Title

Gentrification, Residential Mobility, and Preterm Birth among Black Women: A Mixed-Methods Study of Racial Resegregation in Northern California

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Publication Date

2022

Peer reviewed|Thesis/dissertation

UNIVERSITY OF CALIFORNIA

Los Angeles

Gentrification, Residential Mobility, and Preterm Birth among Black Women: A Mixed-Methods Study of Racial Resegregation in Northern California

A dissertation submitted in partial satisfaction of the requirements for the degree Doctor of Philosophy in Community Health Sciences

by

Rebekah Israel Cross

2022

ABSTRACT OF THE DISSERTATION

Gentrification, Residential Mobility, and Preterm Birth
among Black Women: A Mixed-Methods Study of
Racial Resegregation in Northern California

by

Rebekah Israel Cross
Doctor of Philosophy in Community Health Sciences
University of California, Los Angeles, 2022
Professor Chandra L. Ford, Chair

BACKGROUND

Despite medical and technological advances, the preterm birth rate among Black American women is 55% higher than white women. Prior evidence identifies various forms of racialized spatial inequality, especially residential segregation, that contribute to the persistent racial disparities in preterm birth. However, less is known about how dynamic processes of spatial inequality such as gentrification and Black migration impact preterm birth.

PURPOSE

The purpose of this project is to understand the relationship between two indicators of racial resegregation (gentrification and residential mobility) and preterm birth among Black women in Northern California. The specific aims are (1) to determine if gentrification stage is associated with preterm delivery among Black women; (2) to explore residential mobility patterns relative to racial resegregation and preterm birth among Black women and (3) Identify potential mechanisms linking regional inequality to preterm birth risk among Black women.

METHODS

Design: For Aim 1, I used a non-experimental cross-sectional design to explore the association between gentrification and preterm birth. For Aim 2, I used a retrospective cohort, matched sibling design to explore the relationship between inter-pregnancy residential mobility and preterm birth. For Aim 3, I used a grounded theory approach.

Sampling and Sample: The quantitative component (Aims 1 and 2) drew samples from the San Diego Study of Outcomes in Mothers and Infants (SOMI) database. SOMI contains vital statistics records from all births in California from the years 2011-2017. The inclusion criteria were singleton births to Black individuals in the San Francisco Bay Area. The sample for Aim 1 is N=18,327. The sample for Aim 2 is N=4,910. The qualitative component involved primary data collection using semi-structured interviews with Black women (N=12), birth workers (N=2), maternal and child health experts (N=6), and urban scholars (N=4).

Analysis: This study used multi-level logistic regression to examine the association between gentrification and preterm birth (Aim 1) and conditional logistic regression to analyze the relationship between residential mobility and preterm birth (Aim 2). The qualitative analysis was completed using realist ground theory.

RESULTS

Quantitative Findings: Residence in low-income neighborhoods with advanced gentrification was associated with *lower* odds of preterm birth (aOR= 0.818, 95% CI: 0.642,1.042). Housing insecurity partially suppressed the association. The relationship between residential mobility trajectory and preterm birth is conditional on WIC participation. Out-migration was only associated with preterm birth among non-WIC participants (aOR=1.548; 95% CI: 0.875,2.736). While moving between cities losing Black population was associated with higher odds of preterm birth for WIC participants (aOR= 3.481; 95% CI: 1.363,8.889).

Qualitative Findings: Several processes linked regional inequality to preterm birth risk: Wealth and resource hoarding at different scales leaves Black birthing people with insecure access to health-promoting resources. Black women's willingness and ability to engage in health and

support services is hindered by the fragmentation of the social safety net and the policing of Black mothers in “care” settings. Landlord discrimination and exploitation geographically sorts and; and community-driven resistance and advocacy.

DISCUSSION AND CONCLUSION

The findings demonstrate that gentrification and residential mobility can influence preterm birth among Black individuals in the San Francisco Bay Area in unexpected ways. Major limitations include selection bias, the inability to measure housing tenure or mobility intention, and inadequacy of several measures including housing insecurity and social class. The findings in this study suggest that greater attention should be given to the forces that sort people into places and the policies that provide people with more control in their residential environments. Policies that maximize poor and working people’s ability to remain in or move to places that are supportive and safe may reduce chronic stress, and preterm birth among Black women in the Bay Area.

Key terms: preterm birth; perinatal health; gentrification; neighborhood effects; segregation, racism; critical race theory

The dissertation of Rebekah Israel Cross is approved.

Courtney S. Thomas Tobin

May Sudhinaraset

Michael C. Lens

Gretchen Bandoli

Chandra L. Ford, Committee Chair

University of California, Los Angeles

DEDICATION

To my children, Naomi and Iman.

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LIST OF ACRONYMS

PTB	preterm birth
PTD	preterm delivery
SGA	small for gestational age
UDP	Urban Displacement Project
SOMI	San Diego Study of Outcomes in Mothers and Infants
NCDB	Neighborhood Change Database
LI	Low income (census tract)
MHI	Moderate-to-high Income (census tract)
CT	census tract
CRT	Critical Race Theory

SST	Social Stress Theory
ICE	Index of Concentration at the Extremes
CDC	U.S. Centers for Disease Control and Prevention
WHO	World Health Organization
MLM	Multilevel Model
OSHPD	California Office of Statewide Health Planning and Development
LMP	Last menstrual period
PPROM	Premature rupture of the membranes
HPA	hypothalamic-pituitary-adrenocortical axis
HMDA	Home Mortgage Disclosure Act

ACKNOWLEDGEMENTS

This work would not have been possible without a great deal of support.

First, I want to extend the warmest gratitude to the Black mothers who shared their stories with me throughout this process. Their experience living, working, studying, birthing and raising children in the Bay Area added such rich context for this study and made this process more enjoyable than it would have been otherwise. Their stories grounded me and were a clear reminder of the intimate connection between housing, racial, and economic justice. I am grateful for the research assistance of TaNefer Camara whose efforts made these connections possible. Additionally, I appreciate the professionals and researchers who shed light on the dynamics of inequality in the Bay Area. This context helped me better understand why these questions were important.

To my committee, thank you for your patience and sound advice throughout the process. To my advisor and dissertation chair, thank you for pushing me to think critically about the relationship between racism and health. I am eternally grateful for the intellectual community at the Center for the Study of Racism, Social Justice, & Health through which I have met some of my best friends, collaborators, and comrades. Courtney Thomas Tobin has been a mentor and friend since my first year in the doctoral program. I am grateful for all the time and energy she has invested in me over the years. Mike Lens' course *Community Development and Housing Policies* introduced me to critical urban theory which deeply informed the approaches I took to understand how regional inequality is implicated in health. May Sudhinaraset gave me invaluable feedback on the qualitative design and was instrumental in troubleshooting data collection issues. Finally, this dissertation quite literally would not have happened without my committee member Gretchen Bandoli. Gretchen has been a consistent source of encouragement since I randomly met with her to ask about stress and pregnancy in the summer of 2020. I also must thank Rebecca Baer and the rest of the SOMI team for taking me in as a

SOMI Scholar and providing useful feedback on my work. Rebecca was especially instrumental in data support.

I must also thank other scholars who were instrumental in this dissertation. Kevan Harris' *Comparative Historical Methods* course changed the way I think about mixed methods research and helped me find my identity as a transdisciplinary scholar. Gilbert Gee's feedback on drafts of my proposal helped me tell a more cohesive story about why resegregation was of public health concern. K-Sue Park shared the wonderfully curated reading list for her *Land, Dispossession, and Displacement* course, this scholarship helped ground my theoretical framework. I also owe a great deal of debt to the scholars whose writing I consumed during the dissertation process. There are too many to name, but I must include Ananya Roy, Keeanga-Yahmatta Taylor, Monica McLemore, Tom Slater, Alyssah Sewell, Destin Jenkins, Michael R. Kramer, Alex Schafran, Erin McElroy, David Imbroscio, Alicia Riley, David Harvey, Loretta Lees, Peter Marcuse, and James DeFillipis.

I am grateful for the generous financial support of several funders. First the Health Policy Research Scholars (HPRS) Fellowship sustained me throughout my doctoral process. Because of HPRS, I was able to focus on the work that was most meaningful to me. HPRS gave me the gifts of time and community, both of which helped to make this PhD journey worthwhile. I also grateful for the HPRS dissertation award which supported research assistance and qualitative data collection. Second, I received the Jean Stone Dissertation Award from the UCLA Center for the Study of Women (CSW) which supported qualitative data collection. Third, a grant from the UCLA Ziman Center for the Study of Real Estate supported the software and data acquisition. Finally, this dissertation was also funded the Research Fellowship on Study of Black Life through the UCLA Ralph J Bunche Center for African American Studies. It's important to note that this funding became available after the national uprisings in response to the murder of George Floyd. I recognize the importance of dedicated funds for studying Black life and it is my

sincere hope that these funds continue to be available and that they extend beyond the university.

The administrative staff in the UCLA Department of Community Health Sciences has been exceptional in their support over the past several years. I must thank Melba Tolbert, Kathy Yi, Gloria Greengard (retired), Preethi Thomas (retired), and Jamie Raiss for being available, answering my endless questions and for seeing and treating me as a human before any other titles.

I have been fortunate to befriend and collaborate with amazing individuals who have made my time in this program fulfilling. Thank you Natalie J. Bradford, Taylor B. Rogers, James Huynh, Brittney N. Butler, Michael Anderson, Saron Selassie, Jeremy Levenson, Mya L. Roberson Anthony J. Williams, Lethlogonolo Mokgoroane, Catherine Duarte, Hannah Cory, Marie Plaisime, Brigette A. Davis, and Joven Julien. Thank you for reading, writing, thinking, organizing, conferencing, laughing, crying, and growing with me. I needed it all.

I am eternally grateful for the support of my family who, at different stages, either informed the way I think about issues of racism and inequality or challenged me to articulate my perspectives more clearly. My parents, Kathy and William, thank you for exposing me very early to arguing with me about politics and. To my big sister and best friend, Frances, you have shown me throughout our lives what love is supposed to look like – I can never thank you enough for that.

To my first-born, Naomi Harlem Cross, you sustained me during this process. Thank you for making me laugh and for keeping me honest. In a world that seems to be increasingly violent, thank you for being a source of joy, light, and kindness. To my littlest, Iman Israel Cross, my smiling firecracker. Doing this work while pregnant with you made it so much more meaningful. You helped me tap into a drive that I didn't know I had. Thank you for reminding me about what's important in a home and in life: good food, play, rest, and love.

I could not have completed this dissertation or this program without the support of my life partner, Javan. You have encouraged me when I wanted to leave, you have celebrated my highest highs. You have held me through my lowest lows. I cannot thank you enough. For holding down the fort when I needed time to write. For loving and seeing me. For being you.

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PEER REVIEWED PUBLICATIONS

Thomas Tobin, C. S., Huynh J., Farmer, H., Cross, R. I., Barve, A., Robinson, M.N. Erika Perez Leslie, Roland Thorpe, Jr. (2022) Perceived Neighborhood Racial Composition and Depressive Symptoms among Black Americans across Adulthood: Evaluating the Role of Psychosocial Risks and Resources. *Journal of Aging and Health.*

Nguyen, T. T., Shaniece Criss, S. Michaels, E.K., Cross, R. I., Michaels, J. S., Dwivedi, P Huang, D., Hsu, E., Mukhija, K., Nguyen, L. H., Yardi, I. Allen, A. M, Nguyen, Q. C. and Gee, G. C. (2021). Progress and Push-Back: How the murders of Ahmaud Arbery, Breonna Taylor, and George Floyd Impacted Public Discourse on Race and Racism on Twitter. *Social Science & Medicine – Population Health*

Gailey, S., Cross, R. I., Messer, L. C., & Bruckner, T. A. (2021). Characteristics associated with downward residential mobility among birthing persons in California. *Social Science & Medicine*, *279*, 113962.

