

Historical Redlining and Contemporary Racial Disparities in Neighborhood Life Expectancy

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Abstract

While evidence suggests a durable relationship between redlining and population health, we currently lack an empirical account of how this historical act of racialized violence produced contemporary inequities. In this paper, we use a mediation framework to evaluate how redlining grades influenced later life expectancy and the degree to which contemporary racial disparities in life expectancy between Black working-class neighborhoods and White professional-class neighborhoods can be explained by past Home Owners' Loan Corporation (HOLC) mapping. Life expectancy gaps between differently graded tracts are driven by economic isolation and disparate property valuation which developed within these areas in subsequent decades. Still, only a small percent of a total disparity between contemporary Black and White neighborhoods is explained by HOLC grades. We discuss the role of HOLC maps in analyses of structural racism and health, positioning them as only one feature of a larger public-private project conflating race with financial risk. Policy implications include not only targeting resources to formerly redlined neighborhoods but also the larger project of dismantling racist theories of value that are deeply embedded in the political economy of place.

The strict delineation of neighborhoods based on the perceived social value of their residents represents a recurring form of the racialized, structural violence in the United States. Perhaps the most systemized example of this was the national “redlining” project of the twentieth century (Rothstein 2018). Redlining was pivotal for codifying a central economic feature of structural racism—the conflation of “race” with “financial risk”—and for the sociopolitical construction and reification of racial categories themselves. Although the racialization of places pre-dated the grading of neighborhoods by the Home Owners' Loan Corporation (HOLC), this market-making intervention helped solidify the notion that an area's property value was proportional to its racial composition (Winling and Michney 2021). By spatially marking neighborhoods as “undesirable”

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through state-sponsored policy, redlining helped to entrench racial segregation, facilitate the infusion of resources into White communities—through access to credit, home equity, and public investment—and legitimize the heaping of hazards, dispossession, and displacement on communities of color, particularly Black neighborhoods (Fields and Raymond 2021).

Recently digitized HOLC maps (Nelson et al. 2021) have allowed researchers to draw connections between historical redlining and contemporary health. Across the outcomes examined to date, the legacy of HOLC's hierarchical categorization of places is apparent: Contemporary residents of areas that were once marked as Grade A generally experience better health than residents of places once coded as Grade D despite decades of intermediate urban change. Still, despite this emerging evidence, there is debate over the extent to which and how exactly HOLC maps generated place-based inequalities in health (Fishback et al. 2021; Xu 2021). We argue that these tensions revolve around distinctions between theoretical frameworks for how to operationalize redlining as an exposure in quantitative research, including how to use historical data in a way that most clearly reflects social theories of how different forms of redlining produced contemporary inequity.

In this paper, we show how redlining measured via HOLC maps can be implicated in contemporary place-based health disparities through two analyses. First, we examine how the *spatial-marking* of neighborhoods as “desirable” or “hazardous” through HOLC maps led to different historical trajectories affecting life expectancy *within those places* today. Second, we examine if and how these one-to-one historical trajectories explain the large disparities in life expectancy observed *across racialized communities* today. Using Census-tract data following neighborhoods over a century of change, we use the mediational *g*-formula to decompose the difference in the contemporary life expectancy between former A-graded tracts and D-graded tracts, attributing this disparity primarily to housing value inequities and racialized economic isolation. We then contextualize these findings by demonstrating how this one-to-one neighborhood-level process explains only a small percent of a contemporary disparity between White- and Black-majority neighborhoods. Through this framework, we argue that redlining can be understood not only as a distinct historical event in the durable racialization of specific places but also as one part of a larger, structurally embedded, racialized logic of property valuation, which is a fundamental determinant of population health today, influencing the distribution of privileges and risks across even neighborhoods never explicitly evaluated by HOLC. These findings complicate overly deterministic narratives of the influence of redlining on the health outcomes of specific places, especially as measured via HOLC maps. We discuss not only how an emancipatory research and policy agenda must grapple not only with reparative policies for “formerly redlined” neighborhoods but also the more abstracted contemporary system of place-based capital accumulation built and maintained by these same racist redlining principles (Reyes 2022).

Background

The Racialized Construction of Housing as an Asset Class

In the 1930s, the New Deal laid the groundwork for massive investment into a two-tiered housing system: (1) federally backed mortgages and subsidies for private homeowners, especially among White communities and (2) public housing, which over time became disproportionately occupied by people of color. In determining mortgage terms, US cities partnered with the federally sponsored HOLC to develop a hierarchy of neighborhoods, ranging from “Grade A” to “Grade D” based on their suitability for investment by financial institutions (Rothstein 2018). The criteria underlying this classification scheme were blunt and racist such that areas inhabited by people racialized as “non-White” were systematically coded as “hazardous for investment” (i.e., Grade D).

This logic of racialized financial risk was not only simply an artifact of deeply embedded racism among private real estate actors and public bureaucrats within HOLC but also became structurally necessary for capital growth in a burgeoning market of private real estate; as Faber (2020) describes, “by conflating race with mortgage default risk and home equity growth, these policies not only justified racial discrimination, but also created a marketplace whose metrics of

risk made discrimination necessary ... Although segregation is often considered to persist due to 'inertia,' [Krysan and Crowder 2017] suggest 'momentum' is a more accurate metaphor due to social processes resulting in the 'churning forward' of racially disparate residential mobility patterns ... HOLC's segregationist logic carried 'momentum' through subsequent federal and local policies as well as private institutions (e.g., mortgage lenders)" (Faber 2020, 744). Indeed, a key feature of this market-making process was active state intervention and public-private partnerships in making race central to the relational determination of property value. This included both building high-value White homeownership via exclusionary practices (e.g., redlining maps evolving into algorithmic mortgage and appraisal practices and exclusionary zoning) and in predatory inclusion, whereby access to low-value homeownership was increasingly made available to Black communities through the expansion of credit on exploitative terms (Robinson 2021; Taylor 2019)—or what Robinson (2020) refers to as the role of the state in "making markets on the margins."

The racist construction of the private housing market was a pivotal economic project in the construction and reification of racial categories (Sewell 2016). Here, local politics played a role, often in tandem with the interests of private real estate. As Sugrue (1997) describes in Detroit, reactionary White riots and violence during the 1940s–1950s coalesced into homeowners' associations and neighborhood covenants, aided by the racist blockbusting strategies of real estate actors. Local governments were quick to bow to the pressure of homeowners' associations and real estate in failing to audit covenants or prosecute discriminatory behaviors under the 1968 Fair Housing Act (Taylor 2019). These collaborations reflected a long history of strategic use of state apparatus by private real estate, who were also active in sponsoring local politicians during the New Deal era. For example, profit-seeking within the racialized housing market may have been mitigated by an equally large federal investment in a non-market option alongside the federally backed private home mortgage. Instead, the Labor Housing Conference social housing initiative was defeated during the 1930s through a combination of public-private partnerships in support of private real estate, which had ripple effects decades later: "A major postwar offensive against public housing mounted by real estate business groups that linked directly assisted construction with communism was an important impediment to the acceptance and growth of such programs ... Public and private entities fostered the notion, central to the neoliberal turn of the 1970s, that equity is earned. Reforms to New Deal policy were seen as threats to Americans' 'hard work' and 'investments' in single-family homes, often with no acknowledgement of the subsidies and assistance from federal, state, and local governments making this possible, such as FHA structuring of the mortgage market, tax benefits, and infrastructure construction" (Radford 1996, 200, 204).

In all, "redlining" marshaled together a confluence of racist logics which became deeply embedded within the racialized political economy of place. The era of state-sanctioned redlining between the 1930s and the passage of the Fair Housing Act in 1968 codified a racist theory of property value through multi-level public-private partnerships (e.g., FHA, HOLC, and private real estate), leveraging the authority, legal power, and financial backing of the federal government to build a culture of "earned" (White) homeownership through massive public investment (Jackson 1985; Taylor 2019; Winling and Michney 2021).

Historical Redlining, Spatial-Marking, and Population Health

Recently digitized HOLC maps (Nelson et al. 2021) have allowed researchers to draw connections between historical redlining and contemporary social outcomes, such as racial disparities in mortgage denials and subprime loans (Faber 2021). In many quantitative studies leveraging these data, HOLC maps are, at least implicitly, conceptualized as an indicator of the treatment specific neighborhoods experienced under the structurally racist logics of credit and financing following the New Deal era. In overlaying these historical maps with contemporary Census-tract boundaries, researchers have classified neighborhoods as "formerly A graded" or "formerly D graded"; used these categories to broadly summarize the public and private investment strategies

that a neighborhood was subjected to under the scope of redlining; and connected these historical experiences—of being marked as “desirable” or “hazardous” for investment—to contemporary conditions within these same spaces.

Health researchers have been particularly busy linking past neighborhood redlining grades to present outcomes. As the geographer Ruth Wilson Gilmore (2007, 28) states, structural racism is, at its core, “the state-sanctioned or extralegal production and exploitation of group-differentiated vulnerability to premature death.” (see also Gilmore 2002). HOLC maps represent one such manifestation of this type of structural violence—organizing pre-existing forms of racial discrimination into state-sponsored policy—leading researchers to investigate these grades as possible sources of long-lasting, place-based health disparities. Contemporary outcomes are predicted by these historical labels: Present-day residents of Grade A tracts have been shown to experience better health than residents of Grade D tracts along such indicators as late-stage cancer diagnosis (Krieger et al. 2020a), preterm birth (Krieger et al. 2020b), asthma-related outcomes (Nardone et al. 2020), self-rated health (McClure et al. 2019; Lynch et al. 2021), and life expectancy (Richardson et al. 2021). The bulk of studies in this field indeed align with the notion of HOLC mapping as a violent, state-sanctioned intervention that, despite nearly a century of change, is still implicated in the production of health within neighborhoods.

