the foundation of these urban areas.

In Eastern and Midwestern USA cities, residential segregation overlaid earlier patterns of urban development, and the present-day impacts of redlining may be obscured by other spatial factors. Western USA cities were, however, experiencing rapid urbanization during the period when residential segregation was normative. The social construction of alcohol spaces in the East Bay was coeval with the social construction of racial spaces. Alcohol retail businesses and non-wealthy non-Whites were zoned for the same spaces, which were excluded from, although near to, spaces set aside for wealthy Whites.

The Federal Housing Authority HOLC did not create racial spaces, but it did institutionalize such zoning, and “lent the power, prestige, and support of the federal government to the systematic practice of racial discrimination in housing,” (Massey & Denton, 1993, p. 52). The production of concentrated poverty and concentrated non-White residents in urban areas was institutionalized through exclusionary redlining policies. It was enforced and naturalized in popular discourse, threats, and violence on the part of elite and White residents (Rothstein, 2017).

Previous studies have highlighted inequitable risks of exposure to alcohol sales outlets across urban areas in the USA (LaVeist & Wallace, 2000). Relative land values together with geographically diverse market

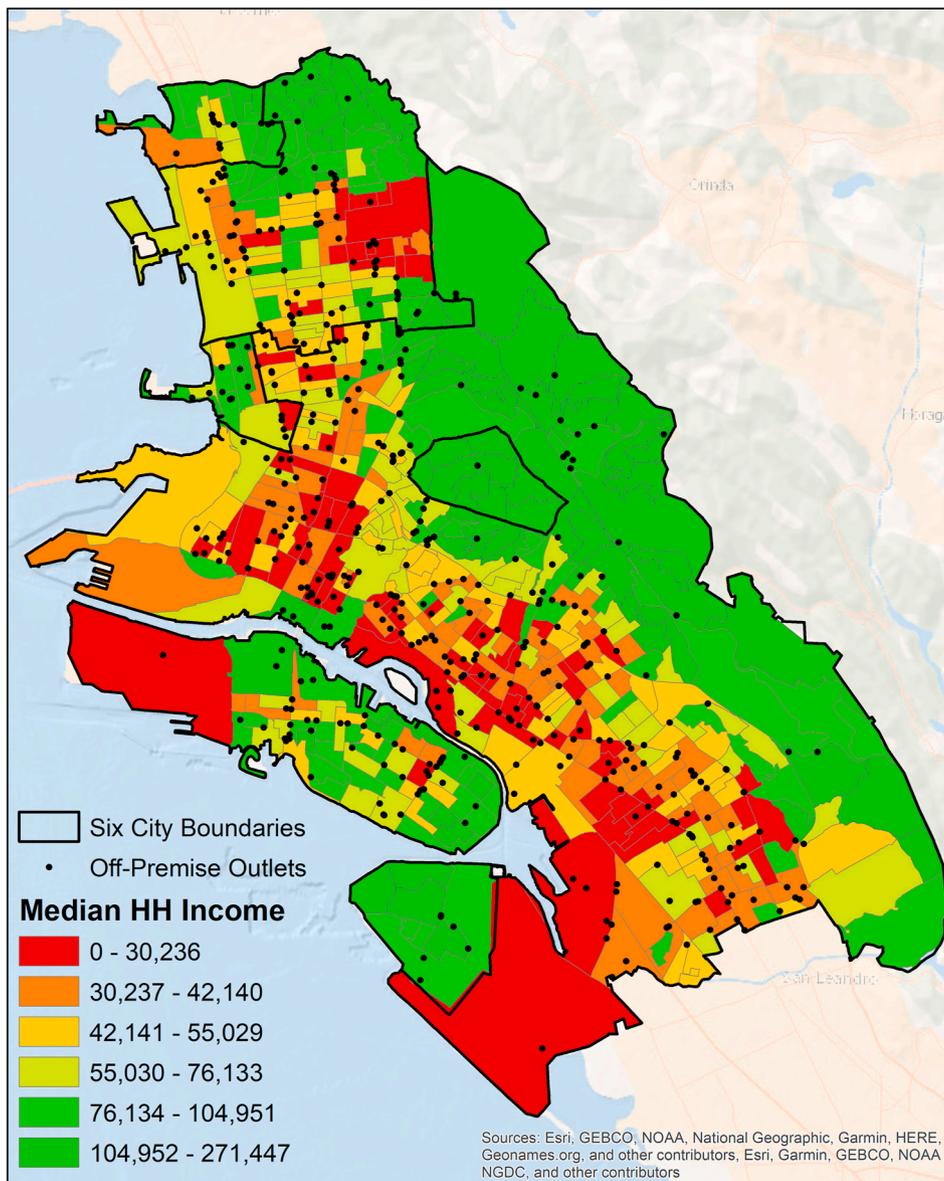


Fig. 3c. Median Household Income, identifying locations of off-premise alcohol outlets.

Table 1
Descriptive statistics for 520 census block groups, total and by HOLC class.

Variable:	Six-City Total n = 520	HOLC Class 1 (Green) n = 33	HOLC Class 2 (Blue) n = 81	HOLC Class 3 (Yellow) n = 202	HOLC Class 4 (Red) n = 120	Not HOLC Rated n = 84
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Off-Premise Alcohol Outlets	0.78 (0.95)	0.27 (0.80)	0.43 (0.69)	0.75 (0.82)	1.11 (1.08)	0.88 (1.11)