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Cross, R. I. (2018). Can Critical Race Theory Enhance the Field of Public Health? A Student's Perspective. *Ethnicity & Disease,* 28(Suppl 1):*267-270.*

SELECTED CONFERENCE PRESENTATIONS

Brittney Butler, Cross, R. I., Brigette Davis, Tongtan Chantarat and Rachel R. Hardeman (Moderator). *Structural Racism and Health Inequities: Lessons Learned from the Last Decade and New Innovations Moving Forward.* A Panel discussion at the AcademyHealth Annual Research Meeting. June 14-17, 2021. Virtual Conference.

Cross, R. I., Brittney Butler, Samuel Baxter, Hawi Teizazu, and Brigette Davis. *An Adjusted Lens: An Examination of Structural Racism in Population Health Research and Policy*. A Panel discussion at the Interdisciplinary Association for Population Health Science (IAPHS). October 1-4, 2019. Seattle, WA.

SELECTED GRANTS, FELLOWSHIPS, AND AWARDS

2021 Research Fellowship for the Study of Black Life, University of California, Los Angeles

2021 Jean Stone Dissertation Fellowship, University of California, Los Angeles

2020 Health Policy Research Scholars Dissertation Award

2019 Ziman Center for Real Estate Research Grant, University of California, Los Angeles

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2017 Graduate Summer Research Mentorship, University of California, Los Angeles

CHAPTER 1: INTRODUCTION

1.1. Purpose

The purpose of this dissertation is to examine the relationship between gentrification, residential mobility and preterm birth among Black women and other birthing people in Northern California.

1.2. Statement of the Problem

Despite medical advances, the U.S. has one of the highest annual rates of preterm birth in the Global North (Frey & Klebanoff, 2016; Purisch & Gyamfi-Bannerman, 2017) and racial inequities in preterm birth have remained persistent (Burris et al., 2019). In 2018, the preterm birth rate among infants born to Black women in the U.S. was 55% higher than infants born to white women (Martin et al., 2019). This inequity is significant because preterm birth is one of the leading causes of infant and child mortality and is linked with a range of adverse child and adult outcomes (Frey & Klebanoff, 2016; World Health Organization [WHO], 2018).

Various forms of racism contribute to this persistent disparity. Especially significant in this scholarship are the ways in which racialized spatial inequality impacts poor infant health outcomes. Racial and economic segregation, in particular, are associated with increased preterm birth risk among Black women (Anthopolos et al., 2014; Britton & Shin, 2013; Chambers et al., 2019; Kramer et al., 2010a; Margerison-Zilko et al., 2017; Mason et al., 2009). This body of research typically examines traditional dimensions segregation (Johnston et al., 2007; Massey & Denton, 1988) at the level of the census tract, zip code, or metropolitan statistical area. These measures can be considered static place-based exposures that assess the relationship between demographic patterns at one point in time and preterm birth. Out of this literature, however, questions arise regarding how the dynamic character of spatial inequality may be linked to preterm birth.

Relational understandings of place take into account how places change and how people change places through various types of mobility throughout the life course (Cummins et al., 2007). Places do not change "naturally" and people—especially Black people—are not free to move about all places. Thus, relational measures of place may help us better understand how ongoing and dynamic processes of racial exclusion (ones that sort people into particular places), and racial exploitation might pattern preterm birth risk for Black women.

Relational approaches also force scholars to think about these patterns at scales beyond the neighborhood. At a larger scale, for example, patterns of *racial resegregation* are evident across multi-metro regions and these processes are understudied in social and perinatal epidemiology. Racial resegregation is a process by which the racial and economic demographics of urban cores and suburban/exurban periphery switch. Resegregation stems from urban restructuring and may be associated with inequitable allocation of health-promoting resources that may have implications for the preterm birth (Samara, 2016; Schafran, 2013).

The process of racial resegregation produces two visible manifestations of spatial inequality that may impact infant health. First, *gentrification* within urban neighborhoods. Gentrification is the process by which by which formerly disinvested neighborhoods are produced for (usually) white middle class residents. Black long-term residents in gentrifying neighborhoods perceive social changes associated with gentrification such as housing insecurity and discrimination as chronically stressful (Shmool et al., 2015). Gentrification may play an important role in preterm birth for Black women (Huynh & Maroko, 2014) but the data is mixed (Zlotorzynska, 2014).

Second, racial resegregation is made visible through a particular type of residential mobility. Black suburban and exurban migration which can be considered the "other side of gentrification" (Chang, 2016). While there are several reasons people move, demographic patterns suggest that Black people are often constrained in their options. This is particularly evident in Northern California, where there are pockets of Black population growth. *Constrained*

mobility, then, refers to mobility patterns that relate to racial resegregation: from areas experiencing Black population loss to those experiencing Black population growth.

Although resegregation does not supplant traditional forms of segregation and concentrated poverty, there may be differences in the pathways linking newer racialized spatial formations and infant health.

1.3. Specific Aims

The overall objective of the dissertation is to examine the relationship between two relational indicators of racialized spatial inequality: gentrification and residential mobility and preterm birth among Black women and birthing people. This project uses birth records from the State of California linked to hospital discharge data and the Neighborhood Change Database (NCDB). The specific aims are outlined below.

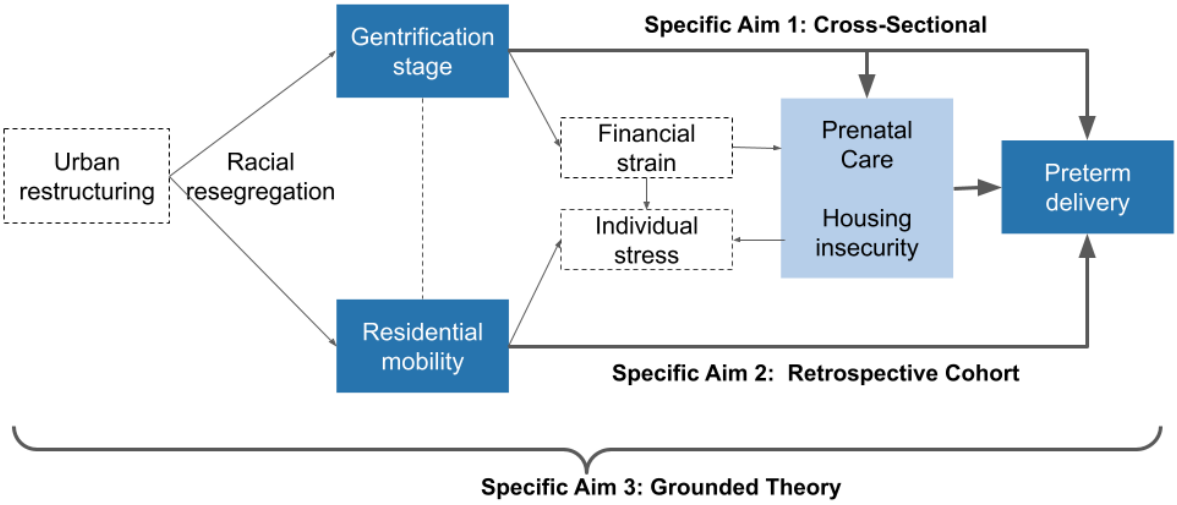
Aim 1. Determine if neighborhood-level gentrification stage is associated with preterm birth among Black birthing people.

- 1.a. Determine whether this association is mediated by housing insecurity
- 1.b. Determine whether this association is mediated by prenatal care
- 1.c. Determine whether this association is moderated by WIC participation

Aim 2. Explore residential mobility patterns relative to racial resegregation and preterm birth among Black birthing people.

Aim 3. Identify potential mechanisms linking regional inequality to preterm birth risk among Black women.

Figure 1.1. Summary Graphic of Specific Aims



1.4. Significance

This study contributes to the body of research on racialized spatial inequality and preterm by addressing four gaps. First, regarding gentrification, this study explored two potential pathways by which residing in neighborhoods experiencing “advanced” gentrification influences preterm birth. The most common measure of gentrification excludes these neighborhoods from study. Second, because studies of gentrification and preterm birth have compared white and Black residents, the potential pathways for Black women, specifically, are unknown. This is important because preterm birth has a complex etiology. Thus, pathways linking gentrification to preterm birth may vary among Black women.

The third and fourth gap are related to residential mobility and preterm birth. This study was among the first to examine mobility in relation to the phenomenon of racial resegregation. Most studies on in this area examine mobility in relation to neighborhood deprivation (Bruckner et al., 2019; Gailey et al., 2021), neighborhood socioeconomic status (Collins et al., 2011, 2015), lifetime suburban migration (Collins et al., 2013), or the specific timing of a residential

move (Bond et al., 2019). There is little research on maternal and infant health in the context of racial resegregation. Therefore, knowledge is limited about the (quantitative) association between residential mobility *and* the potential mechanisms that might link different types of mobility to infant health. Thus, this study explored whether residential mobility relative to Black population change is associated with preterm birth (Aim 2) and generate a set of hypotheses for future research (Aim 3).

1.5. Overview of the Dissertation

This dissertation consists of six chapters. In *Chapter 2: Literature Review*, I review the relevant literature documenting the relationship between neighborhood inequality, residential displacement, and preterm delivery. In *Chapter 3: Theoretical Framework,* I describe the two main theoretical perspectives from which I drew: ecosocial theory and public health critical race praxis (PHCRP) to hypothesize the relationships between gentrification, residential mobility, and preterm birth. In this chapter, I also explain the study constructs and hypothesized relationships among them. In *Chapter 4: Methods*, I present the methodological strategies used to address each of the research aims. This chapter includes data sources, study population, measures, and analytical plans for each study aim. In *Chapter 5: Results*, I present the results by each research aim. In *Chapter 6: Discussion and Conclusions*, I review the findings of the study and discuss the implications, strengths, and limitations of the research.

CHAPTER 2: LITERATURE REVIEW

2.1. Overview

This literature review focuses on the relationship between gentrification, residential mobility, and preterm birth. This chapter is divided into six sections. In the second section, I describe the epidemiology of preterm birth. This section highlights that stress is a key mechanism linking the social environment and adverse pregnancy outcomes. In the third section, I assess the literature that examines the effects of residential racial segregation on preterm birth. The evidence here suggests that racialized spatial arrangements are important for infant health. In the fourth section, I outline the link between gentrification and regional racial resegregation. In the fifth section, I critically evaluate the research linking gentrification (and similar processes), residential mobility, and adverse pregnancy outcomes. The evidence here is mixed and suggests that gentrification may be associated with adverse birth outcomes for Black women but there is considerable conceptual and methodological variation. Additionally, the evidence suggests that the relationship between residential mobility and preterm birth is conditional on the context of the new residential location. In the sixth and final section, I provide a summary of the gaps in the literature and situate the study.