While evidence points to some durable relationship between HOLC grades and contemporary health, there is room to further interrogate the health legacies of redlining. One unanswered question concerns the specific historical mechanisms that link HOLC grades to contemporary place-based health outcomes. Prior work often implicates the *spatial-marking* of places in these long-run effects, theorizing that the social meaning ascribed to neighborhoods via HOLC persisted far beyond the initial point of intervention to stratify and segment neighborhoods across subsequent decades (Faber 2021). Put differently, scholars argue that the institutionalized interpretations of Grade A neighborhoods as places that are “valuable” and “worth investment” and of Grade D neighborhoods as places that are “lesser” and “hazardous” became embedded in subsequent systems distributing privileges and harms in ways that motivated private and public actors to perpetually layer resources onto A areas and risks onto D areas (Krieger et al. 2020b).

We currently lack an empirical account of this idea, one that traces the trajectories of Grade A and D neighborhoods across time and identifies how these disparate histories shaped current place-based health disparities. It is important to document the specific mediating pathways through which redlining grades shaped neighborhoods over the decades leading up to and following the 1968 Fair Housing Act; doing so situates “redlining” not as a static historical exposure but rather as part of a dynamic process that continues to be embedded in the spatial distribution of risks and privileges today. As we discuss below, this empirical task has important implications for how we situate redlining within an agenda of restorative justice: not only in focusing on the “direct effect” of historical redlining but also in the specific, mediating exposures that have been distributed by redlining.

Given this perspective, we pose the following empirical hypothesis:

- *Spatial-marking*: Census-tracts graded as D in 1935–1940 followed substantially different historical trajectories of urban renewal, school segregation, property valuation, and racialized economic isolation than tracts graded as A, resulting in differential period life expectancy in 2018 between these tracts.

Redlining and Structural Racism

Beyond disentangling how HOLC mapping unfolded onto contemporary health outcomes within the same tracts, we might also contextualize the legacy of redlining grades by considering how much of a disparity in outcomes observed across the contemporary geography of race and class can be explained by spatial-marking. Redlining was not only part of a larger project of racial dispossession (e.g., mortgage terms and denial) but also of displacement (e.g., “urban renewal” and

eviction) (Fields and Raymond 2021)—and these segregationist logics were subsequently codified within national systems of housing financialization following deindustrialization and the shift of capital from manufacturing to real estate (Sugrue 1997; Taylor 2019).

Considering these broad place-making processes, the degree to which we can pin the history of displacement and dispossession brought about directly from being spatially marked by HOLC to contemporary racial health disparities is called into question. Indeed, as we demonstrate below, 70% of the most concentrated Black working-class neighborhoods in 2015–2019 are not located in Census-tracts that were once graded as D. And yet, these areas that were never formally marked as “hazardous for investment” by HOLC still face systematic isolation, devaluation, and, consequently, exposure to risk factors that structure health disparities that we observe today—including state violence, environmental hazards, and exploitative conditions undersegmented labor and housing markets (Sewell 2016). Redlining likely played a role in constructing contemporary conditions within these spaces by fueling a racist theory of property value and a broader, anti-Black segregationist logic that spilled across all geographies, but the extent to which we can leverage the direct experience of being negatively marked by HOLC in explaining outcomes across contemporary racialized communities is uncertain.

The spatial-marking of neighborhoods by HOLC was only one manifestation of the broader redlining project of codifying a theory of value that conflated “race” with “financial risk”—a logic that shaped the historical and contemporary practice of public–private partnerships in real estate long after the 1968 Fair Housing Act and extended beyond the one-to-one matching of historical and contemporary land areas (Winling and Michney 2021). Given this perspective, we pose a second empirical hypothesis:

- *Structural perspective:* There is an immense gap in life expectancy between Black working-class tracts and White professional-class tracts in 2015–2019, and only a small portion of this disparity can be explained by tract-level HOLC grades in 1935–1940.

Note that empirical support for this hypothesis would not suggest that redlining writ large is unimportant in organizing the distribution of premature mortality across racialized populations. Rather, as long noted by scholars theorizing structural racism and racial capitalism, the ramifications of redlining extend far beyond the HOLC maps into the more abstracted systems of finance and appraisal governing the racialized dual mortgage market today (Dantzler 2021; Fields and Raymond 2021; Howell and Korver-Glenn 2018; Imbroscio 2021; Pulido 2016; Rucks-Ahidiana 2021; Taylor 2019; Zaimi 2020). Evidence from this perspective would instead complicate the increasingly common practice of pinning contemporary racial stratification on the actions of a single bad actor of the past (e.g., HOLC), avoiding deterministic narratives of place-based histories by drawing attention to the broader social and economic relations maintaining, reproducing, and profiting from segregation and uneven development.

Present Study

In this study, we build upon our understanding of how redlining influenced present-day population health inequalities through a counterfactual mediation framework. Using this approach, we test not only the two hypotheses above to identify mechanisms through which the spatial-marking of HOLC grades operated over time to influence population health but also whether this one-to-one process connecting historical to contemporary land area explains only a small portion of a total racial disparity in life expectancy. We find evidence for both hypotheses: There is a significant difference in life expectancy between A and D tracts which can be traced along the axes of urban renewal projects, school segregation, property valuation, and racial isolation which occurred in the decades following HOLC mapping. Still, there is a much larger difference in life expectancy between the Black working-class and White professional-class neighborhoods today, only a small percent of which can be attributed to the matching of past HOLC grades to contemporary tracts. We discuss the implications for policy by considering not only the equitable targeting of resources to formerly redlined neighborhoods but also the larger project of

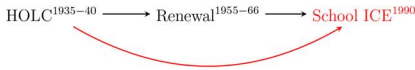
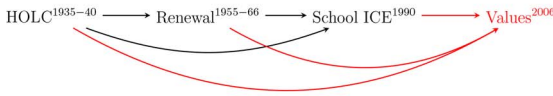
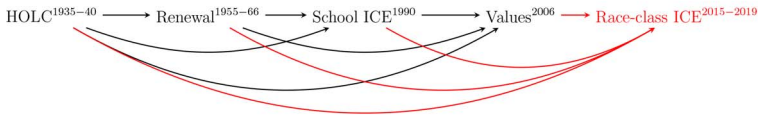
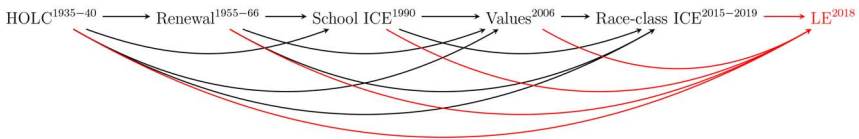
Mediation 1**Mediation 2****Mediation 3****Mediation 4**

Figure 1. DAGs tracing connections between tract-level HOLC redlining grades in 1935–1940 to subsequent mediators, ending with period life expectancy (LE) in 2018. The outcome for each mediation analysis (i.e., defining the ATE, $HOLC \rightarrow [ImEquation\#]$ Outcome, from which the CDE, PAIs, and PIEs are decomposed) is highlighted in red. Potential unobserved confounders are omitted here; see Supplementary Appendix A3.

dismantling racist logics of capital accumulation now codified in the broader political economy of place distributing risk of premature death.

Data and Methods

We use a counterfactual mediation approach to trace connections between redlining and the contemporary distribution of period life expectancy, as illustrated in the directed acyclic diagram (DAG) in figure 1 (note this DAG does not illustrate unobserved confounders; see Supplementary Appendix A3). These ordered mediators, spanning 1930–2018, proxy four broad dynamics through which redlining has built enduring racial and place-based vulnerabilities to premature death:

- 1) *Racialized public-private investment*: Redlining was one instrument within the broader project of racialized public-private investment during the New Deal and post-war era. Importantly, these efforts triggered a decades-long process of not only entrenching racial segregation but also of building groundwork for new systems of displacement (Nelson and Ayers 2021). Here, we consider how redlining is linked to subsequent, so-called “urban renewal” projects in “undesirable” neighborhoods, which displaced thousands of Black families and connected to durable school and residential segregation.
- 2) *Racialized valuation of place*: The turn to federal subsidies in private (White) homeownership and the massive expansion of profiteering in the real estate industry necessitated the conflation of “race” and “financial risk,” deepening the social and political construction of racial categories (Faber 2020; Taylor 2019). This entanglement accelerated during deindustrialization and suburbanization as the capital shifted from manufacturing to real estate (Howell and Korver-Glenn 2021; Sugrue 1997). Indeed, today, the financialization of housing

shapes both anti-Black dispossession (e.g., the ability to build equity) and displacement (e.g., foreclosures) (Fields and Raymond 2021). Here, we consider how redlining, including through its connection to urban renewal and school segregation, ultimately influenced the distribution of property valuation in the early twenty-first century.

- 3) *Racialized “selection” into place*: This political economy of place intersected with the racialized organization of the real estate industry to produce extreme segregation of Black communities, particularly working-class populations (Massey and Denton 1993; Sharkey 2013; Taylor 2019). In this way, the legacies of redlining have been an important feature in not only perpetuating racist systems’ distributed risks and privileges but also in reifying racial categories (Sewell 2016). Here, we consider the reciprocal relation through which Black working-class communities continued to be steered, after redlining, toward low-value property and how property valuation continued to be linked to the racial composition of neighborhoods (Howell and Korver-Glenn 2018).
- 4) *The racialized and classed production of premature mortality*: The distribution of mortality risk in the population is co-constituted with the historical legacies of place in contrast to the conceptual models of population health that treat characteristics such as income and homeownership as individual-level risk factors. Rather, these place-based relations to segmented labor and housing markets, as well as access to affordable health care, are predicated on a history of racism in the political economy of place, including contributions from redlining (Laster Pirtle 2020; Logan and Molotch 1987; Pulido 2016; Rucks-Ahidiana 2021).