Off-Premise Outlets per Square Mile	10.0 (14.7)	1.1 (3.1)	4.6 (7.8)	12.4 (16.0)	13.2 (12.8)	8.4 (18.5)
% Black Population	19.8 (19.1)	2.3 (3.6)	16.8 (22.2)	18.9 (16.6)	29.6 (18.7)	17.8 (19.1)
% Hispanic Population	21.8 (22.3)	3.1 (1.9)	10.2 (10.0)	25.2 (22.0)	33.0 (26.0)	16.0 (18.9)
Median Household Income (x \$1000)	68.1 (45.1)	163.6 (48.4)	96.0 (44.9)	55.0 (28.7)	46.3 (21.7)	66.1 (41.1)
Total Population	1210 (532)	994 (306)	1064 (361)	1220 (510)	1201 (418)	1427 (801)
Land Area (Square Miles)	0.18 (0.43)	0.22 (0.20)	0.11 (0.07)	0.08 (0.07)	0.11 (0.10)	0.60 (0.94)
Population Density (1,000s/ Sq. Mile)	15.0 (11.9)	5.5 (1.7)	12.2 (9.7)	19.3 (12.5)	14.3 (6.1)	11.8 (16.3)

Note: all variables above show significant differences ($p < 0.01$) across the HOLC groupings as measured by a group F-test.

Table 2
Results of Bayesian spatial analyses estimating associations of 1937 HOLC classifications with current characteristics of 520 Census Block Groups in six California cities.

Variable Name	Model 1: Black Population vs. Total Population (Poisson)	Model 2: Hispanic Population vs. Total Population (Poisson)	Model 3: Household Income [\$1000s] (Linear Model)
	Relative Rate (95% CI)	Relative Rate (95% CI)	Coefficient (95% CI)
HOLC Classes: (Class 1 [Green] is reference)			
Class 2 (Blue)	5.21 (2.87, 9.52)	2.57 (1.91, 3.46)	-6.49 (-7.87, -5.12)
Class 3 (Yellow)	13.50 (7.78, 23.69)	6.53 (4.96, 8.62)	-10.71 (-11.96, -9.45)
Class 4 (Red)	30.36 (17.05, 54.6)	9.69 (7.25, 12.95)	-11.54 (-12.86, -10.22)
Area Not HOLC Rated	13.54 (7.4, 24.95)	4.04 (2.98, 5.48)	-9.66 (-11.03, -8.29)
Intercept	0.04 (0.02, 0.06)	0.11 (0.09, 0.14)	16.2 (15.04, 17.36)
SD (Spatial Random Effect)	0.97 (0.78, 1.21)	0.58 (0.48, 0.71)	0.96 (0.46, 1.68)
SD (Non-Spatial Random Effect)	1.18 (1.07, 1.31)	0.58 (0.52, 0.66)	2.17 (1.79, 2.60)
Spatial Autocorrelation (Moran's I) of spatial random effect	0.609	0.647	0.647