2.2. Preterm Birth among Black Women

2.2.1. Public Health Significance of Preterm Birth

In the United States, Black women are more likely to deliver their infants early compared to their white counterparts. This pattern has persisted amidst overall downward trends in preterm birth between 2007 and 2014 and the more recent upward trends between the years 2014 and 2019 (Martin, 2019). In California, the Black-white disparity largely mirrors national trends. Black women are 30% more likely to deliver preterm infants than white women (March of Dimes, n.d.).

The most recent data on racial disparities in predictors of preterm birth in California shows that a greater proportion of Black women live in impoverished neighborhoods (52% vs 21%) and experience food insecurity (20.1% vs 11.4%) during pregnancy (California Department of Public Health, 2018). This is coupled with lower rates of health insurance coverage pre-pregnancy. These disparities are not explained by behavioral factors. Rates of smoking were comparable between Black and white women and Black women were less likely to alcohol use during pregnancy (6.1% vs. 15.3%).

This persistent racial disparity is significant because preterm birth is an important indicator for infant, child, adult health outcomes. Most immediately, preterm birth is a leading cause of neonatal (within 28 days of birth) infant (within the first year) mortality. Of the approximately 22,000 infants who die before their first birthday on an annual basis, 70% are born preterm (Lorenz et al., 2016). Preterm birth is also a leading cause is child mortality, death before age 5 (Howson et al., 2013). In the U.S., Thus, experts see the prevention of preterm birth as a significant intervention in infant and child mortality.

Fortunately, technological advances have improved survival rates among preterm infants. Even those born *extremely* preterm have a higher likelihood of survival today than they did 50 years ago (Moster et al., 2008). Higher survival rates, however, have coincided with long term health complications for individuals born preterm. These complications are the result of "immature organ systems that are that are not yet prepared to support life in the extrauterine environment" (Institute of Medicine, 2006, p. 314). Neurological and respiratory systems are especially impacted by preterm birth because of the underdevelopment of the brain and lungs (Luu et al., 2017).

It is also important to note that the monetary costs of preterm birth are substantial. According to the Institutes of Medicine, the U.S. pays an estimated $26 billion annually to address preterm birth. This figure includes healthcare costs for mothers and children up to age 5. The costs are higher for infants born before 28 weeks' gestation. Of course, important factors

not considered in the figure include psychological and financial strain associated with caring for preterm infants especially those that are born on the earlier end of the spectrum. In a society that does not prioritize the funding of a social safety net, these costs can exacerbate existing health inequalities among populations.

2.2.2. Defining and Measuring Preterm Birth

Preterm birth is defined as birth before 37 completed weeks of gestation. This definition is used to distinguish between other proxies of prematurity, such as birth weight which until recently was a more commonly used measure in the public health literature (Institute of Medicine, 2006). Precisely measuring time of conception is difficult making birth weight is a more exact measure. However, birth weight does not necessarily capture prematurity as some infants can be born low birth weight at full term and others can be born within a normal weight range and be preterm. Thus, the use of low birth weight as a proxy may miss a substantial number of infants born preterm (Wilcox, 2001). This is important because infants who are born preterm but have a normal birth weight or are "large for gestational age" (i.e. in the top 10^{th} percentile) have different rates of morbidity and mortality than infants born at term (Wilcox, 2001).

Several methods are used to measure gestational age including mother's report of last menstrual period (LMP) and prenatal ultrasounds. Obstetricians can use LMP in combination with other methods (ultrasound, fetal heartbeat, and measures of the abdomen) to estimate the duration of gestation. However, LMP is more accurate for individuals who have regular (28-30 day) menstrual cycles. For those with irregular cycles, the unpredictable timing of ovulation and implantation of the zygote make using LMP difficult for accurate measures of gestation duration (Zhang & Savitz, 2011). In addition, there are issues of recall when determining LMP. Studies have demonstrated that 25-50% of women may not precisely remember when the last menstruated and there seem to be socioeconomic disparities with regard to LMP recall (Institute

of Medicine, 2006). Thus, population-based datasets derived from medical records that rely on LMP or other estimates likely have missing data for impoverished women and large distributions across the population. The due date is determined by adding 40 weeks to the LMP when it is available.

Ultrasounds are another common method for determining gestational age. Early use of prenatal ultrasounds tends to be more accurate than reports of LMP (save individuals undergoing invitro fertilization) (Zhang & Savitz, 2011). At the population-level, ultrasound measurements result in a lower population mean gestational age at birth compared to LMP measurements. “The use of ultrasound to estimate gestational age resulted in the birth of many fewer infants at what was considered postterm and a small increase in the numbers of infants delivered at what was considered preterm” (Institute of Medicine, 2006, p. 64).

One problem with ultrasounds is that they are used to measure gestational age (an indicator of *time*) by estimating fetal growth (using indicators of *size)*. This may introduce systematic bias if there is variation in fetal growth at early stages (Institute of Medicine, 2006). Another problem with ultrasounds is that they require access to healthcare. Women who are at the greatest risk for preterm birth also experience the greatest barriers to healthcare in early pregnancy given their social position (Bryant et al., 2010; Gadson et al., 2017). Despite these issues, ultrasounds provide a useful estimate for duration of pregnancy.

2.2.3. Causes of Preterm Birth

The causes of preterm birth are complex and not entirely known. Preterm birth results from an interaction of genomics, behavioral and psychosocial factors, and environmental conditions. There appears to be consensus that the etiology of preterm birth differs for *medically indicated* and *spontaneous* preterm births. Medically indicated preterm birth refers to a clinical

decision to initiate delivery before 37 weeks for the safety of the mother and/or infant. Spontaneous preterm birth refers to preterm birth that occurs because of the premature rupture of membranes (PPROM) and the spontaneous onset of labor.

Biological factors contribute to preterm birth in various ways. Medically indicated preterm birth is driven by maternal and fetal conditions that make extending the gestation dangerous for health. The most common of these conditions are considered ischemic placental diseases. These include preeclampsia (gestational high blood pressure), fetal distress, intrauterine growth restriction, and placental abruption (Ananth & Vintzileos, 2008).

Genetic factors likely contribute to preterm birth in general. Twin studies have demonstrated that up to 33% of the variation in preterm birth risk is heritable. Genetic explanations for *racial disparities* in preterm birth, however, are not as conclusive. Early studies in this area allude to racial genetic differences without examination of genetic data evidence. For example, one study examined the relationship between “race” and preterm birth using hospital records in Missouri (Kistka et al., 2007). The authors found that a statistically significant relationship remained after controlling for “relevant social factors” such as socioeconomic status, prenatal care, and smoking. They concluded that genetic differences are likely undergirding the relationship between “black race” and preterm birth although they examined no genetic data.

Studies that do analyze genetic associations with preterm birth typically study a limited number of candidate genes because the collection of whole-genome data is costly (Institute of Medicine, 2006). This approach is increasingly evolving to include multiple (as opposed to single) candidate genes because scientists acknowledge that preterm birth has multiple etiologies. Many of these types of studies are interested in understanding general genetic contributions but a few are interested in racial difference. One such study found that “the

significant racial difference in the variance of gestational age can largely be attributed to non-genetic sources" (York et al., 2010, p. 2). The authors concluded that scholars should identify specific environmental exposures to understand racial differences in preterm birth.

Taken in isolation, genetic factors cannot explain higher rates of preterm birth among Black women. Studies comparing birth outcomes among US-born and African immigrant women show that rates of low birth weight among African immigrants are more like white American women although, presumably, their genes should be more like and U.S.-born Black women. This suggests that there are particularities about being Black in the U.S. (i.e., exposure to racism) that are harmful for birth outcomes. Furthermore, researchers generally accept that genes do not operate in a vacuum. Genes interact with social environments such that women with similar genetic profiles, but different social experiences, may have markedly different health outcomes (Dolan, 2010).

Behavioral factors thought to influence preterm birth are physical exercise, diet, and smoking. Though this data is inconsistent with a number of meta analyses reporting null results (Di Mascio et al., 2016; Tinloy et al., 2014). Due to the stigma associated with substance uses, the body research on these factors is limited by recall bias and social desirability bias. Additionally, the associations found in these studies may be confounded by socioeconomic position. People living in poverty are less likely to have the resources to eat healthy diets and exercise on a regularly basis. They are also more likely to smoke. Therefore the difficulty of separating the cluster of "poor" health behaviors from the experience of poverty makes understanding the causal effect of health behaviors on preterm birth elusive (Lynch et al., 1997).

Psychosocial factors associated with preterm birth include personally mediated racism, chronic and acute stress, maternal mental disorder, and lack of social support. Personally mediated, or interpersonal, racism refers to prejudice (negative assumptions) and discrimination (differential negative treatment) toward others due to race. Across multiple measures of racism,

there is a consistent association with preterm birth (Bower et al., 2018; Giurgescu et al., 2011; Rosenberg et al., 2002; Slaughter-Acey et al., 2016). There is also evidence that psychosocial factors may interact to produce unique impacts on preterm birth. For example, one study found that the relationship between lifetime racism and preterm birth among Black women was not statistically significant in the full sample but was substantial among women with depressive symptoms (Misra et al., 2010).

2.2.4. Stress and Preterm Birth

Stress is an important biological mechanism related to the onset of preterm birth. There are two main biological pathways through which stress is thought to be linked to preterm birth. The first pathway is through inflammatory response. Inflammation is the body's normal reaction to infections and injuries. During an inflammatory response, blood flow increases, and a host of fluids and white blood cells migrate to the site of the infection or injury. While inflammation is a normal part of the reproductive cycle, too much inflammation can lead to both preterm labor and PPROM (Dunkel Schetter & Glynn, 2011). Overproduction of proinflammatory cytokines, for example, can cause the premature ripening of the cervix (Cappelletti et al., 2016). A large proportion of inflammation-induced preterm birth is a result of bacterial infections that enter the amniotic cavity through the vagina (Goldenberg et al., 2008). Other common sources of infection include system infections such as malaria or those in the lower genital tract (Pararas et al., 2006).

The second biological pathway linking stress to preterm birth is through the neuroendocrine system and involves the hypothalamic-pituitary-adrenocortical (HPA) axis. This process involves a series of interactions that ultimately results in the releasing of stress hormones. First, corticotropin-releasing hormone (CRH) triggers the release of (ACTH). Then,

ACTH binds to the adrenal cortex and triggers the release of stress hormones such as cortisol. The HPA process is responsible for regulating the body's response to stress exposure (Herman et al., 2016). Increased exposure to stress, then, can dysregulate this system causing elevated levels of CRH in the placenta (Kalantaridou et al., 2004). Higher levels of CRH in the placenta have been associated with shorter gestation periods (Ruiz et al., 2002; Wadhwa et al., 2004). But "its precise role in this complex process has yet to be fully elucidated" (Dunkel Schetter & Glynn, 2011, p. 324).

The evidence linking stress to preterm birth can be analyzed by type of stressor: life events, chronic and neighborhood stress, and daily hassles. Life events refer to episodic stressors that may be a normal part of life (e.g., death in the family) but that may have a negative impact on one's wellbeing. The majority of studies examining the impact of life events on preterm birth found statistically significant associations (Burns et al., 2015; Koning & Ehrenthal, 2019; Ortiz Martínez & Castillo, 2016; Zhu et al., 2010). Stressful life events might also exacerbate the impact that toxic environmental exposures have on preterm birth (Ferguson et al., 2019). Another type of episodic stressors are severe events. These stressors, sometimes referred to as catastrophic, are different from life events in that they large scale and destructive (e.g., mass shooting or deadly natural disaster). There is inconsistency regarding the classification of events as severe. For example, some studies consider the death of a relative severe and others consider it a life event. Nevertheless, these types of stressors are consistently associated with shorter gestation (Class et al., 2011; Lederman Sally Ann et al., 2004).