Data and Variables

To build the scaffolding of this historical process, we draw on the following data: (1) Census tract-level HOLC grades (1935–1940; A–D), (2) county-level total urban renewal projects (1955–1966; log), (3) school segregation at the district-level (1990; continuous Black vs. White index of concentration at the extremes [ICE]; Krieger et al. 2016), (4) tract-level home values (2006; log), (5) tract-level race-class segregation (2015–2019; continuous Black working-class vs. White professional class ICE), and (6) tract-level period life expectancy (2018; continuous). We define “working-class” and “professional-class” using crude occupational tabulations at the tract-level.

In our first analysis of spatial-marking, we construct two samples following Krieger et al. (2020b): All tracts with more than half of their land area covered by a D-graded polygon ($n = 3,196$) and all tracts with more than half covered by an A-graded polygon ($n = 632$). In our second analysis from a structural perspective, we also construct two samples: all tracts in the top 5% nationally of the 2015–2019 race-class ICE (“Black working-class”; $n = 3,776$) and all tracts in the bottom 5% (“White professional-class”; $n = 3,147$). Following Faber (2020), we include a set of pre-treatment confounders at the county-level from the 1930 Census: percent Black, percent foreign-born, unemployment rate, population size, median home value, and Black-White homeownership ratio. Information on all sources is available in Supplementary Appendix A1.

Analytical Framework

Before detailing our mediation framework, we note the causal language used throughout this paper. As has been argued elsewhere (e.g., Lundberg, Johnson, and Stewart 2021), being clear about causal estimands is useful for describing the implicit assumptions related to confounding and mediation—which we contend is particularly important when interrogating long-run historical processes via quantitative methods. Framing this project as a causal analysis allows us to target useful counterfactuals for understanding a complex social process. Overall, we view our analysis from a holistic counterfactual perspective rather than as an analysis of effects in an interventional potential outcomes framework (Supplementary Appendix A3). Still, if causal assumptions are not met, we can interpret this analysis as a time-varying decomposition of the counterfactual difference in tract trajectories along several dependent factors; in other words,

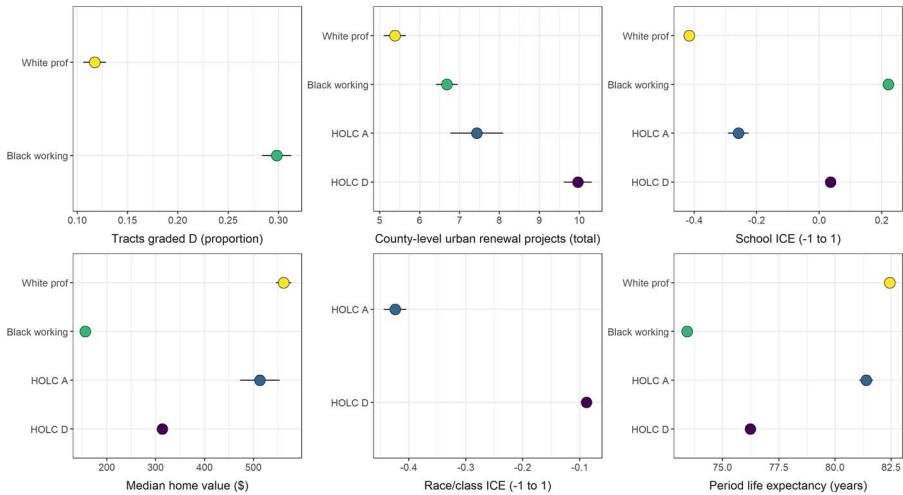


Figure 2. Descriptive statistics across four types of tracts: (1) tracts graded as “A”, (2) tracts graded as “D”, (3) White professional-class tracts (2015–2019 ICE \leq 5th percentile), and (4) Black working-class tracts (2015–2019 ICE \geq 95th percentile).

as a more dynamic Kitagawa-Blinder-Oaxaca decomposition that accounts for the mediator dependencies over time (Jackson and VanderWeele 2019; Sudharsanan and Bijlsma 2021).

We focus our analysis on the following counterfactuals:

R1. A *spatial-marking* frame, which asks how the HOLC grading of neighborhoods (1935–1940) translated into historical trajectories influencing period life expectancy (Y) within those places. In other words, we might consider that HOLC mapping is a place-based exposure (H), and we want to measure its marginal effect on contemporary life expectancy (e.g., considering if tracts graded as A instead had experienced the historical trajectories of tracts graded as D).

R2. A *structural* frame, which asks how much of the disparity in 2018 life expectancy between 2015 and 2019 White professional-class neighborhoods (W) and between 2015 and 2019 Black working-class neighborhoods (B) is explained by the 1935–1940 HOLC grades. In other words, we might consider that the one-to-one redlining of neighborhoods is but one cause in the historical production of a total racialized disparity in the place-based life expectancy we observe today.

These complementary counterfactuals not only help us to identify the place-based mechanisms underlying the long-run effects of HOLC mapping on life expectancy (R1) but also help us explore to what extent a total racialized gap in the contemporary life expectancy can be traced back to tract-level redlining grades (R2). This second frame is important to consider in parallel with the first, as roughly 70% of the hyper-segregated Black working-class communities today live within neighborhoods never marked as Grade D (figure 2).

In our analysis from a spatial-marking perspective (R1), we decompose the average treatment effect (ATE) of being graded as D versus A by HOLC, that is,

$$ATE = E[Y^{H=D}] - E[Y^{H=A}],$$

into three mediation estimands:

- 1) *The controlled direct effect (CDE)*: The exposure causes the outcome through pathways outside of the observed mediators.
- 2) *The pure indirect effect (PIE)*: The exposure causes the mediator, and the mediator then causes the outcome in ways that *do not* depend on the exposure.
- 3) *The proportion attributable to interaction (PAI)*: The exposure causes the mediator, and the mediator then causes the outcome in ways that *do* depend on the exposure.

We use these quantities to summarize the historical process through which HOLC grades unfolded onto contemporary life expectancy within formerly redlined tracts. Beyond the more conventional question of whether redlining exerted some residual influence on outcomes outside of more proximal historical mediators (CDE), these estimands also reflect on whether redlining influenced the *distribution* of subsequent systems (PIE) and the *relationship* between those systems and outcomes (PAI).

In our analysis from a structural perspective (R2), we leverage these quantities to simulate how a total racial disparity in life expectancy might have otherwise manifested had all redlined contemporary Black working-class tracts been graded as A. Put differently, using the estimands defined above, we simulate counterfactual historical trajectories for Black working-class tracts that were graded as D as if they had instead been graded as A (i.e., had $H = a^*$ for all formerly redlined tracts).

$$\text{Counterfactual disparity (CD)} = E[Y|B, H = a^*] - E[Y|W].$$

We contrast the life expectancy disparity observed between all Black working-class tracts and all White professional-class tracts under this counterfactual history to the disparity between these communities that emerged in reality—or in other words, to the observed disparity, $E[Y|B] - E[Y|W]$ —to assess how the contemporary racial disparities in life expectancy might have manifested had the tracts that were once coded as Grade D enjoyed the same marking and subsequent place-based histories of the tracts once coded as Grade A.

Mediation Analysis

We use the mediational *g*-formula for our analyses. Conventional regression, controlling for time-varying characteristics, assumes there exists no exposure-induced mediator-outcome confounding (Vanderweele 2014; Wodtke and Zhou 2020). The implicit counterfactual comparison made in such analyses is between two populations that vary on exposure status—in this case, being graded as D versus A—assuming nothing else changes across the populations over time. As described elsewhere (e.g., Wodtke and Zhou 2020), such assumptions about “post-treatment” variables are often untenable when considering a complex social exposure, which likely affects all other variables over time.

The *g*-formula is a generalization of standardization that allows for the estimation of unconfounded summary effects in the presence of observed post-treatment confounding (Naimi, Cole, and Kennedy 2016; Robins 1986). Equation (1) illustrates the population mean, $E[Y]$ (in our case, tract-level life expectancy), standardized across an exposure variable, X (in our case, being graded as D vs. A by HOLC). The variable Y^x is used to denote the counterfactual outcome given different values of exposure.

$$E[Y^x] = \sum_v P(Y = y|X = x, V = v) P(V = v) \quad (1)$$

This generalized formula, or “*g*-formula,” for the mean outcome at a given time can be extended over all stratifying variables, \mathbf{V} , which confound the association between X and Y , as well as variables, \mathbf{M} , which mediate the association. We use $P(y|x)$ as shorthand for $P(Y = y|X = x)$, $P(v)$ as shorthand for $P(\mathbf{V} = \mathbf{v})$, etc. In Equation (2), we illustrate the *g*-formula for the expectation of Y given exposure level $X = x$.

$$E[Y^x] = \sum_m \sum_v P(Y|x, m, \mathbf{v}) P(m|x, \mathbf{v}) P(\mathbf{v}) \quad (2)$$

Equation 2 makes explicit that this expected outcome depends on the ways in which changing the exposure affects the mediator M (which we might also intervene on). For example, considering a counterfactual where all neighborhoods had been graded as D requires considering a counterfactual distribution of M , such as home values. This equation can be extended to incorporate multiple mediators. For instance, consider the following two-mediator scenario in which a mediator M is dependent on a previous mediator L :

$$E[Y^x] = \sum_m \sum_l \sum_v P(Y|x, m, l, \mathbf{v}) P(m|x, l, \mathbf{v}) P(l|x, v) P(\mathbf{v}) \tag{3}$$

where Y is the tract-level life expectancy (continuous), X is the HOLC grade ($x = D, x^* = A$), M is the second mediator (e.g., home value; $m =$ index value, $m^* =$ reference value), L is the first mediator (e.g., urban renewal projects; $l =$ index value, $l^* =$ reference value), and \mathbf{V} is the vector of (1) exposure-outcome confounders and (2) mediator-outcome confounders not influenced by exposure (e.g., 1930s home values).