Note: Results in bold indicate that the 95% credible interval excludes no effect (i.e., CI excludes a relative rate of 1 in Poisson models 1–3, and excludes a coefficient of 0 in linear model 4).

Table 3
Testing association between 1937 HOLC categories and 2016 alcohol outlets relative to land area, alone and with additional alcohol-demand factors included (Morrison et al., 2015) in 520 Census Block Groups.

Variable Name	Model 1: Off-Premise Alcohol Outlets vs. Land Area (Poisson)	Model 2: Add controls for alcohol-demand factors
	Relative Rate (95% CI)	Relative Rate (95% CI)
HOLC Classes: (Class 1 [Green] is reference)		
Class 2 (Blue)	3.41 (1.61, 8.12)	1.50 (0.67, 3.64)
Class 3 (Yellow)	8.66 (4.36, 19.73)	2.00 (0.89, 4.97)
Class 4 (Red)	9.60 (4.77, 22.09)	1.90 (0.81, 4.84)
Area Not HOLC Rated	2.64 (1.27, 6.25)	0.70 (0.31, 1.75)
Local Population (1,000s)		1.13 (0.92, 1.38)
Adjacent population (1,000s)		1.00 (0.96, 1.04)
Median Household Income (x \$10,000)		0.94 (0.89, 0.99)
Adjacent Median Household Income (x \$10,000)		0.90 (0.84, 0.96)
Intercept	0.19 (0.09, 0.37)	1.82 (0.58, 5.43)
SD (Spatial Random Effect)	0.83 (0.62, 1.08)	0.76 (0.57, 0.99)
SD (Non-Spatial Random Effect)	0.03 (0.01, 0.09)	0.03 (0.01, 0.09)
Moran's I for spatial random effect	0.687	0.486

Note: Results in bold indicate that the 95% credible interval excludes no effect (i.e., CI excludes a relative rate of 1).

potentials have been found to explain this inequitable distribution of risk (Morrison et al., 2015). The present study contextualizes these efforts by examining the social and historical processes through which these inequities developed and have been maintained. In our study area, the socially ambivalent character of alcohol sales—both a value and a nuisance—together with normalized racial segregation enabled the concentration of off-sales alcohol outlets in poor and majority non-White neighborhoods.

Without community-level programs to redress this inequitable distribution, local problems associated with alcohol sales outlets disproportionately become problems for the people who live in neighborhoods over-concentrated with outlets. Retailers in the USA and other nations must obtain a special license to sell alcoholic beverages, and the per capita density of these licenses may be established by law, as in California's Alcoholic Beverage Code. However, California's code was established many decades after alcohol retailers had already become overconcentrated in California cities. Local efforts to reduce local alcohol outlet density were blocked by state pre-emption (Mosher & Treffers, 2013). Land use and zoning policies such as Deemed Approved Ordinance and Conditional Use Permits (Mosher & Works, 1994; Wittman, 2007) provide local officials the means to regulate outlet operating conditions and even eliminate some outlets, but require substantial commitment of time and effort by city officials and community members (Burt, 2004) and have not yet been found to significantly reduce the overconcentration of alcohol outlets in neighborhoods with predominantly lower income and non-White residents. Efforts to enhance the amount and quality of food products available in off-premise alcohol outlets (e.g., Oakland's Healthy Retail Initiative, and similar "store conversion" projects in urban areas) offer a means to increase the benefits of store concentration to neighbors without, however, reducing the risks.