Chronic stressors are those that individuals have been exposed to for a longer duration of time. Individual-level poverty is considered a chronic stressor as is neighborhood poverty. Aside from neighborhood stressors (which I return to in Section 2.3.2), much of the literature on chronic stress and preterm birth measures biological manifestations of chronic stress such as

allostatic load rather than exposures to chronic stress*ors*. This research finds that women with greater biological "wear and tear" are more likely to deliver preterm. The dearth of evidence on chronic stressors is concerning as our ability to intervene at biological level is limited.

The studies reviewed above measure stress *during* pregnancy. A smaller body of research also suggests that preconception stress may impact gestation length as well (Kramer et al., 2011; Witt et al., 2015). One recent study (Mahrer et al., 2020) examined how exposure to different types of stressors before conception found that preconception stress appraisal increases the odds of preterm birth. They also found a curvilinear relationship between exposure to stressors and length of gestation such that moderate stress was associated with longer gestation (Mahrer et al., 2020).

Overall, this body of literature suggests that exposure to preconception and prenatal stress may increase risk for preterm birth and that this relationship is especially salient for Black women (Lu & Chen, 2004). Perinatal epidemiology has moved in a direction where scholars explicitly study the impact of racism-related social stressors on preterm birth among Black women. In the following section, I will review the literature on residential context and preterm birth.

2.3. Residential Segregation and Preterm Birth

Racial categories developed from particular histories of exploitation, domination and discrimination (Feagin, 2006; Fields & Fields, 2014; Harawa & Ford, 2009; Smedley & Smedley, 2012). These categories are "varied in their consequences and meaning in different places and times" (Smaje, 2000, p. 115). Racism largely dictates the meanings and consequences of racial categories. Thus, racism plays a unique role in preterm birth risk among Black women. In this section, I review the literature on the relationship between two racism-related neighborhood

stressors and preterm birth: racial residential segregation and neighborhood deprivation. Substantial evidence suggests that neighborhood-level racial and economic inequality is associated with racial inequities in preterm birth. These studies typically use ecologic designs to demonstrate that neighborhood inequality can explain some of the disparity in preterm birth between Black and white women. A growing body of literature also demonstrates that unequal neighborhoods are associated with preterm birth risk among Black women irrespective of their white counterparts. These studies typically use a multilevel design whereby individuals are nested in neighborhoods characterized by some level of material deprivation. Residential segregation (by race and income) is a key indicator of structurally mediated racism but cannot explain all patterns of exclusion that may be related to preterm birth. Thus, I conclude with a review the literature that moves beyond the view of neighborhoods as containers for good or poor infant health outcomes to help us better understand how ongoing and dynamic processes of exclusion pattern preterm birth risk for Black women.

2.3.1. Residential Racial Segregation

Residential racial segregation, defined as the spatial separation of racial groups created and sustained largely by institutional racism, is a commonly studied form of neighborhood inequality. Segregation operates through a number of pathways to shape health including health behaviors and exposures, social and political capital, and socioeconomic status at the individual and neighborhood level (Kramer & Hogue, 2009). Typically, racial segregation is measured using one or more of five indices corresponding to the five dimensions outlined by Massey and Denton (1988). Briefly,

> [t]hey are *centralization*, the extent to which racialized communities are located in the oldest, most dilapidated parts of the municipality; *isolation*, the degree of potential interactions between two racial groups; *concentration*, the degree to which minority

> groups are confined to an area smaller than their population size; *clustering*, the location of higher minority neighborhoods adjacent to one another; and *evenness*, a simple indicator as to whether the percentage of minorities in a neighborhood exceeds the overall average for the municipality (Cross, 2019, p. 503).

Scholars have noted that these five dimensions, once spatialized, can be narrowed to two distinct dimensions: one that encompasses the continuum of separation (evenness/clustering) and the other that captures location (exposure/isolation/centralization) (Johnston et al., 2007; Kramer, 2018; Reardon & O'Sullivan, 2004).

In most studies, segregation has been associated with increased odds of preterm birth for Black women. But drilling down to the dimension of segregation reveals a more nuanced pattern with important contradictions. For example, the studies using the exposure dimension of segregation (measured using the index of isolation) consistently found an association with preterm birth (Anthopolos et al., 2011; J. F. Bell et al., 2006; Britton & Shin, 2013; Kramer et al., 2010a; Kramer & Hogue, 2009; Nyarko & Wehby, 2012). This may suggest that isolation from resources readily provided to white residents is harmful for infant health. However, among the four that examined evenness, measured by the index of dissimilarity, only one (Nyarko & Wehby, 2012) found a statistically significant association. This is notable because evenness is the most common dimension of segregation used in neighborhood effects research. It may suggest that more theorizing is needed to understand how this dimension may shape infant health. The data on the clustering dimension is mixed with one study (J. F. Bell et al., 2006) finding that clustering *decreased* odds of preterm birth and the other finding null results (Kramer et al., 2010a). Clustering may have a protective effect if it is related to increased political power among Black residence or community support. Osypuk and Acevedo-Garcia (2008) examined multiple simultaneous dimensions and found that women living in "hyper-segregated" neighborhoods had increased odds of preterm birth.

2.3.2. Racialized Economic Deprivation

In addition to racial segregation, various forms of economic deprivation have been used to explain racial disparities in preterm birth. Scholars have examined neighborhood deprivation and disadvantage as neighborhood-level stressors. Neighborhood deprivation and disadvantage are operationalized differently in different studies (Messer et al., 2006), but they typically include measures of neighborhood poverty, crime, and racial composition. Scholars have consistently shown that neighborhood disadvantage is associated with preterm birth among Black women but to a lesser extent than it is for white women (Cubbin et al., 2008; Kramer et al., 2014; Ncube et al., 2016).

Compared to segregation researchers, neighborhood deprivation scholars are less likely to explicitly evoke “racism,” but they largely agree that a relationship exists between “race” and neighborhood economic deprivation. Recently, studies have combined elements of racial segregation and neighborhood poverty. This body of research provides evidence that the interconnection between economic and racialized exclusion matters for pregnancy outcomes. Conceptually, racialized economic segregation describes to the extent to which the residents of geographical areas are either Black *and* poor or white *and* wealthy (Krieger et al., 2018). Areas with a greater proportion of residents who are Black and poor are considered more “deprived.” These studies have shown that Black women living in neighborhoods with higher levels of deprivation, have worse outcomes than women in neighborhoods with less deprivation (Chambers et al., 2019; Krieger et al., 2017; Shrimali et al., 2020).

2.3.3. Conceptual and Methodological Issues with Neighborhood Effects Research

There is considerable scholarly debate regarding conceptual and methodological approaches in estimating with neighborhood effects. This section focuses on three questions these debates

raise. First, how are neighborhoods operationalized in studies? Second, how can causal inference be enhanced in studies of neighborhood effects? And finally, on a conceptual level, who or what is doing the *action* in the neighborhood context?

The first issue is primarily concerned with how researchers decide the boundaries of a neighborhood. Geographers have long noted that the modifiable areal unit problem (MAUP) must be taken into consideration to ensure the associations observed are real rather than created by the drawing of the boundaries (Duncan & Kawachi, 2018; Flowerdew et al., 2008). Relatedly, studies of segregation have focused primarily on the neighborhood-level and use administrative boundaries such as census tracts, or block groups due to data availability. Riley (2018) and other scholars interested in processes of inequality critique these operationalizations as atheoretical and apolitical (Schafran, 2018). However, a 2004 study comparing administrative boundaries and “natural neighborhoods” found similar effect sizes (Ross et al., 2004). A more recent study (Kramer et al., 2010b) comparing census tract-derived and spatial density measures of segregation found similar results in larger metropolitan areas but discrepancies in areas with smaller populations.

Beyond the question of whether administrative boundaries are appropriate, other scholars have questioned whether the scale of the neighborhood is appropriate. Regarding segregation, researchers have found that measuring at different scales produces different results (B. A. Lee et al., 2008; Reardon et al., 2008). Some, on the other hand, suggest that the census tract is indeed the best scale to measure such exposures. However, the scale should depend on the research question. Scholars interested in processes of spatial inequality, should seek to understand how particular processes are operating then choose the appropriate scale.

The issue of causal inference hinges upon the concept of structural confounding. Structural confounding refers to the notion that there are factors influencing who lives in which neighborhoods. Thus, even with randomization, matching and other tools to minimize bias, there

are too few counterfactuals (i.e., wealthy white people living in impoverished Black neighborhoods or impoverished Black people living in wealthy white neighborhoods) to satisfy statistical criteria for causal inference. Some scholars suggest that research should move in the direction of 'natural experiments' to truly understand the effect neighborhoods have on health (Oakes, 2006). Another approach to deal with structural confounding is to approach explanation differently—with different methods. This approach requires a shift in attention from risk factors to social mechanisms (Shankardass & Dunn, 2012). Focusing on the mechanisms that link context to health will help scholars and policymakers provide deeper explanations that can meaningfully be translated into interventions.

Finally, most studies designed to assess the effect of neighborhood-level segregation on infant health neglect to examine who or what is perpetrating the action. This practice of treating neighborhoods as containers, rather than dynamic place-based systems, fails to capture both the processes that sort people into places and how these processes influence birth outcomes. A notable exception in perinatal epidemiology is the work of Dara Mendez and colleagues on mortgage discrimination and preterm birth (Mendez et al., 2014). Using data from the Home Mortgage Disclosure Act (HMDA) database, they assess whether redlining was associated with preterm birth. They found that Black women who lived in neighborhoods characterized by *greater* mortgage discrimination against Black households were at *lower* risk of delivering early. At first glance, this finding may be surprising but conceptually it makes sense. Black households were systematically—but not totally—excluded from these neighborhoods; thus, those who were able to elude that exclusion, may have benefitted from the resources available to other residents. Residents in neighborhoods where Black people were *more* likely to get loans, on the other hand, may have been neighborhoods with fewer health-promoting resources. Furthermore, predatory lending practices are known to target neighborhoods with greater proportions of Black households (Rugh & Massey, 2010; Taylor, 2019).

To better understand how place impacts preterm birth, scholars must take better care to understand *processes,* rather than just indicators, of exclusion. In other words, we need to know more about segregation as a verb rather than just a noun. As Mendez's work shows increased access mortgages for Black households, per se, may not be as beneficial for health as expected if they are concentrated in 'unhealthy' neighborhoods. The underlying question, then, shifts from "how does where you live affect your life chances, and thus, your health?" to "how do structural factors affect where you live *and* your health?" Traditional neighborhood effects research often fails to measure the structural factors that determine how and why people end up in particular neighborhoods (Slater, 2013).

The hyper focus on the causal impact of the neighborhood itself is lacking because the neighborhood is a *result of* political economic factors. Racially and economically segregated neighborhoods are created through processes of racialized spatial exclusion. Thus, little can be learned about how racism impacts health by studying concentrated poverty or segregation in isolation (Riley, 2018). Instead, it is important to study how *processes* of neighborhood investment and disinvestment, inclusion, and exclusion impact health. As Slater asserts, it is not a clustering of poor people (who are assumed to make poor choices) that causes a neighborhood decline, it is that disinvestment makes "declining neighborhoods" more affordable for both poor people and hazardous industry (Slater, 2013). Underdevelopment, then, may cause the concentration of poverty *and* unhealthy social environments.