The generalization of the entire conditional probability space in Equation (3) is the critical contribution of the g -formula, as it allows for the estimation of population-level counterfactuals without requiring all variables to be fixed at their means or reference values. Rather, in decomposing a disparity in Y by exposure X (or the “average treatment effect” of HOLC grades on life expectancy), specific mediating effects can be considered while other variables that are dependent on the exposure can take on values they *would have had* under a particular counterfactual exposure history (Wang and Arah 2015). In conventional regression (e.g., Baron-Kenny mediation) or demographic decomposition (e.g., Kitagaswa decomposition), estimates of the counterfactual change are calculated under the assumption that no other conditional probabilities change as a result of the exposure changing (Sudharsanan and Bijlsma 2021). By contrast, g -formula standardization makes explicit the sum of all cascades of conditional probabilities for all variables. The conditional probabilities of all mediators can be expanded to include the specific dependence structure for each variable as described by a given causal model (e.g., figure 1).

Estimands in the Case of Multiple Sequential Mediators

In the scenario described in Equation (3)—where M is considered as the mediator of interest, and a prior mediator L is considered as a post-treatment confounder—the difference between $E[Y^x]$ and $E[Y^{x^*}]$ can be decomposed into the CDE, the PAI via mediator M , and the PIE via mediator M (Wang and Arah 2015).

- *The CDE:* The exposure causes the outcome through pathways outside of the observed mediators.
 - $CDE_{M=m^*} = E[Y_{xm^*}] - E[Y_{x^*m^*}]$.
- *The PIE:* The exposure causes the mediator, and the mediator then causes the outcome in ways that do not depend on the exposure.
 - $PIE^{(M)} = E[Y_{x^*M_x}] - E[Y_{x^*M_{x^*}}]$.
- *The PAI:* The exposure causes the mediator, and the mediator then causes the outcome in ways that do depend on the exposure.
 - $PAI^{(M)} = E[(Y_{xm} - Y_{x^*m} - Y_{xm^*} + Y_{x^*m^*})(M_x)]$.

We use an extension of this decomposition to describe separate mediated effects via multiple sequential mediators (Graetz, Boen, and Esposito 2022). In other words, in context of the example above, we treat both M and L as mediators of interest in maintaining the relation between X and Y —rather than treating L as a nuisance in identifying the mediating effect of M —and decompose the ATE into the following quantities (see Supplementary Appendix A2 for details):

$$CDE_{L=l^*, M=m^*} = E[Y_{xl^*m^*}] - E[Y_{x^*l^*m^*}]$$

$$PAI^{(L)} = E [(Y_{x|m^*} - Y_{x^*|m^*} - Y_{x^*|m^*} + Y_{x^*|m^*}) (L_x)],$$

$$PIE^{(L)} = E [Y_{x^*L_xM_{x^*|x}}] - E [Y_{x^*L_xM_{x^*|x}}],$$

$$PAI^{(M)} = E [(Y_{x|m} - Y_{x^*|m} - Y_{x^*|m} + Y_{x^*|m}) (M_{x})],$$

$$PIE^{(M)} = E [Y_{x^*L_xM_{x^*|x}}] - E [Y_{x^*L_xM_{x^*|x}}].$$

Note that, in this decomposition, the CDE and PAIs are relative to a set of fixed mediator values but that the PIEs do not depend on these values. If there are exposure-mediator interactions, then the CDE/PAIs may change depending on the reference value set for the mediators. This creates a high-dimensional mediator space over which we could possibly evaluate the CDE/PAIs when considering multiple ordered mediators. In our analysis, we focus on one specific set of mediator values for evaluating the CDE/PAIs: urban renewal projects = 0 (no projects); school ICE = 0 (equal proportions of Black and White students); scaled home value = 0 (relative to the national median); and race-class ICE = 0 (equal proportions of Black working-class and White professional-class residents). We use these values to conceptualize the “absence of mediators”, as is common when considering binary mediators. In other words, we are framing the CDE/PAI as how deviations from these values are patterned by histories of redlining grades.

Sequential Mediation Framework

We use mediation analyses to understand how historical conditions become structurally embedded in subsequent systems, including the ways in which redlining grades influence the development of various sequential mediators (e.g., urban renewal → [ImEquation#] school segregation). In other words, each mediator might be considered as the “outcome” within a different historical window. Given this, we conduct multiple mediation analyses, treating each mediator as an “outcome” over time; this requires four separate mediation analyses in total (figure 1).

This is different from what has previously been referred to as “sequential mediation,” where multiple models are fit for the same outcome, adding each mediator one at a time. As discussed elsewhere, this approach will generally fail (VanderWeele and Vansteelandt 2014). Instead, we only ever use a single model for each variable but decompose the ATE of redlining on each mediator sequentially, treating each mediator as the “outcome” in separate analyses. For example, we begin by decomposing the ATE of redlining on school segregation into the CDE and PIE/PAI of the historical mediator *urban renewal* to summarize how redlining shaped school segregation via subsequent urban renewal projects. We then perform a second, separate mediation analysis, decomposing the ATE of redlining on housing values into the CDE and PIEs/PAIs for urban renewal and school segregation. We repeat this procedure four times, ending with a final mediation analysis that decomposes the ATE of redlining on life expectancy into a CDE and distinct PIEs/PAIs for each historical mediator. Again, note that the same model is used for each variable across all analyses. For example, in calculating the CDE/PAI/PIE for HOLC → [ImEquation#] School ICE (figure 1; Mediation 1), $School\ ICE_t = \beta_0 + \beta_1 (Renewal_t \times D_t) + \beta_2 (V_t \times D_t) + \epsilon_t$ is the “outcome model,” whereas in Mediations 2–4, this is a “mediator model.” Model specifications are given in Supplementary Appendix A5.

Further details on estimation are included in Supplementary Appendix A4. Besides the usual assumptions of consistency and positivity, the estimands above are identified under a set of potentially strong assumptions: (1) no unobserved treatment-outcome confounding, (2) no unobserved treatment-mediator confounding, (3) no unobserved mediator-outcome confounding, and (4) no unobserved treatment-induced mediator-outcome confounding (Supplementary Appendix A3). Further, the mediational g-formula requires the parametric estimation of the outcome and each mediator, which introduces a risk of misspecification. We perform sensitivity tests for misspecification using a nonparametric machine learning framework (Supplementary Appendix A6).

Results

In [figure 2](#), we present the descriptive statistics for our spatial-marking analysis (R1; D tracts vs. A tracts) and for our analysis from a structural perspective (R2; Black working-class tracts vs. White professional-class tracts). We observe that roughly 30% of the most concentrated Black working-class tracts are located in areas once graded as D compared with 13% of White professional-class tracts. Across all mediators, the gap between tracts formerly graded as D and A is smaller than the gap between the contemporary Black working-class and White professional-class tracts. We also observe stark inequalities in life expectancy across these groups: The average, descriptive difference in 2018 life expectancy between A and D tracts was 5.15 years (95% confidence interval [CI]: 4.80–5.50), while the difference in 2018 life expectancy between Black working-class and White professional-class tracts was 9.14 years (95% CI: 8.94–9.35).

We next turn to results of our analysis from a spatial-marking perspective (R1), which traces the trajectories of tracts that were marked as Grade D versus A and estimates how these histories generated contemporary life expectancy disparities across these places. [Figure 3](#) displays the results from this analysis.

The ATE of a tract being graded as D versus A on 2018 life expectancy is 5.95 years (95% CI: 5.59–6.36). The first three panels of [figure 3](#) demonstrate the historical trajectories that A and D tracts followed after being spatially marked by HOLC in the 1930s. Here, we observe the following: (1) tracts that were marked as Grade D experienced elevated levels of subsequent school segregation compared to tracts marked as Grade A—though D-graded tracts in areas that participated in more urban renewal projects tended to have less racially isolated schools ([figure 3](#); Panel 1); (2) tracts marked as D in the 1930s experienced much lower levels of property valuation in later decades compared to tracts marked as A ([figure 3](#); Panel 2); and (3) Grade D tracts displayed much higher levels of contemporary racialized and classed isolation than Grade A tracts, with part of this relationship being mediated through school segregation and housing valuation compositions. However, we also find that contemporary racialized/classed isolation would have been even higher among Grade D tracts if not for prior urban renewal projects ([figure 3](#); Panel 3).

The final panel of [figure 3](#) demonstrates how these historical trajectories underpin contemporary disparities in life expectancy between Grade A and D tracts—our key result for R1. The large PIEs associated with housing values and racialized/classed isolation suggest these mediators played substantial roles in connecting past redlining grades to contemporary life expectancy. For instance, the PIE associated with housing values (–1.26; –1.54 to –1.06) demonstrates that a measurable portion of the life expectancy advantage experienced by Grade A tracts is accounted for by inflated housing values within these neighborhoods; this suggests that redlining played a significant role in distributing property values across A and D tracts and that this differential distribution patterned life expectancy disparities between neighborhoods. The PIE associated with racialized/classed isolation (–2.47; –2.82 to –2.08) reveals a similar story: A considerable portion of the life expectancy advantage experienced by A tracts is explained by the distribution of more proximal racialized economic isolation. Results also demonstrate smaller PAI effects of housing values and racialized/classed isolation; these estimates suggest that redlining served to segment life expectancy across A and D tracts not only by shaping the compositional characteristics of these spaces but also by influencing these factors' relationships to life expectancy; for example, increases in home values cause larger increases in life expectancy in A compared to D neighborhoods.