In urban planning and policy, efforts are underway to acknowledge the devastating and enduring effects of exclusionary practices and policies in USA cities. Inclusionary housing and zoning, for example, encourage and sometimes obligate developers to build lower-cost units alongside market rate projects. The State of California's Accessory Dwelling Unit ordinance permits the building of "granny" or "in-law" units on residential parcels which were previously zoned exclusively for single-family residence building (California Department of Housing and Community Development, 2020). As these policies were intended to enable people of lower- and middle-income to reside in middle- and upper-income neighborhoods, inclusionary zoning may remediate some of the harms of exclusionary zoning. Inclusionary programs, however, have not been found to substantially increase affordable housing (Krispell et al., 2016) and the majority of new affordable units have been found to be located in low-income areas (Schwartz et al., 2012).

Although we are interested in the impacts of historical processes in urban areas, our data are cross-sectional, and the patterns we observed may be subject to continued urban change. Increased pressure on available housing stock in urban areas can drive movement of upper-income individuals into lower-income neighborhoods through processes referred to as gentrification; such processes have been observed to be rapidly occurring in the San Francisco Bay Area in recent years (Mujahid et al., 2019). Widespread evictions together with sharply increased rental costs and property values are noted to be dramatically reshaping Bay Area demographics and political economies (Maharawal & McElroy, 2018). A study of segregation in the San Francisco Bay Area, however, found that while Black populations have decreased in core Oakland neighborhoods, the region overall remains segregated, with White residents being the most residentially isolated of all race/ethnic groups (Menendian & Gambhir, 2019). Given these trends, while neighborhoods with high concentration of outlets may be less populated by African American residents, it is likely that the exclusion of high concentration of alcohol outlets from wealthy White neighborhoods will persist. Our study establishes a framework for conducting such analyses.

Our study is based on archival records for one urban area in Northern

California and it is unclear whether similar results would be found in other formerly-redlined urban areas. We are unable to discuss alcohol outlet locations in urban areas in the USA that were not subject to exclusionary zoning practices, for example, rural and exurban areas, or urban areas developed in the post-Civil Rights era. Future research into these areas may ascertain whether these areas show more equitable distributions of alcohol availability across communities. Because the six cities in our sample were developed and zoned during a historical era in the USA in which both overt structural racism and alcohol prohibition were publicly and judicially sanctioned, the study provides an excellent case through which to trace how racial formation in the USA (Omi & Winant, 2014 [1994]) may shape present-day alcohol environments in the cities where the majority of USA citizens reside. As such, this study underscores the importance of attending to the historical contexts within which inequitable alcohol environments may arise and become instantiated. Without attending to these historical dimensions, over-concentration of alcohol retailers in “their” neighborhoods may be incorrectly attributed to African American and Latinx residents, and not to the racist structures of practice and policy which lined the foundations of many USA urban neighborhoods.

Financial disclosure

The research and preparation of this manuscript were made possible by National Institute on Alcohol Abuse and Alcoholism grants R01AA023085 (to JL), R01AA024759 (to CM), and P60-AA006282-35 (to PG). The funder had no role in the design, conduct, or reporting of this research.

CRedit authorship contribution statement

Juliet P. Lee: Conceptualization, Writing - original draft, Project administration, Funding acquisition. **William Ponicki:** Methodology, Data curation, Software, Formal analysis, Visualization, Writing - original draft. **Christina Mair:** Resources, Writing - original draft, Funding acquisition. **Paul Gruenewald:** Supervision, Resources, Writing - original draft, Funding acquisition. **Lina Ghanem:** Writing - original draft.

Declaration of competing interest

None.

Acknowledgements

We acknowledge the efforts of field staff members for data collection on this project. We acknowledge that this study was conducted on unceded Chochenyo Ohlone territory.

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