In the next section, I discuss how relational approaches to the study of place might improve upon some of these limitations in our understanding of racialized spatial inequality.

2.4. Toward Relational Measures of Racialized Spatial Inequality

The previous section described how static measures of racialized spatial inequality is associated with preterm birth and other pregnancy outcomes. Relational approaches to place-based research developed from the understanding that places are not merely container for social activities. Instead, they are dynamic systems that change and are changed by the people living, working, learning, and playing there.

Two related themes stem from the relational approach The first theme is that the sociopolitical processes in one place—a neighborhood, city, county, region, or nation state—are related to and often caused by sociopolitical processes in other places and at different scales. To think about this using an example, take neighborhood deprivation. Conventional approaches treat neighborhoods as not deprived, moderately deprived or highly deprived. While this approach can tell us about the relationship between deprivation and health outcomes, it obscures the fact that some places are deprived *because* others are not. A relational approach might seek to understand the policies, practices, and processes that produce both neighborhoods in the same geography and explicate the health implications of that production.

The second theme is that places are dynamic. Geographers and other scholars focusing on the dynamic interplay between spatial and social conditions "stress the dynamic and changing characteristics of places and the place-to-place mobility of populations on a daily basis, and over the life-course. This implies that individuals often influence, and are influenced by, conditions in multiple places" (Cummins et al., 2007, p. 1828). Regarding this dynamism, scholars engaging in quantitative research can benefit from operationalizing the various ways in which places are dynamic through social, political, and economic changes within and mobility across places. Research on neighborhood change processes (such as gentrification) and residential mobility are two approaches in this vein.

Because spatial processes are always racial processes (Lipsitz, 2007, 2011; Mills, 2011), the shift to relational measures of place simultaneously requires a shift in relational understanding about the connections between racism, power, and place. Questions that arise in

making these connections include: Who benefits and who is harmed when a neighborhood changes? Who moves where and under what circumstances? What are the power struggles involved in these processes? How do these processes shape the landscape of health resources and harmful exposures for Black people?

For the remainder of this section, I will discuss how the focus on gentrification and residential mobility as two relational approaches to place point to larger geopolitical processes of urban restructuring and racial resegregation.

Gentrification presents a puzzle for public health researchers. On the one hand, housing activists and tenant organizers consider gentrification a form of urban colonialism. On the other hand, academics across multiple disciplines often characterize gentrification as “neighborhood upgrading” and suggest the influx of capital investment could increase access to health promoting resources. Thus, some scholars suggest that there could be health benefits to living in gentrifying or gentrified neighborhoods for some populations (Schnake-Mahl et al., 2020; Steinmetz-Wood et al., 2017)

One solution to the puzzle might lie in how gentrification is conceptualized in relation to displacement, especially racialized spatial exclusion. There is considerable variation in the scholarly definition and measurement of gentrification. According to Merriam-Webster, the definition of *gentry* from which the term *gentrification* is derived is **“**upper or ruling class, a class whose members are entitled to bear a coat of arms though not of noble rank, especially, wealthy landowners having such status” (Merriam-Webster, n.d.). The term gentrification, in its original conception, necessarily meant the replacement of people of lower social ranks with those of a higher rank.

Slater criticized recent work on gentrification as “lacking critical perspectives” and “advancing gentrification’s agenda” (Slater, 2006). He points to the disconnection between gentrification and displacement in attempts to quantify gentrification (Slater, 2009). Indeed, numerous quantitative studies call into question whether gentrification *causes* displacement. Carlson

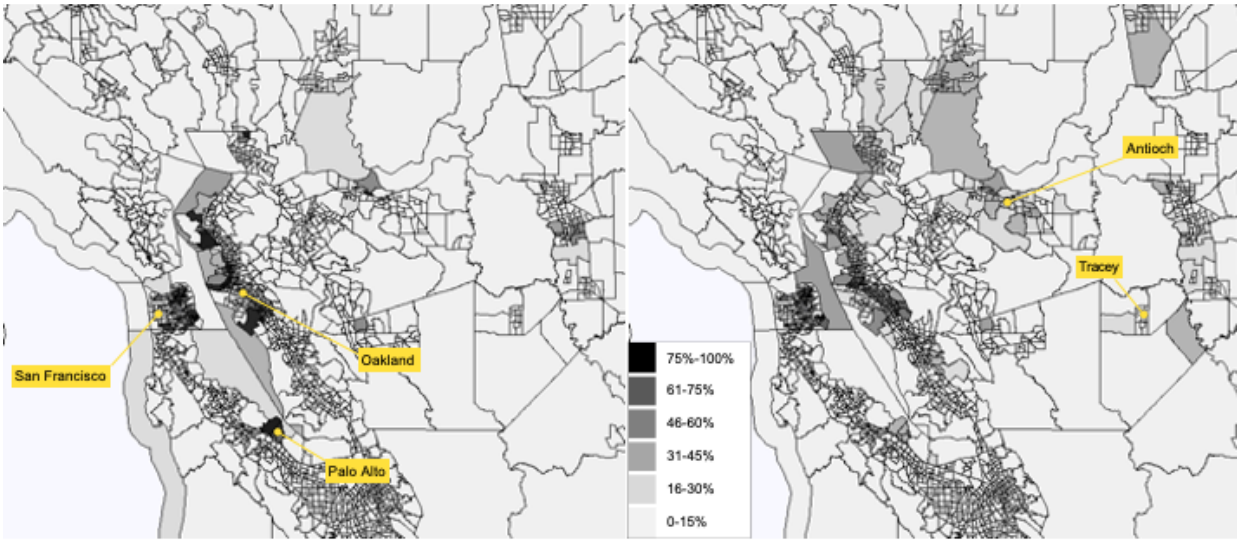
(2020) took the issue up and found that there is a racialized component to gentrification-induced displacement that had been previously overlooked. In racially segregated neighborhoods, gentrification *is* associated with increased displacement. Thus, there is an intimate connection between gentrification, displacement, and racialized outcomes.

There has been a recent uptick in population health studies on gentrification. This increase might be explained by three factors: the growth in the popular use of the term, the increased focus on the impact of inequality within the population health field, and the current housing affordability crisis. At least five systematic reviews assessing different aspects of the gentrification and health literature including conceptualization (Bhavsar et al., 2020), measurement (Tulier et al., 2019), health effects (Schnake-Mahl et al., 2020; G. S. Smith et al., 2020), and causal inference (Firth et al., 2020) have been published since 2019. These reviews offer useful critiques of the existing literature but even they fail to acknowledge how gentrification is part of a larger process of spatial inequality. The noticeable changes at the neighborhood level only tell part of the story. Scholars need "to look beyond the boundaries of the city, into how entire regions are being reshaped into new geographies of inequality" (Chang, 2016, p. 58). Gentrification, according to Chang, "is only the visible side of the larger problem: resegregation" (2016, p. 61).

In the San Francisco Bay Area, resegregation is most visible when looking at the Black population changes. Figure 2.1 displays the 1970 Census map and the 2010 Census map of the proportion of the population that is Black in Bay Area census tracts. In 1970, Black people mostly reside in compact neighborhoods. In 2010, Black people are more dispersed across the region but noticeably, they are only in certain parts of the region. Importantly, segregation is not supplanted by resegregation. Instead, as Schafran (2013, 2018) points out, these forms of segregation are happening at the same time. While the 2010 map displays Black population loss in Oakland, San Francisco, Berkley and Palo Alto, there are still tracts with high concentrations of Black residents.

Figure 2.1a. Proportion African American by census tract, 1970

Figure 2.1b. Proportion African American by census tract, 2010



Source: Map by author, Neighborhood Change Database

Table 2.1. outlines some of the key characteristics that differentiate racial residential segregation and racial resegregation. In the Keynesian era, ghettoized segregation is characterized by spatial exclusion. The separation between cities and suburbs were along the lines of race. In contrast, in the neoliberal era, resegregation is mobile. Black households are not confined to the ghettoized neighborhood in the same way, but their movement is also not unconstrained. In the Bay Area, there are several suburban and exurban localities where many Black households are moving. In this new era, exclusion is accompanied by predatory inclusion (e.g., subprime lending) (Taylor, 2019). These racialized spatial patterns are more apparent at the regional level. Thus, to better understand the impact of racialized spatial inequality on preterm birth, it is necessary to examine the gentrification and residential mobility *through the lens of resegregation*.

Table 2.1.
Differences Between Segregation and Resegregation

	Ghettoized Segregation	Resegregation
Era	Keynesian	Neoliberal
Market mechanisms	Overt discrimination; racial covenants	Subprime lending
Policy mechanisms	Redlining, urban renewal	Housing-choice vouchers; banking deregulation
Policy "solutions"	Vouchers; anti-discrimination laws	Shifting anti-poverty resources to suburbs; anti-foreclosure legislation
Iconic space	Inner-city	Suburb, exurb
Scale	Neighborhood	Regional
Metaphor	Lack of opportunity	Insecure opportunity

Note. Table Adapted from Schafran (2018, p. 58)

2.5. Gentrification, Residential Mobility, and Preterm Birth

2.5.1. Gentrification and Preterm Birth

To my knowledge, only two studies explicitly examine the relationship between gentrification and preterm birth in the U.S. The only peer-reviewed published study was conducted in New York City and found that high levels of gentrification were associated with slightly higher odds of preterm birth among Black women (aOR=1.16, 95% CI: 1.01–1.33) (Huynh & Maroko, 2014). For white women, however, residence in a high gentrification area was associated with slightly reduced odds of preterm birth (aOR=0.78, 95% CI: 0.64–0.94). In a systematic review of the literature examining the health implications of gentrification, Tulier et al (2019) critiqued the Huynh study for two research design flaws. First, the overlap between exposure and outcome measurement. Second, for the selection of preterm birth as an outcome. I will address each of these critiques in turn and then offer my own.

The overlap between exposure and outcome measurement is unquestionably a problem for attempts at causal inference. Based on this analysis, it is unclear if the exposure occurred before the outcome. This is a critical flaw in the methodology. Certainly, the authors could have

used older birth records and census data to ensure that the timeframes between exposure and outcome were distinct. For example, if using census data, they could have measured gentrification between 2000 and 2010 and birth outcomes between 2011 and 2013. That said, gentrification is a *process*, thus hard cut-offs in measurement due to data limitations do not necessarily make sense conceptually. For example, there may be health implications of gentrification throughout the entire measurement period. In fact, according to the rent gap theory (discussed earlier), the earliest stages of gentrification are particularly important to understand as the "gap" between what the land is worth and what is costs is the highest (Slater, 2009). Nevertheless, Tulier and colleagues are right to point out this methodological concern.

In their second critique, Tulier et al. suggest that preterm birth "theoretically *requires* exposure over the lifecourse" (2019, p. 6, emphasis added) which they argue is not measured in the study. While extended exposure to deprivation plays an important role in preterm birth, whether life course exposure is a *requirement* is an unsettled empirical question. However, evidence suggests that acute stressors with relatively shorter exposure windows also impact birth outcomes (Lu & Chen, 2004; Stanhope & Hogue, 2020; Witt et al., 2013). Additionally, if gentrification is associated with financial strain (as I will explore later in this section), exposure need not be over the life course.