Finally, the CDE displayed in [figure 3](#), Panel 4 indicates that, even after accounting for our mediators, Grade A tracts still experience longer overall life expectancy than their Grade D counterparts. Put differently, the CDE tells us some portion of the life expectancy advantage experienced by A tracts is underpinned by additional pathways operating outside of our measured mediators.

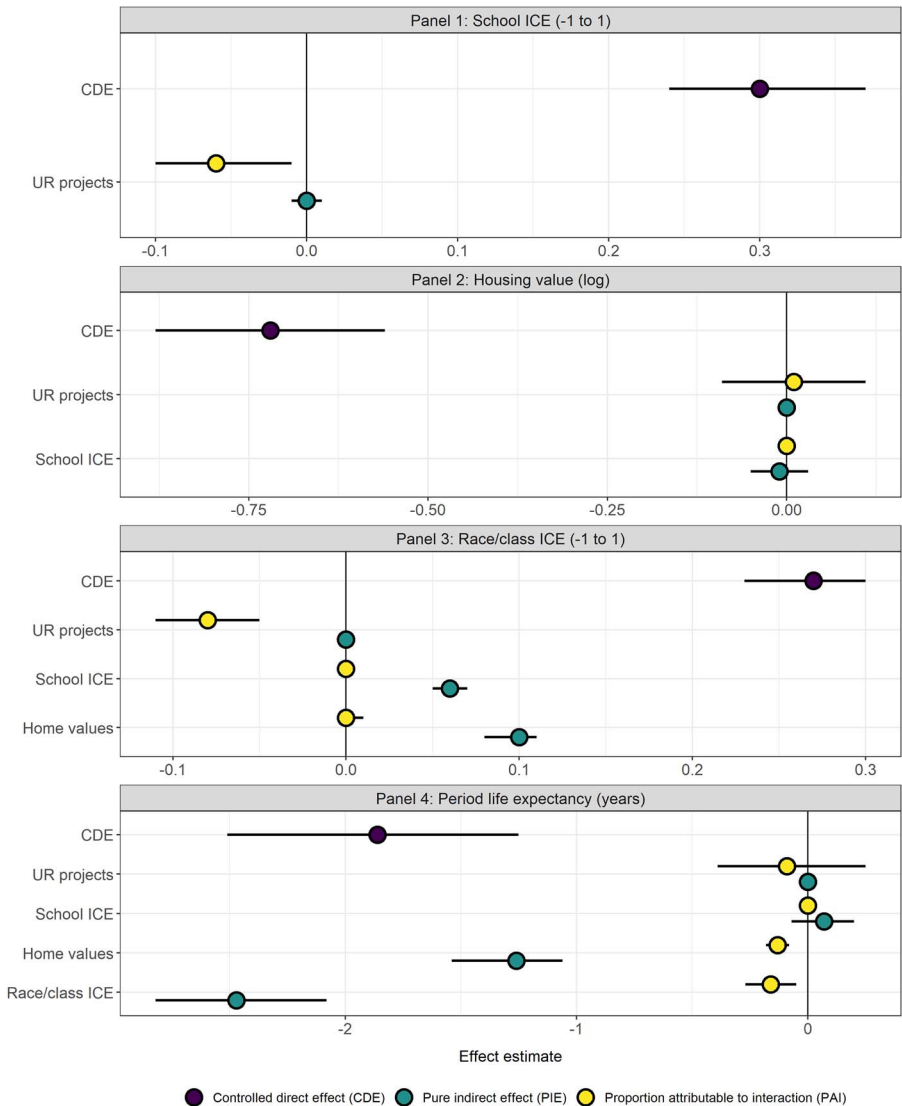


Figure 3. Results for mediation analysis R1, examining how the spatial-marking of place translates into historical trajectories of school segregation, housing values, and contemporary segregation influencing contemporary period life expectancy in those places (HOLC “D” vs. HOLC “A”). UR = urban renewal.

Turning to our analysis from a structural perspective (R2), figure 4 examines the extent to which past HOLC grades explain more contemporary inequalities between Black working-class and White professional-class communities.

The final panel of figure 4 displays our primary finding, comparing the descriptive, 9.14-year disparity in life expectancy between Black working-class tracts and White professional-class tracts to the CD that might have otherwise manifested if formerly D-graded neighborhoods had instead experienced the history of being marked as Grade A. In this counterfactual simulation, we estimate that White professional-class communities today would still see a substantial life expectancy advantage regardless of shifts to the past distribution of neighborhood HOLC grades:

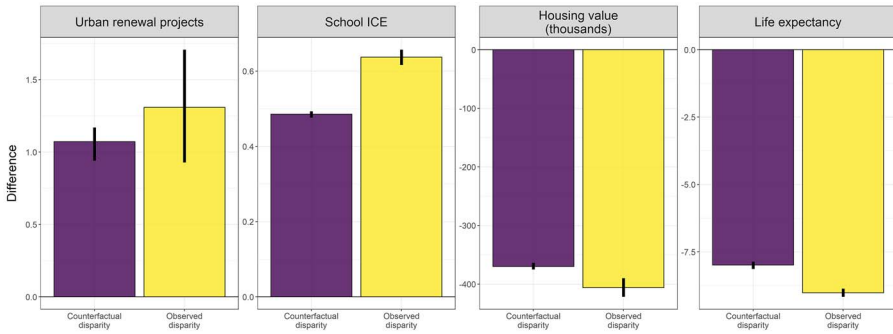


Figure 4. Results for mediation analysis R2, examining the extent to which the spatial-marking of place explains the total difference in average life expectancy between 2015 and 2019 Black working-class versus White professional-class Census-tracts.

A 7.97-year disparity in 2018 life expectancy (95% CI: 7.82, 8.08) remains. Overall, the 1.17-year reduction (i.e., 9.14-year descriptive disparity and 7.97-year CD) suggests that redlining grades, conceptualized as a one-to-one, direct historical exposure, offer only a very marginal explanation of contemporary health inequality across these racialized communities. Similar conclusions result from an analysis that manipulates the full range of HOLC grades (Supplementary Appendix A7).

Decompositions of prior mechanisms are also instructive in understanding how redlining grades contributed to disparities across contemporary Black and White communities. For instance, figure 4, Panel 3, demonstrates average property value inequalities between our sample of Black working-class and White professional-class neighborhoods, both as they are observed and as they might have manifested if all neighborhoods had followed A trajectories. The observed (\$406 K; 95% CI: \$392–\$421 K) and counterfactual (\$370 K; 95% CI: \$364–\$375 K) disparities in housing valuations are largely similar, which again suggests that the historical experience of being marked as “hazardous” by the state via HOLC played only a marginal role in producing more contemporary housing value disparities across these communities. Similar conclusions are drawn from contrasting observed versus counterfactual disparities in school segregation and urban renewal projects.

Discussion

We contribute to literature on how historical redlining connects to contemporary population health through two analyses of HOLC maps as a dynamic social intervention—each of which is motivated by a distinct theoretical starting point. First, using a *spatial-marking* perspective, our results highlight the legacy of tract-level redlining via both observed mediators and unobserved pathways. Tracing these legacies sheds light on how HOLC grades are historically embedded in the distribution of place-based exposure to urban renewal, school segregation, property values, racialized/classed isolation—and ultimately death. Our results demonstrate that the life expectancy advantage experienced by residents of Grade A tracts relative to residents of D tracts is underpinned by the uneven distribution of home values and race/class concentrations across these geographies. Redlining grades do appear to exert some marginal influence on the disparities in life expectancy not captured in these observed pathways; yet, results suggest that HOLC mapping largely influenced contemporary, place-based vulnerabilities to premature death through historical trajectories that conditioned more proximal inequities in segregation and property valuation. We find some evidence that redlining became embedded not only in the distribution of these subsequent mediating systems but also in the relationships of those systems

to mortality; for example, elevated racialized economic isolation has a stronger negative effect on life expectancy in D compared to A tracts. These findings demonstrate that redlining was not a static historical exposure experienced by neighborhoods but instead continues to be embedded in the distributions and influences of more proximal place-based drivers of population health today.

Second, using a *structural perspective*, we highlight that the one-to-one legacies of tract-level HOLC grades were only one part of a larger project of (re)producing racialized geographies of premature death in the United States. Indeed, we find that contemporary race-class concentration is strongly linked to housing valuation, and both are in turn strongly linked to life expectancy, but that only a small proportion of these total disparities are explained by HOLC grades. This finding is supported in other work which contends that the “effect of redlining” cannot be operationalized only through one-to-one matching of historical HOLC grades and contemporary Census-tract areas (Imbroscio 2021; Winling and Michney 2021). Rather, our findings suggest that neighborhood labeling via redlining grades in the 1930s was only one manifestation of racism as “the state-sanctioned or extralegal production and exploitation of group-differentiated vulnerability to premature death” (Gilmore 2007, 28)—and that these logics of structural violence likely informed the organization of housing, labor markets, and health care across all neighborhoods in the following decades and not only those that were formally redlined by HOLC. Indeed, consider maps of redlining, home valuation, and life expectancy in Cleveland and Dallas/Ft. Worth (figure 5). Cleveland aligns closely with the spatial-marking perspective, where contemporary low home valuation and low life expectancy are almost perfectly distributed along D grades. By contrast, Dallas does not follow this pattern at all, and yet, it is very likely that the Dallas housing market grew out of the same racist logic of redlining to produce equally large, racialized disparities in home valuation and life expectancy (Korver-Glenn 2021). As we discuss in Supplementary Appendix A8, this phenomenon is difficult to isolate in quantitative models and highlights the importance of social theory and triangulation across multiple methods in describing the historical legacy of racist housing policy (Itzigsohn and Brown 2020).