The present critique of the Huynh and Maroko (2014) analysis addresses two concerns f that the measurement of gentrification does not differentiate between neighborhoods vulnerable to gentrification and those that are not. Secondly, the measure does not take into consideration key dimensions of the construct. They measure changes in median household income, percent of households in poverty and proportion of college-educated residents. They do not provide justification for why the excluded other dimensions such as housing investment. The third limitation in this study is that the authors fail to test any pathways linking gentrification to preterm birth despite plausibly having data to do so from birth records. Ultimately, this

exploratory study raised more questions than it answered and consisted of methodological issues that threatened validity.

The second study explicitly measuring gentrification and preterm birth is an unpublished master's thesis (Zlotorzynska, 2014). In bivariate analyses, this study found that there was an inverse relationship between gentrification level and preterm birth such that high gentrification was associated with lower rates of preterm birth. In multivariate analyses, there was no association in the overall sample. Race-stratified models showed that compared to living in a low gentrification neighborhood, living in a neighborhood characterized by medium (aOR= 0.70, 95% CI: 0.45–1.09) or high (aOR= 0.71, 95% CI: 0.44–1.12) gentrification was protective for white women. This study was unique in that the models were run on two different cohorts (2000-2003 and 2004-2007) to test the hypothesis that *more advanced* gentrification will have different effects. The author, indeed, found that for white women, advanced gentrification was even more protective (aOR= 0.47, 95% CI: 0.31–0.71).

This study used a two-step approach that differentiates between non-gentrifiable and gentrifiable neighborhoods at baseline. Then, calculated the 1990-2000 change in five variables to reflect housing, economic and social changes associated with gentrification: (1) proportion of adults with a college education (2) proportion of labor force in professional occupations. (3) median household income (4) median house value and (5) median rent. Zlotorzynska's measure is like Freeman's in that it differentiates between gentrifiable and non-gentrifiable neighborhoods. Zlotorzynska deviates from the Freeman method regarding establishing a cutoff point for the changes that are to be considered gentrification. Instead of treating gentrification as increases in certain variables above the metropolitan mean, Zlotorzynska includes all changes and then creates a categorical variable using z-scores. This method, may misclassify neighborhoods as gentrifying when they may actually be following secular regional trends. If, on average, more college educated people are moving to the metropolitan area of interest, the

neighborhood, itself, might not be experiencing gentrification, per se. The author does, however, use the method to categorize different “levels” of gentrification. It is unclear, however, whether these levels are conceptually meaningful.

The two studies have common issues with their measurement of gentrification. Huynh and Maroko do not establish neighborhood vulnerability to gentrification at baseline. Zlotorzynska’s measure is an improvement over Huynh and Maroko’s in this regard. However, the neighborhoods that are designated “non-gentrifiable” are not further examined in previous decades to determine whether they gentrified earlier. According to this measure, once a neighborhood has gentrified, it is no longer gentrifiable. While this is the common operationalization of gentrification, this is not how the process occurs. Neighborhoods can become increasingly gentrified, increasingly expensive, and increasingly exclusionary at more advanced stages. Thus, it is important to distinguish between *rate* of gentrification and *stages* of gentrification. Though the two studies examined different levels (i.e., low, moderate, high, etc.), these refer to relative changes in at the spatial unit of interest. For example, high gentrification refers to percent changes that are above *Z* standard deviations from the mean. These levels do not refer to the temporal histories of gentrification in these neighborhoods. The Zlotorzynska study attempted to model staged gentrification by disaggregating two cohorts and found significant results among white women. This raises futher questions about how the staged process might be captured more robustly over a longer period of time.

2.5.2. Neighborhood Demographic Change

Three additional studies have examined neighborhood processes that are like gentrification without explicitly measuring it. In all three studies, the authors were interested in examining whether changes in neighborhood socioeconomic or racial composition was associated with birth outcomes. The first (Margerison-Zilko et al., 2015), sought to examine

whether longitudinal measures of neighborhood poverty in California were associated with preterm birth. They measured neighborhood poverty rates at 10-year intervals between 1970-2009. Trajectories that might be consistent with gentrification include those that experienced poverty decreases. Neighborhoods that changed trajectories before 1990 were considered early changes and those that changed after 1990 were considered late changes. The authors found that compared to residence in long-term low poverty neighborhoods, residence in neighborhoods that experienced early (aOR=1.17, 95% CI: 0.98-1.40) and late (aOR=1.11, 95% CI: 0.89, 1.37) poverty decreases was associated with preterm birth among the full sample of Black, white and Hispanic women.

Cubbin and colleagues (2020) sought to build on neighborhood change and gentrification research but they measured only population-based changes. This operationalization neglects critical aspects of the gentrification process. These include capital investments and housing costs. There are also concerns about using neighborhood income as an indicator for gentrification as newcomers may be young professionals with lower relative incomes. Their proxy measure of gentrification was a longitudinal measure of neighborhood poverty. Residence in neighborhoods with decreasing poverty (comparing to long term low poverty neighborhoods) was associated with slightly higher odds of preterm birth among the full sample of Black and white women (aOR=1.08, 95% CI: 1.03–1.14).

The same authors performed a similar analyses but based on neighborhood racial trajectories (Kim et al., 2020). They sought to understand whether changes in racial demographics of neighborhoods measured by racial composition at three time points, was associated with preterm birth. For this study there are potentially three trajectories that could be proxies for gentrification: [1] Latinx neighborhoods losing Latinx people [2] Black neighborhoods losing Black people and [3] any neighborhoods gaining white people. Among these neighborhoods, loss of Black population was not associated with increased odds of preterm

birth. Additionally, they found that the Black-white disparity in preterm birth is the smallest in neighborhoods that have “steady low” white trajectories. In these neighborhoods, the odds of delivering early is 34% higher for Black women compared to white women. In neighborhoods with increasing white trajectories however, the Black-white disparity increases to 55%. This could be a function of worse outcomes among white women who live in “low white” neighborhoods (i.e., there is a protective effect of segregation for white women). It could also suggest that there is something about neighborhoods becoming whiter that is associated with preterm birth among Black women.

These studies found that neighborhood trajectories that may be linked with gentrification are associated with slightly higher odds of preterm birth. All three suggest, however, that other neighborhood trajectories may have more significant effects on preterm birth. This may be because the measures do not include other key components of gentrification that may indicate neighborhood level exclusion or displacement pressures such as increasing housing costs. Nevertheless, these studies suggest that socioeconomic “upgrading” in neighborhoods may have implications for birth outcomes among certain populations.

2.5.3. Residential Mobility and Preterm Birth

Residential mobility is a ubiquitous feature of life. People move for a variety of reasons including increasing family size. People tend to seek more space around the time they plan to welcome new members to the family. However, residential moves can also be a source of stress, especially if the move is unwanted, unexpected, or to a residential area with increased social stressors. The perinatal epidemiology literature on residential mobility explores how different residential trajectories are related to preterm birth. Three main designs are used for these studies. First, an intergenerationally linked design that links mothers’ birth certificates to infant birth certificates. In these studies, Collins and colleagues consider residential mobility a

move to a neighborhood different on some indicator (for example, high vs. low income or suburban vs. urban) than the neighborhood in which the mother was born. Collins and colleagues used and intergenerationally linked dataset to assess whether upward (Collins et al., 2011) or downward (Collins et al., 2015)mobility (increase or decrease neighborhood income) was associated with pregnancy outcomes for Black women in Chicago.

Another study conducted by this group focused on suburban migration (i.e., mothers who were born in Chicago and moved to the either Cook county suburbs or "collar counties" prior to delivering their child) (Collins et al., 2013). This study found that women who migrated to the suburbs (relative to those that did not) had lower risk of preterm birth for Black women. This effect was moderated by neighborhood income. The protective effect of migration was only present for women who moved *out of* low-income Chicago neighborhoods to moderate or high-income Suburban Cook County neighborhoods. Interestingly, the protective effect of suburban migration was not present at all for Black women who moved the furthest out of the city to the "collar counties."

The second type of design is cross-sectional. Bond and colleagues (2019) used birth certificate data to time (for example, first vs. third trimester) the exposure to residential relocation. Using propensity score matching, they found that compared to all other women, those who moved during the first trimester of pregnancy were at increased risk of low birth weight and preterm birth (Bond et al., 2019).

The third type of design is sibling matched designs that link at least two births to the same mother. These studies differ from the intergenerationally linked design because it requires a tighter residential interval (from first birth to second birth rather than from mother's birth to infant birth). The matched sibling design also differs from the cross-sectional design as women can serve as their own controls. These studies use matched designs demonstrate that *inter-pregnancy* residential relocation may have important implications for health. In one such study, Bruckner et al. (2019) measure the association between inter-pregnancy upward residential

mobility and birth outcomes. The results indicate that upward residential mobility is associated with reduced odds of preterm birth compared to no mobility (aOR=0.83, 95% CI: 0.74-0.93). In a follow-up paper using a similar design, Gailey and colleagues (2021) find that downward mobility is associated with poorer birth outcomes and importantly, is partially predicted by neighborhood affordability. This design does not specify the timing of the exposure to residential mobility, but it suggests that moving from one neighborhood to another in the timeframe between pregnancies may have important implications for pregnancy outcomes. None of these studies specify whether the moves were voluntarily which is a key component in displacement but taken together, they do provide evidence that residential relocation may be an important stressor or protective factor depending on the residential context to which a woman moves.

Two additional studies using matched sibling design are important to discuss because, to my knowledge, they are the only studies that examine individual-level household displacement and preterm birth. Their findings also suggest that regional resegregation may impact birth outcomes, although in different ways which I explain below.

The first study (Kramer et al., 2012) examine policy-induced displacement via public housing redevelopment in Atlanta. Kramer et al. (2012) examined the birth outcomes of women in Atlanta who experienced housing transitions because of public housing demolition beginning in the mid-1990s. Women who had 1 singleton birth 12 months before and at least 1 singleton birth after the transition into the private market were included in the sample. The authors measured two types of housing transitions. First, any type of transition not associated with policy changes (public to public; private to private; private to public) and second transition from public housing to private market. The results show that transitioning from public housing, likely because of demolition, was associated with low birth weight for gestational age but not preterm low birth weight. This study has relevance for understanding racial resegregation because public housing demolition is one process by which low-income Black city residents were expelled from cities across the country.

The second study on displacement and pregnancy outcomes focused on mortgage foreclosures in California (Downing & Bruckner, 2019). The authors linked individual-level foreclosure data during the subprime lending crisis to addresses on birth certificates in the state of California. They found that birthweight for gestational age (BWGA) was lower for infants born during or after the foreclosure process compared to their siblings born before the foreclosure process began. The authors were able to estimate when in the duration in the pregnancy women were exposed to the foreclosure process and women were able to serve as their own controls. This form of displacement is relevant to the study of resegregation in Northern California because the racial disparities in foreclosures can be seen as a *consequence of resegregation* (Schafran, 2013). The extent to which women who relocate to suburban counties are at greater risk for foreclosure also puts them at increased risk for adverse pregnancy outcomes. Unfortunately, Downing and Brucker's analysis does not account for the racial and spatial dynamics of displacement by foreclosure (though they mention in the text that "Hispanic" households were far more likely than other households to experience foreclosure during the crisis). Other studies of the foreclosure crises demonstrate that California cities with increasing Black and Latinx households had the highest rates of foreclosure in the state (Rugh & Massey, 2010; Schafran, 2013).