When taken together, our results demonstrate a varied legacy of HOLC-maps: spatially marked neighborhoods did experience different historical trajectories that shaped life expectancy within those places, and yet, these neighborhood-based histories triggered by HOLC-mapping offer little direct explanatory power for how stark mortality disparities arose across Black and White neighborhoods at the extremes of racialized and classed isolation. Measuring the “effect of redlining” is dependent on the theoretical starting point used to conceptualize the lasting impacts of this historical intervention.

Limitations

As a general consideration, it is difficult for quantitative analyses of long-run historical processes to meet conditions necessary for identifying unbiased causal effects in the interventional potential outcomes framework (Supplementary Appendix A3). One major limiting factor here is the availability of historical data that might be used to satisfy assumptions pertaining to conditional exchangeability. Indeed, while innovative data curation efforts have provided researchers with some capacity to reconstruct the social conditions that shaped the distribution of both historical treatments and subsequent outcomes (Cunningham, Lee, and Ward 2021), the absence of widespread, formalized data collection mechanisms limits our ability to condition on pretreatment information and to bolster confidence that results are not driven by unobserved forces.

Despite these concerns, we contend there is much to be gained from studying the long-run effects of historical exposures within a counterfactual mediation framework. Common research questions that ask, *how much of the relationship between exposure X and outcome Y is explained by some intermediate variable M?* implicitly invoke counterfactual comparisons. Empirical frameworks like the one used here make these counterfactual contrasts explicit and connect our research questions to clear empirical estimands that help us evaluate our theoretical ideas

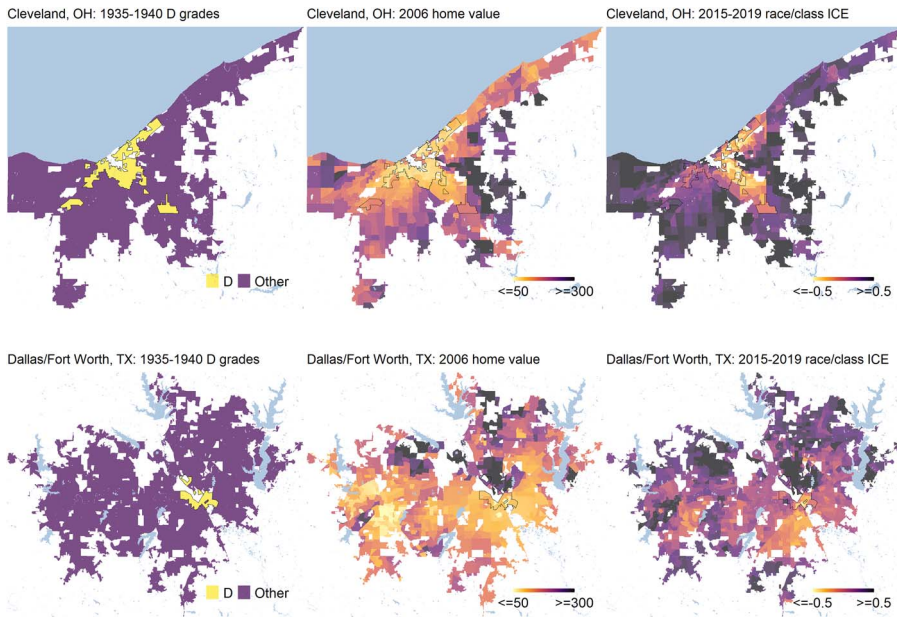


Figure 5. Maps of D-graded tracts (1935–1940), median house values in thousands (2006), and race-class ICE (2015–2019) in two types of cities: (1) overlapping D grades and contemporary race-class ICE (Cleveland, OH) and (2) non-overlapping D grades and contemporary race-class ICE (Dallas/Fort Worth, TX).

(Lundberg, Johnson, and Stewart 2021). Moreover, an approach like the g-formula avoids the pitfalls of alternative mediation and decomposition approaches (Naimi, Cole, and Kennedy 2016). Altogether, counterfactual approaches help provide a careful and conceptually grounded description of a long-run social process and avoid sources of error that we do have control over (e.g., the handling of observed post-treatment relations).

Most importantly, historical causal mediation can help avoid the fallacy of pinning racial disparities today on a specific racist decision made by a specific racist actor in the past. Rather, our analysis demonstrates how these broad logics become structurally embedded and reproduced in constructs deemed “not race” across education, housing, etc. (Norris 2021; Reskin 2012). In our causal model (figure 1), each arrow represents a complex and unobserved racialized process that is supported by the interactions between many different actors, including housing developers, appraisers, real estate agents, and mortgage bankers (Korver-Glenn, Bartram, and Besbris 2021). Those who animate these racialized processes linking housing to other economic systems—or “race brokers”—and the organizations in which they are embedded are central to legitimizing and perpetuating structural racism (Korver-Glenn 2021; Norris 2021). In this way, there are many opportunities to break these connections, but coordinated structural effort is necessary (Pattillo 2013; Reskin 2012), or the mechanisms reproducing racial stratification can be easily substituted (Phelan and Link 2015). A mediation framework can also make explicit ongoing forms of resistance against these racist forces. While, here, we focus on how much *better* things might be if not for negative mediators (e.g., urban renewal projects), we might also consider how much *worse* things might have been if not for positive mediators (e.g., tenant organizing; Michener and SoRelle 2022; Robinson 1983). Mediation analysis and effect decomposition can help make explicit that what we observe today is always the cumulative sum of (often opposing) historical forces.

One final limitation is using the modeled life expectancy as an outcome, which may result in conclusions that are partially based on the covariance between our exposures/mediators and measures used in that model (Supplementary Appendix A9).

Policy Implications

Racism has historically used the racialization of people and place to arrange violence via redlining, urban renewal, policing, and other instruments of dispossession and displacement which are necessary to maximize the place-based capital accumulation (Bledsoe, McCreary, and Wright 2022; Sugrue 1997; Taylor 2019). This has durable effects not only in distributing place-based risks and privileges but also in constructing their relation to premature mortality (Bailey, Feldman, and Bassett 2021; Tilly 1999). Still, formal redlining was only one manifestation of the broader project of racist abstraction via the financialization of housing that increasingly shapes both anti-Black dispossession (e.g., ownership and property valuation) and displacement (e.g., evictions and foreclosures; Fields and Raymond 2021). As demonstrated by the history of redlining in American housing, it is critical to center the pervasive role of public-private partnerships in organizing racialized displacement and dispossession for the sake of capital accumulation (Taylor 2019). While redlining and urban renewal might be seen as blunt forms of violence, these logics and partnerships have informed the evolution of more indirect, abstracted instruments of racial violence that drive place-based differentiation today, including the financialization of housing and health care, credit and loan algorithms, and more (Benjamin 2019; Dantzer 2021; Fields and Raymond 2021; Robinson 2020; Norris 2021).

Centering the practice of redlining within the long history of public-private projects of racist exclusion and predatory inclusion, our findings can be contextualized within a more general tension between two place-based policy frameworks: (1) the equity-informed targeting of resources to “vulnerable” communities and (2) engagement with movements aimed at dismantling larger sociopolitical projects maintained within capitalist, White supremacist institutions. While important from a restorative justice standpoint, the first framework risks legitimizing current combinations of technocratic, piecemeal policy-initiatives to address structural problems (Schwartz, Gatto, and Campbell 2016). While such place-based policies can be made historically contingent, there is a circular logic to leveraging popular place-based indices (e.g., the CDC Social Vulnerability Index) to understand what makes certain communities “vulnerable”: Communities are vulnerable because they have the traits of vulnerability, such as low median income. Our findings demonstrate that simply targeting formerly redlined neighborhoods in such frameworks has limited potential for achieving racial health equity (Creary 2021).

By contrast, a relational framework asserts that the racist contours of place-based risk do not exist in a vacuum but rather are an evolving, adaptive precondition for the extraction and dispossession necessary for accumulating privileges in other communities (Cummins et al. 2007; Purifoy and Seamster 2021; Reynolds 2021; Rucks-Ahidiana 2021). The financialization of real estate on a global scale has vastly accelerated these place-based cycles of dispossession and displacement for the sake of speculative profiteering (Bledsoe and Wright 2019; Stein 2019): for example, private equity firms increasingly investing in rental property in low-income neighborhoods and evicting at higher rates (Fields 2014) and the targeting of subprime lending products in Black neighborhoods organizing the fallout of the Great Recession (Rugh and Massey 2010). In parallel, speculative private equity creeps further into health-care delivery; for example, private equity ownership in safety-net hospitals serving historically Black neighborhoods leads to increased instability in access (Bruch, Gondi, and Song 2020). Social policy must consider its role within this broader political economy, the racial contours of which are predicated on the conflation of “financial risk” with “race” formalized, in part, by the segregationist logics of redlining and deeply embedded in the subsequent delivery systems of education, housing, and health care. The long reach of this history is seen in the racialized geographic relations of all American cities and communities and not just those that were explicitly graded as “undesirable” in the 1930s.

Conclusions

In articulating the history of housing, there is a risk of naturalizing broad economic relations, describing their incidental contact with racist actors and lamenting the fact that the housing

market is tainted by racism. Certainly, there are many entry points for the dismantling key mechanisms of structural racism in the housing market (e.g., standardized appraisal systems) (Howell and Korver-Glenn 2021)—which would likely have impacts on the population health. But from a relational, historical perspective, the commodification of housing itself is constitutive with racism, deeply rooted in settler colonialism and racial capitalism (Bledsoe, McCreary, and Wright 2022; Dantzer 2021; Pattillo 2013; Rucks-Ahidiana 2021; Taylor 2019; Zaimi 2020). These racialized processes have long histories; for example, in describing the innovation of foreclosure as an economic tool to accelerate the dispossession of Indigenous land, Park (2016) concludes that “racial practices and the concomitant process of racialization were key to producing the mechanisms of the market, the values and commodities it circulated, its viability, and its success.” The housing market continues to be a key site of production in the link between racialization and economic inequality (Dorries, Hugill, and Tomiak 2022; Robinson 2021). But the problem is not simply racism in the housing market, as if these are neatly separable constructs. The problem is the racialized commodification of land and housing itself, and the cumulative result continues to be death.