2.5.4. Potential Pathways Linking Gentrification, Residential Mobility and Preterm Birth

Gentrification, as a source of racialized economic exclusion, may affect several social stressors that, in turn, influence preterm birth. These stressors are related primarily to financial strain that may be exacerbated as gentrifying neighborhoods become increasingly expensive. Housing insecurity is a social stressor that may negatively impact pregnancy outcomes among Black women. A study of young mothers in New York City found that housing instability defined as multiple moves was a significant predictors of low birth weight (Carrion et al., 2015). A 2019

study used propensity score matching to assess the effect of housing instability on preterm birth (Pantell et al., 2019). The authors found that women with housing instability designated on hospital discharge records had higher odds of preterm birth compared to presumably stably housed women (Pantell et al., 2019). This pathway may additionally operate through maternal mental health as housing insecurity may influence depression and other mental health disorders (Marcal, 2018; Suglia et al., 2011).

Another pathway that may link gentrification to preterm birth through financial strain is access to healthcare. As neighborhoods become more expensive, residents may make tradeoffs between financial burdens. For example, forgoing medical service to pay for housing or other bills. This may especially be the case with women who have inconsistent healthcare coverage. The only study to date that examines gentrification and healthcare utilization found that individuals displaced from gentrifying neighborhoods are more likely to visit the emergency department (ED) than those that remain (Lim et al., 2017). The authors concluded that displacement has a negative impact on health as displaced people need to visit the ED more frequently. While this is likely the case, it does not follow, as the authors suggest, that gentrifying neighborhoods are not hazardous to health *because* remaining residents use the ED less frequently. Another study suggests that Black women in neighborhoods with low deprivation, which could be a proxy for a gentrified neighborhood, are more likely to have no or delayed prenatal care (Cubbin et al., 2008). Other studies suggest that housing unaffordability is a barrier to healthcare utilization (Reid et al., 2008).

2.6. Summary and Situating the Proposed Study

The etiology of preterm birth is complex which helps to explain why it is not fully understood. Preliminary evidence suggests that stress plays an important role. Racism-related stress may

partially explain why Black people have higher rates of preterm delivery than white people. Racism-related stressors can operate at multiple ecologic levels including the individual, the neighborhood, and the geographic region. Much scholarly attention has been given to the relationship between neighborhood inequality and preterm birth. This rich body of literature demonstrates that adverse birth outcomes map on to various spatial expressions of racialization including segregation, concentrated poverty, and racialized economic polarization. Gentrification can be thought of as another manifestation of spatialized inequality.

This review reveals that the body of research examining the relationship between gentrification and preterm birth is small and inconsistent. I identified three important gaps that, if addressed, will advance understandings of how spatialized inequality might influence preterm birth.

Gap 1: Commonly used measures of gentrification fail to capture how it is a dynamic, staged process. Both studies that examine gentrification explicitly use a measure that may misclassify neighborhoods as not gentrify*ing* if they have already been gentrif*ied*. These measures treat neighborhoods that may have become increasingly exclusionary since gentrifying in previous time periods as irrelevant to the study of gentrification. In this study, I used a robust measure of gentrification that differentiates between 4 stages of exclusion across two types of neighborhoods: low-income and moderate-to-high income neighborhoods.

Gap 2: The current literature does not assess potential causal pathways from gentrification to preterm birth. Gentrification is theoretically and empirically linked to stressors that influence the distribution of preterm birth such as housing insecurity and lack of access to healthcare. No studies to date have examined pathways between gentrification and preterm birth. To respond to this gap, I tested whether the relationship between gentrification and preterm birth is partially explained through housing insecurity or prenatal care.

Gap 3: A paucity of studies examine residential mobility in relation to resegregation and preterm birth. Segregation is most apparent at the neighborhood level, however regional-level forces can drive new patterns of racialized spatial inequality. In the case of the San Francisco Bay Area, a stark pattern of racial resegregation has emerged. This pattern of constrained mobility has yet to be examined as a determinant of birth outcomes. To address this gap, I examined whether inter-pregnancy residential mobility relative to resegregation is associated with preterm birth.

CHAPTER 3: THEORETICAL FRAMEWORK

3.1. Overview

The theoretical framework for this dissertation draws on ecosocial theory and critical race theory to hypothesize the relationships between gentrification, residential mobility, and preterm birth. This chapter consists of seven sections. In the second section, I briefly discuss the strengths and limitations of the two main perspectives used to explain the relationship between racialized spatial inequality and preterm delivery: the psychosocial stress perspective and the sociopolitical perspective. In the third section, I outline the core constructs in ecosocial theory, a framework that weds the psychosocial stress and the sociopolitical perspectives. Ecosocial theory additionally builds on these perspectives to posit that inequality operating at multiple spatio-temporal scales produces and reproduces patterns of preterm delivery through embodiment. In the fourth section, I describe the public health critical race praxis and explain how I draw on it to select study constructs, and guide study design. In the fifth section, I present the study conceptual model. In this section, I describe the study constructs and the hypothesized relationships between them. In the sixth section, I outline the study research aims, questions and hypotheses. In the seventh and final section, I summarize the chapter.

3.2. Current Theoretical Perspectives

3.2.1. *Psychosocial Stress Framework*

The psychosocial stress perspective is which is a theoretical orientation primarily concerned with how social stressors shape health and wellbeing (Pearlin, 1989; Pearlin et al., 1981, 2005). It is a useful framework to explain the relationship between racialized spatial inequality and pregnancy outcomes given the extensive evidence that stress—both chronic and

acute—is associated with preterm birth (Dole et al., 2003; Dunkel Schetter, 2011; Koning & Ehrenthal, 2019; Mendez et al., 2014; Nkansah-Amankra et al., 2010; Sealy-Jefferson et al., 2019). Stress theory posits that social stress is a normal part of everyday life. But stressful events and environments are rooted "structural contexts" (Turner et al., 1995, p. 105). According to this framework, socially oppressed groups are more vulnerable to stress due to greater exposure to stressors and constrained resources to cope with stress (Aneshensel, 1992). The psychosocial perspective acknowledges the role of racial discrimination as a source of stress for minoritized communities. For example, Harrell (2000) offers a multidimensional framework for racism related stress. Drawing from this compelling model, scholars have argued that neighborhood-level racism (i.e., segregation) is a source of chronic stress for Black women and has detrimental effects on pregnancy outcomes such as preterm birth and low birth weight (Dominguez, 2008; Misra et al., 2017).

There are differences among specific theories within the psychosocial framework but what they have in common is that they direct attention to how individuals respond—biologically or behaviorally—to stress. The focus on "stressed people in need of psychosocial resources" is apparent (Krieger, 2001, p. 670). Less attention is given to who or what is distributing stressors and/or resources to buffer stress. Social stress theory, for example, acknowledges that stressors are not equally distributed but focuses on the effects of the distribution rather than the causes. This limits knowledge about how health inequalities are produced and, ultimately, the type of interventions available to promote health equity.

3.2.2. Sociopolitical Perspective

The sociopolitical perspective combines political economy, political power, and relative social position to explain distributions of health and disease across populations. This perspective attends to class exploitation and the production of health inequalities. Underlying this perspective is the notion that political and economic institutions are responsible for

differentially allocating privilege and deprivation through racial and economic segregation (Doyal & Pennell, 1979; Navarro, 2007). This approach has elucidated important macro-level trends related to pregnancy outcomes. The differential allocation of health-promoting resources and health harming exposures partially explains disparities in in pregnancy outcomes (Wallace et al., 2016). Additionally, redistributive policies are associated with improvements in particular population health indicators including infant mortality (Navarro et al., 2006).

The sociopolitical perspective is invaluable to the study of health inequalities because it is necessarily concerned with social justice. However, it is limited in that it does not fully link the macro-level political determinants to the actual biology of health outcomes. Additionally, it lacks specificity in highlighting which policies have the potential to reduce health inequalities "above and beyond securing adequate living standards" (Krieger, 2001).

3.3. Ecosocial Theory

Ecosocial theory is a multilevel framework used to explain health inequalities (Krieger, 2014). Ecosocial theory links and builds on the psychosocial and the sociopolitical perspectives to elucidate how social patterns, processes, and decisions influence the distribution of health and disease across ecologic (micro to macro) levels, spatial scales (household to global) and throughout the life course (birth through death). Ecosocial theory has been used to understand how preterm birth is influenced by segregation at multiple scales (Kramer, 2015) mass incarceration (Jahn et al., 2020), and the very use of the race concept in research (Eichelberger et al., 2018).

3.3.1. Ecosocial Theory Core Constructs and Related Propositions

The first core construct of ecosocial theory is *embodiment* which refers to the notion that people's bodies engage with and "incorporate" physical and social environments. This includes, but is not limited to, how societal relations can create social groups vis a vis each other, that

have biological consequences. Thus, ecosocial theory embraces biology, but biology is not the dominant lens of analysis. Instead, ecosocial theory emphasizes that factors determining the societal distribution of health and disease (1) are exogenous to individuals, and (2) “manifest at different levels and involve multiple spatiotemporal scales” (Krieger, 2014, p. 215). Thus, from an ecosocial perspective, one cannot understand the distribution of health and disease without analyzing it within its dynamic context. This contextualization suggests that explanations must go beyond disease mechanisms.

The second core construct of ecosocial theory is that there are *multiple pathways of embodiment*. These pathways are structured by “societal arrangements of power and property” and “the constraints and possibilities of human biology” (Krieger, 2001, p. 672). In other words, the pathways through which health and disease profiles can be explained are historically and biologically contingent. Krieger outlines six specific pathways that can be considered relevant for analyzing the distribution of health: social and economic deprivation, hazardous exposures, discrimination and other trauma, marketing of harmful products, inadequate health care and “degradation of ecosystems” (Krieger, 2014, p. 223). Related, the third core construct is the *cumulative interplay of exposure, susceptibility, and resistance across the lifecourse*. This construct helps to explain why individuals with similar exposures may have different health outcomes. Variation in psychosocial resources as articulated by the psychosocial perspective, biological susceptibility and active resistance all play a role.

The fourth core construct, *accountability and agency,* emphasizes the importance of assigning accountability for health inequalities and acknowledging the capacity to act to confront inequalities at all levels. This construct also refers to the importance of being critical of the tools used to measure, interpret, and explain health inequalities. The practice of a reflexive epidemiology will improve the ability to contextualize understand and explain study findings.

3.3.2. Spatializing Ecosocial Theory

"Ecosocial theory suggests that inequitable patterns of pregnancy outcomes within and between populations must be viewed in a spatio-temporally dynamic, relational, and multi-level framework" (Kramer, 2015, p. 279). This suggests that research must be attentive to how exposures and their meaning change over space and time. But in attempts to spatialize ecosocial theory, research has used spatial variations of segregation measures. These measures, however, do not account for how newer forms of exclusion and deprivation shape birth outcomes among Black women. To address this gap, I draw on critical race theory to situate gentrification and displacement as spatial manifestations of racism.

3.4. Critical Race Theory

Critical Race Theory (CRT) is body of work concerned with power dynamics undergirding racism and racialization, the ascription of racial meanings to non-racial phenomena, in the law and social institutions. Critical Race Theory was developed in the U.S. in the 1980s by legal scholars who questioned the ability of nondiscrimination and civil rights law to substantially change the material lives of Black Americans (A. P. Harris, 2015). Critical race theorists mobilized in response to two issues: first, the institutional racism in elite law schools and, second, the failure of critical legal studies, a leftist legal movement, to include race in their critique of liberalism (Valdes et al., 2002). Critical Race Theory emerged as a theoretical lens through which to examine racialized social structures and interactions to understand and transform the relationship between race, racism and power (Delgado & Stefancic, 2012).