To break systematic arrangements that reproduce place-based racial health inequality over time, we echo calls that social policy must engage with theories of racism as a fundamental cause of population health (Bailey, Feldman, and Bassett 2021; Laster Pirtle 2020; Phelan and Link 2015). A technocratic social science can incorporate redlining maps as a marginal risk factor in documenting contemporary racial disparities and targeting piecemeal interventions; an emancipatory research and policy agenda can engage with the historical role of redlining in the broader political economy of place, including the fact that historical redlining grades are no longer a necessary instrument for maintaining the larger racist project of conflating race and risk.

Supplementary Material

Supplementary material is available at Social Forces online, <http://sf.oxfordjournals.org/>.

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References

- Bailey, Zinzi D., Justin Feldman, and Mary Bassett. 2021. “How Structural Racism Works—Racist Policies as a Root Cause of U.S. Racial Health Inequities.” *New England Journal of Medicine* **384**(8): 768–73. <https://doi.org/10.1056/NEJMms2025396>.
- Benjamin, Ruha. 2019. *Race after Technology: Abolitionist Tools for the New Jim Code*. Oxford, England: Polity. <https://doi.org/10.1093/sf/soz162>.
- Bledsoe, Adam, Tyler McCreary, and Willie Wright. 2022. “Theorizing Diverse Economies in the Context of Racial Capitalism.” *Geoforum* **132**:281–90.
- Bledsoe, Adam, and Willie Wright. 2019. “The Anti-Blackness of Global Capital.” *Environment and Planning D: Society and Space* **37**(1):8–26. <https://doi.org/10.1177/0263775818805102>.

- Bruch, Joseph, Suhas Gondi, and Zirui Song. 2020. "Changes in Hospital Income, Use, and Quality Associated with Private Equity Acquisition." *JAMA Internal Medicine* **180**(11):1428–35. <https://doi.org/10.1001/jamainternmed.2020.3552>.
- Creary, Melissa. 2021. "Bounded Justice and the Limits of Health Equity." *The Journal of Law, Medicine & Ethics* **49**(2):241–56. <https://doi.org/10.1017/jme.2021.34>.
- Cummins, Steven, Sarah Curtis, Ana Diez-Roux, and Sally Macintyre. 2007. "Understanding and Representing 'Place' in Health Research: A Relational Approach." *Placing Health in Context* **65**(9): 1825–38. <https://doi.org/10.1016/j.socscimed.2007.05.036>.
- Cunningham, David, Hedwig Lee, and Geoff Ward. 2021. "Legacies of Racial Violence: Clarifying and Addressing the Presence of the Past." *The Annals of the American Academy of Political and Social Science* **694**(1):8–20. <https://doi.org/10.1177/000271622111022712>.
- Dantzler, Prentiss. 2021. "The Urban Process under Racial Capitalism: Race, Anti-Blackness, and Capital Accumulation." *Journal of Race, Ethnicity and the City* **2**:113–34. <https://doi.org/10.1080/26884674.2021.1934201>.
- Dorries, Heather, David Hugill, and Julie Tomiak. 2022. "Racial Capitalism and the Production of Settler Colonial Cities." *Geoforum* **132**:263–70.
- Faber, Jacob. 2021. "Contemporary Echoes of Segregationist Policy: Spatial Marking and the Persistence of Inequality." *Urban Studies* **58**(5):1067–86. <https://doi.org/10.1177/0042098020947341>.
- Faber, Jacob. 2020. "We Built This: Consequences of New Deal Era Intervention in America's Racial Geography." *American Sociological Review* **85**(5):739–75. <https://doi.org/10.1177/0003122420948464>.
- Fields, Desiree. 2014. *The Rise of the Corporate Landlord: The Institutionalization of the Single-Family Rental Market and Potential Impacts on Renters*. Right to the City Alliance. <https://homesforall.org/wp-content/uploads/2014/07/corp-landlord-report-web.pdf>.
- Fields, Desiree, and Elora Lee Raymond. 2021. "Racialized Geographies of Housing Financialization." *Progress in Human Geography* **45**(6):1625–45. <https://doi.org/10.1177/03091325211009299>.
- Fishback, Price, Jonathan Rose, Kenneth Snowden, and Thomas Storrs. 2021. "New Evidence on Redlining by Federal Housing Programs in the 1930s." NBER Working Papers. <https://www.nber.org/papers/w29244>.
- Gilmore, Ruth Wilson. 2007. *Golden Gulag*. Berkeley, CA: University of California Press.
- Gilmore, Ruth Wilson. 2002. "Fatal Couplings of Power and Difference: Notes on Racism and Geography." *The Professional Geographer* **54**(1):15–24. <https://doi.org/10.1111/0033-0124.00310>.
- Graetz, Nick, Courtney Boen, and Michael Esposito. 2022. "Structural Racism and Quantitative Causal Inference: A Life Course Mediation Framework for Decomposing Racial Health Disparities." *Journal of Health and Social Behavior* **63**(2):232–49. <https://doi.org/10.1177/00221465211066108>.
- Howell, Junia, and Elizabeth Korver-Glenn. 2018. "Neighborhoods, Race, and the Twenty-First-Century Housing Appraisal Industry." *Sociology of Race and Ethnicity* **4**(4):473–90. <https://doi.org/10.1177/2332649218755178>.
- Howell, Junia, and Elizabeth Korver-Glenn. 2021. "The Increasing Effect of Neighborhood Racial Composition on Housing Values, 1980–2015." *Social Problems* **68**(4):1051–71. <https://doi.org/10.1093/socpro/spaa033>.
- Imbroscio, David. 2021. "Race Matters (Even More than you Already Think): Racism, Housing, and the Limits of the Color of Law." *Journal of Race, Ethnicity and the City* **2**(1):29–53. <https://doi.org/10.1080/26884674.2020.1825023>.
- Itzigsohn, Jose, and Karida Brown. 2020. *The Sociology of W.E.B. Du Bois: Racialized Modernity and the Global Color Line*. New York: New York University Press. <https://doi.org/10.18574/nyu/9781479842292.001.0001>.
- Jackson, John, and Tyler VanderWeele. 2019. "Intersectional Decomposition Analysis with Differential Exposure, Effects, and Construct." *Social Science & Medicine* **226**:254–9. <https://doi.org/10.1016/j.socscimed.2019.01.033>.
- Jackson, Kenneth. 1985. *Crabgrass frontier: the suburbanization of the United States*. New York: Oxford University Press.

- Korver-Glenn, Elizabeth, Robin Bartram, and Max Besbris. 2021. "The Sociology of Housing Market Intermediaries." *Chapter prepared for The Sociology of Housing (under advance contract at the University of Chicago Press)*, edited by Brian McCabe and Eva Rosen. SocArXiv. <https://doi.org/10.31235/osf.io/gevq3>.
- Korver-Glenn, Elizabeth. 2021. *Race Brokers: Housing Markets and Segregation in 21st Century Urban America*. New York: Oxford University Press. <https://doi.org/10.1093/oso/9780190063863.001.0001>.
- Krieger, Nancy, Pamela Waterman, Jasmina Spasojevic, Wenhui Li, Gil Maduro, and Gretchen Van Wye. 2016. "Public Health Monitoring of Privilege and Deprivation with the Index of Concentration at the Extremes." *American Journal of Public Health* **106**(2):256–63. <https://doi.org/10.2105/AJPH.2015.302955>.
- Krieger, Nancy, Emily Wright, Jarvis Chen, Pamela Waterman, Eric Huntley, and Mariana Arcaya. 2020a. "Cancer Stage at Diagnosis, Historical Redlining, and Current Neighborhood Characteristics: Breast, Cervical, Lung, and Colorectal Cancers, Massachusetts, 2001–2015." *American Journal of Epidemiology* **189**(10):1065–75. <https://doi.org/10.1093/aje/kwaa045>.
- Krieger, Nancy, Gretchen Van Wye, Mary Huynh, Pamela Waterman, Gil Maduro, Wenhui Li, R. Charon Gwynn, Oxiris Barbot, and Mary Bassett. 2020b. "Structural Racism, Historical Redlining, and Risk of Preterm Birth in New York City, 2013–2017." *American Journal of Public Health* **110**(7):1046–53. <https://doi.org/10.2105/AJPH.2020.305656>.
- Krysan, Maria, and Kyle Crowder. 2017. *Cycle of Segregation*. New York: Russell Sage Foundation. <https://doi.org/10.7758/9781610448697>.
- Laster Pirtle, Whitney. 2020. "Racial Capitalism: A Fundamental Cause of Novel Coronavirus (COVID-19) Pandemic Inequities in the United States." *Health Education & Behavior* **47**(4):504–8. <https://doi.org/10.1177/1090198120922942>.
- Logan, John, and Harvey Luskin Molotch. 1987. *The Political Economy of Place*. Berkeley, CA: University of California Press.
- Lundberg, Ian, Rebecca Johnson, and Brandon M. Stewart. 2021. "What Is Your Estimand? Defining the Target Quantity Connects Statistical Evidence to Theory." *American Sociological Review* **86**(3): 532–65. <https://doi.org/10.1177/00031224211004187>.
- Lynch, Emily, Lorraine Halinka Malcoe, Sarah Laurent, Jason Richardson, Bruce Mitchell, and Helen Meier. 2021. "The Legacy of Structural Racism: Associations between Historic Redlining, Current Mortgage Lending, and Health." *SSM-Population Health* **14**:100793. <https://doi.org/10.1016/j.ssmph.2021.100793>.
- Massey, Douglas, and Nancy Denton. 1993. *American Apartheid: Segregation and the Making of the Underclass*. Cambridge, Mass.: Harvard University Press.
- Michener, Jamila, and Mallory SoRelle. 2022. "Politics, Power, and Precarity: How Tenant Organizations Transform Local Political Life." *Interest Groups & Advocacy*. **11**:209–36. <https://doi.org/10.1057/s41309-021-00148-7>.
- McClure, Elizabeth, Lydia Feinstein, Evette Cordoba, Christian Douglas, Michael Emch, Whitney Robinson, Sandro Galea, and Allison Aiello. 2019. "The Legacy of Redlining in the Effect of Foreclosures on Detroit Residents' Self-Rated Health." *Health & Place* **55**:9–19. <https://doi.org/10.1016/j.healthplace.2018.10.004>.
- Naimi, Ashley, Stephen Cole, and Edward Kennedy. 2016. "An Introduction to g-Methods." *International Journal of Epidemiology* **46**(2):756–62. <https://doi.org/10.1093/ije/dyw323>.
- Nardone, Anthony, Joan Casey, Rachel Morello-Frosch, Mahasin Mujahid, John Balmes, and Neeta Thakur. 2020. "Associations between Historical Residential Redlining and Current Age-Adjusted Rates of Emergency Department Visits Due to Asthma across Eight Cities in California." *Lancet Planetary Health* **4**(1):e24–31. [https://doi.org/10.1016/S2542-5196\(19\)30241-4](https://doi.org/10.1016/S2542-5196(19)30241-4).
- Nelson, Robert, LaDale Winling, Richard Marciano, and Nathan Connolly. 2021. "Mapping Inequality". In *Mapping Inequality*. <https://dsl.richmond.edu/panorama/redlining/>.
- Nelson, Robert, and Edward Ayers. 2021. *Renewing Inequality: Family Displacements through Urban Renewal, 1950–1966*. <https://dsl.richmond.edu/panorama/redliningandhttps://dsl.richmond.edu/panorama/renewal/>.

- Norris, Davon. 2021. "Embedding Racism: City Government Credit Ratings and the Institutionalization of Race in Markets." *Social Problems*. spab066. <https://academic.oup.com/socpro/advance-article/doi/10.1093/socpro/spab066/6458099>.
- Park, K-Sue. 2016. "Money, Mortgages, and the Conquest of America." *Law & Social Inquiry* **41**(4):1006–35. <https://doi.org/10.1111/lsi.12222>.
- Pattillo, Mary. 2013. "Housing: Commodity Versus Right." *Annual Review of Sociology* **39**:509–31. <https://doi.org/10.1146/annurev-soc-071312-145611>.
- Phelan, Jo, and Bruce Link. 2015. "Is Racism a Fundamental Cause of Inequalities in Health?" *Annual Review of Sociology* **41**(1):311–30. <https://doi.org/10.1146/annurev-soc-073014-112305>.
- Pulido, Laura. 2016. "Flint, Environmental Racism, and Racial Capitalism." *Capitalism Nature Socialism* **27**:1–16. <https://doi.org/10.1080/10455752.2016.1213013>.
- Purifoy, Danielle, and Louise Seamster. 2021. "Creative Extraction: Black Towns in White Space." *Environment and Planning D: Society and Space* **39**(1):47–66. <https://doi.org/10.1177/0263775820968563>.
- Radford, Gail. 1996. *Modern Housing for America: Policy Struggles in the New Deal Era*. Chicago: University of Chicago Press. <https://doi.org/10.7208/chicago/9780226702216.001.0001>.
- Reskin, Barbara. 2012. "The Race Discrimination System." *Annual Review of Sociology* **38**(1):17–35. <https://doi.org/10.1146/annurev-soc-071811-145508>.
- Reyes, Victoria. 2022. "For a Du Boisian Economic Sociology." *Sociology Compass* **16**(5):e12975. <https://doi.org/10.1111/soc4.12975>.
- Reynolds, M. 2021. "Health Power Resources Theory: A Relational Approach to the Study of Health Inequalities." *Journal of Health and Social Behavior* **62**(4):493–511. <https://doi.org/10.1177/00221465211025963>.
- Richardson, Jason, Bruce Mitchell, Helen Meier, Emily Lynch, and Jad Edlebi. 2021. *Redlining and Neighborhood Health*. National Community Reinvestment Coalition. <https://ncrc.org/holc-health/>.
- Robins, James. 1986. "A New Approach to Causal Inference in Mortality Studies with a Sustained Exposure Period—Application to Control of the Healthy Worker Survivor Effect." *Mathematical Modelling* **7**:1393–512. [https://doi.org/10.1016/0270-0255\(86\)90088-6](https://doi.org/10.1016/0270-0255(86)90088-6).
- Robinson, John III. 2020. "Making Markets on the Margins: Housing Finance Agencies and the Racial Politics of Credit Expansion." *American Journal of Sociology*. Chapel Hill. **125**(4):974–1029. <https://doi.org/10.1086/707927>. <https://uncpress.org/book/9781469663722/black-marxism-revised-and-updated-third-edition/>.
- Robinson, John III. 2021. "Surviving Capitalism: Affordability as a Racial 'Wage' in Contemporary Housing Markets." *Social Problems* **68**(2):321–39. <https://doi.org/10.1093/socpro/spaa078>.
- Robinson, Cedric. 1983. *Black Marxism: The Making of the Black Radical Tradition*. University of North Carolina Press.
- Rothstein, Richard. 2018. *The Color of Law: A Forgotten History of How Our Government Segregated America*. New York: Liveright.
- Rucks-Ahidiana, Zawadi. 2021. "Theorizing Gentrification as a Process of Racial Capitalism." *City and Community* **21**:173–92. <https://doi.org/10.1177/15356841211054790>.
- Rugh, Jacob, and Douglas Massey. 2010. "Racial Segregation and the American Foreclosure Crisis." *American Sociological Review* **75**(5):629–51. <https://doi.org/10.1177/0003122410380868>.
- Schwartz, Sharon, Nicolle Gatto, and Ulka Campbell. 2016. "Causal Identification: A Charge of Epidemiology in Danger of Marginalization." *Annals of Epidemiology* **26**(10):669–73. <https://doi.org/10.1016/j.annepidem.2016.03.013>.
- Sewell, Abigail. 2016. "The Racism-Race Reification Process: A Mesolevel Political Economic Framework for Understanding Racial Health Disparities." *Sociology of Race and Ethnicity* **2**(4):402–32. <https://doi.org/10.1177/2332649215626936>.
- Sharkey, Patrick. 2013. *Stuck in Place: Urban Neighborhoods and the End of Progress toward Racial Equality*. Chicago: University of Chicago Press. <https://doi.org/10.7208/chicago/9780226924267.001.0001>.
- Stein, Samuel. 2019. *Capital City: Gentrification and the Real Estate State*. London: Verso.

- Sudharsanan, Nikkil, and Maarten Bijlsma. 2021. "Educational Note: Causal Decomposition of Population Health Differences Using Monte Carlo Integration and the g-Formula." *International Journal of Epidemiology* **50**(6):2098–107. <https://doi.org/10.1093/ije/dyab090>.
- Sugrue, Thomas. 1997. *The Origins of the Urban Crisis*. Princeton, NJ.: Princeton University Press.
- Taylor, Keeanga-Yamahtta. 2019. *Race for Profit*. Chapel Hill: University of North Carolina Press. <https://doi.org/10.5149/northcarolina/9781469653662.001.0001>.
- Tilly, Charles. 1999. *Durable Inequality*. Berkeley, CA: University of California Press. <https://doi.org/10.1525/9780520924222>.
- VanderWeele, Tyler. 2014. "A Unification of Mediation and Interaction: A 4-Way Decomposition." *Epidemiology* **25**(5):749–61. <https://doi.org/10.1097/EDE.000000000000121>.
- VanderWeele, Tyler, and Stijn Vansteelandt. 2014. "Mediation Analysis with Multiple Mediators." *Epidemiological Methods* **2**(1):95–115. <https://doi.org/10.1515/em-2012-0010>.
- Wang, Aolin, and Onyebuchi Arah. 2015. "G-Computation Demonstration in Causal Mediation Analysis." *European Journal of Epidemiology* **30**(10):1119–27. <https://doi.org/10.1007/s10654-015-0100-z>.
- Winling, LaDale, and Todd Michney. 2021. "The Roots of Redlining: Academic, Governmental, and Professional Networks in the Making of the New Deal Lending Regime." *Journal of American History* **108**(1):42–69. <https://doi.org/10.1093/jahist/jaab066>.
- Wodtke, Geoffrey, and Xiang Zhou. 2020. "Effect Decomposition in the Presence of Treatment-Induced Confounding: A Regression-with-Residuals Approach." *Epidemiology* **31**(3):369–75. <https://doi.org/10.1097/EDE.0000000000001168>.
- Xu, Wenfei. 2021. "Legacies of Institutionalized Redlining: A Comparison between Speculative and Implemented Mortgage Risk Maps in Chicago, Illinois." *Housing Policy Debate* **32**(2):249–74. <https://doi.org/10.1080/10511482.2020.1858924>.
- Zaimi, Rea. 2020. "Making Real Estate Markets: The Co-Production of Race and Property Value in Early 20th-Century Appraisal Science." *Antipode* **52**:1539–59. <https://doi.org/10.1111/anti.12642>.