Critical Race Theory has explicitly been applied to health sciences research in the past decade to examine the role of racism and racialization in health research and outcomes (Bridges et al., 2017; Ford & Airhihenbuwa, 2010a, 2010b, 2018; Graham et al., 2011). The public health critical race praxis (PHCR) is one approach for incorporating tenets of CRT into public health research (Ford & Airhihenbuwa, 2010a, 2010b, 2018). PHCRP "combines theory,

experiential knowledge, science and action" to inform scholarship on the root causes of health disparities (Ford & Airhihenbuwa, 2010a)

This study draws components of focus one, *contemporary race relations,* of the guided PHCRP framework to explain how gentrification and resegregation have come to be important manifestations of racialized spatial inequality impacting the well-being of Black people. Ecosocial theory contends "socially structured casual links between exposures and outcomes can vary over time and place" (Krieger, 2014, p. 216). PHCRP builds on this notion as it underscores the need to understand how racism operates contemporarily. For example, not only does the link between segregation and health change over time but segregation, itself, changes. We cannot fully grasp how racism patterns health and disease—let alone respond to and eliminate racial inequalities—if we fail to consider how racism is operating in the time period of interest (Ford & Airhihenbuwa, 2010a). In the following subsection, I will first describe racialized spatial exclusion as a key form of systemic racism. Then, I will describe neoliberal racism that is embodied in processes of gentrification and uneven redevelopment.

3.4.1. Contemporary race relations

Racialized spatial exclusion is a key form of systemic racism. The link between race, racism, and property in what is now the United States was established in the genocide of Indigenous peoples for the expropriation their land and the enslavement of Africans (C. I. Harris, 1993). Key to the control of property and its benefits is the ability to exclude undesirables (Lipsitz, 2011). Indeed, exclusionary rights is what makes whiteness, itself, a form of property. Black communities have been excluded from owning property on equal terms (Coates, 2014), accumulating wealth from property, and retaining property. Additionally, spaces designated as "Black" have been treated as unhealthy (Swope, 2018), dangerous, and blighted, on one hand or empty frontiers devoid of humanity on the other (Bledsoe & Wright, 2019). Both of these

characterizations have justified the systemic dismantling of Black spaces (Goetz, 2011) resulting in further racialized exclusion (Anderson, 2015; Fullilove, 2001; Fullilove et al., 2016). Gentrification, then, can be situated in the historical trajectory of dispossession and displacement of Black communities in the United States (Fullilove & Wallace, 2011; Hyra, 2012).

Critical Race Theory additionally offers the perspective that current race relations are both historically rooted *and* taking on new forms. In the case of gentrification, I shift the lens to the neoliberal racial order as articulated by Dawson and Francis (2016). The neoliberal racial order refers to the myriad ways in which policy agendas emphasizing markets, privatization, and personal responsibility reproduce racism and reform race through ostensibly race-neutral stances. According to Dawson and Francis,

> Neoliberal ideology, by stressing the virtues of free markets and excessive consumerism, redirects attention away from the havoc caused by the intertwined history of white supremacy and capitalist economic structures. There is little need to attend to the complicated history of race in making corporate decisions since we have moved passed its fraught legacy.

Neoliberalism is often characterized by a rollback of the state power and government functions (Brenner & Theodore, 2002). But, in actuality, it calls for the use of state power and resources to facilitate the market, manage capital flow, and advance the agenda of private enterprise (Hackworth, 2007; Harvey, 2007). I do not intend to evoke neoliberalism as a meta theory or a stand in explanation of everything (and, thus, nothing) (K. Bell & Green, 2016). I used it to contextualize how racism and racialization continue to operate through urban redevelopment policies and practices in a colorblind manner (Mele, 2013; Phinney, 2020; Triece, 2018; Weber, 2002). The urban crises experienced in recent years from the subprime housing collapse to the displacement crisis can be seen through the lens of neoliberal restructuring of urban space

(Diamond, 2020; Schafran, 2013, 2018). In the San Francisco Bay Area, this restructuring has "led to new forms of racialized exurbanization, pushing poor and working-class communities of color into the suburbs" (McElroy & Szeto, 2017, p. 13). Gentrification is one part of this larger exurbanization, or racial *re*segregation.

3.5. Dissertation Conceptual Model

Figure 3.1. Conceptual Model of Gentrification, Residential Mobility and Preterm Delivery

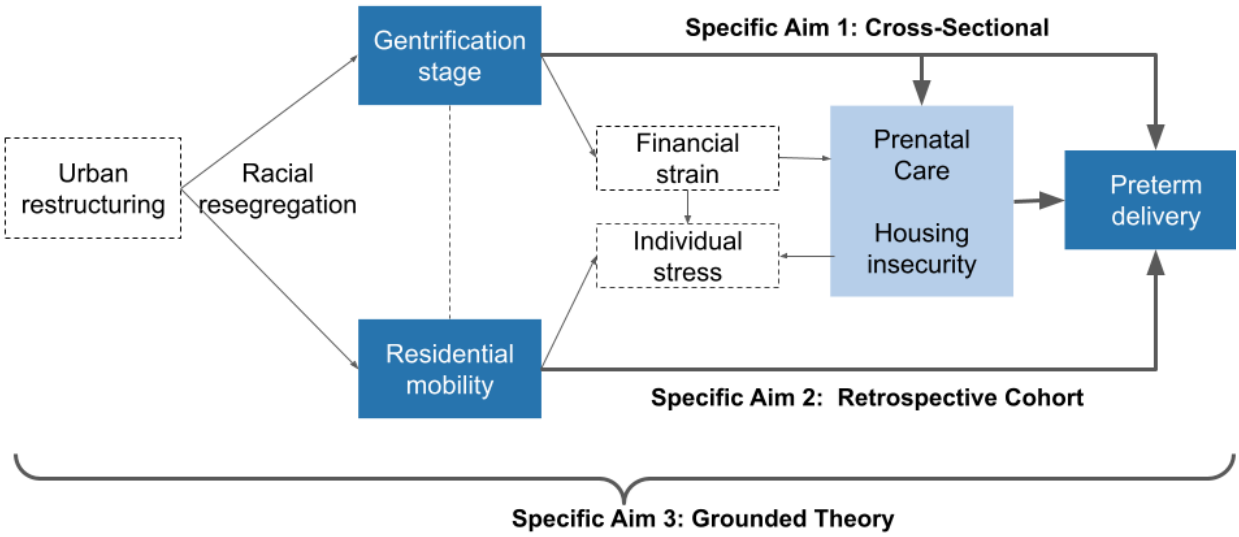


Figure 3.1 outlines the relationships explored in the dissertation project. Resegregation is a process produced by urban restructuring. Resegregation produces two interrelated visible manifestations of racialized spatial inequality, first gentrification of the inner region cities, and *residential mobility* which refers to the patterns of Black migration. Both these measures of inequality impact individual-level stress and increase risk of preterm delivery. ***Gentrification stage*** refers to the level of gentrification that a neighborhood is undergoing. Because gentrification is a dynamic and historical process, neighborhoods can undergo multiple stages of 'upgrading'. These iterations of gentrification can compound on each other creating what Lees

describes as “super-gentrification” (Lees, 2003). I expect residence in low-income neighborhoods with more advanced gentrification to be positively associated with preterm birth risk.

In addition to the expected direct association, I explored potential pathways through which this relationship might operate. I expected that the relationship between gentrification stage and preterm birth was mediated by ***prenatal care*** and ***housing insecurity***. Gentrifying neighborhoods are characterized as having increasingly expensive housing and amenities. Residing in one such neighborhood may force women to make financial tradeoffs to conserve funds. I expected residence in advanced gentrifying neighborhood was negatively associated with prenatal care for Black women. I expected that women in more advanced gentrifying neighborhoods to be more likely to experience housing insecurity which, in turn, may increase their risk for preterm birth.

Gentrification is a part of a larger restructuring of the Bay Area. The decades-long pattern of Black residents moving from the “inner” region to the “outer” region has been referred to as the “Black Exodus” (Anti-Eviction Mapping Project, 2019). This process has been described as following patterns of racial “resegregation” (Samara, 2016; Schafran, 2018) and “racial banishment” (Roy, 2019). ***Racial resegregation*** refers not only to spatial separation but to the process of inequitable allocation of land, power, and resources. The configuration of space is central to racialization processes but it does not follow that we can reconfigure space and solve the racism problem, we have to deal with the *processes* themselves (DeFilippis, 2017). Racial resegregation in this sense is a proxy for uneven development in the Bay Area. As certain areas experience gains in income, others experience increases in racialized poverty. Thus, I expect that women who experience ***residential mobility*** in patterns that follow resegregation to be at greater risk for preterm birth relative to women with different residential

trajectories. Finally, I conducted qualitative interviews to uncover mechanisms that may explain the links between regional racial inequality and preterm birth risk among Black birthing people.

Table 3.2.
Conceptualization of Neighborhood and Household Stressors

Key Concepts	Definition
Urban restructuring	A multidimensional ongoing process driving the major transformations in cities and regions "affecting spaces unevenly and people unequally" (Soureli and Youn, 2009 p. 36).
Racial resegregation	A regional restructuring process of racialized allocation of land, resources, and political power.
Gentrification	A multidimensional neighborhood-level process consisting of capital investment as well as the exclusion and replacement of low-income people and people of color
Residential mobility	Moving from one residence to another
Financial strain	An imbalance between income and outgoing funds to maintain material needs
Housing insecurity	The inability to stay in a housing unit for an extended period
Individual stress	The processing state of an individual in response to (often negative) external stimuli
Prenatal Care	Healthcare visits with obstetrician (or other birth professional) during pregnancy
Preterm Birth/Delivery	Birth before 37 completed weeks' gestation. Used as a marker of "prematurity"

3.6. Research Aims and Hypotheses

Aim 1. Determine whether neighborhood-level gentrification stage is associated with preterm birth among Black birthing people in Northern California

H1.1. Residence in a low-income tract with advanced gentrification was *positively* associated with preterm birth relative to low-income neighborhoods at risk of gentrification controlling for individual characteristics.

H1.2. Residence in a high-income tract with advanced exclusion was *negatively* associated with preterm birth relative to high-income neighborhoods at risk of exclusion controlling for individual characteristics.

Aim 1.a. Determine whether any association between gentrification stage and preterm delivery is mediated by housing insecurity among Black birthing people in Northern California

H1.3. Housing insecurity will partially explain the positive association between residence in a low-income tract with advanced gentrification and odds of preterm delivery controlling for individual characteristics.

Aim 1.b. Determine whether the association between gentrification stage and preterm delivery is mediated by prenatal care among Black birthing people in Northern California

H1.4. Adequacy of prenatal care will partially explain the positive association between residence in a low-income tract with advanced gentrification and odds of preterm delivery controlling for individual characteristics.

Aim 1.c. Determine whether the whether the association between gentrification stage and preterm birth is moderated by WIC participation.

H1.5. The association between gentrification stage and preterm birth would be stronger for WIC participants (i.e., individuals with low income).

Aim 2. Explore residential mobility patterns relative to resegregation and preterm birth among Black birthing people in Northern California.

H2.1. Inter-pregnancy residential mobility was associated with preterm birth.

H2.2. The association between residential mobility and preterm birth will be present among women who move from cities experiencing Black population loss to those experiencing Black population gain (i.e., out-migration).

H2.3. The association between residential mobility and preterm birth was moderated by WIC participation at Time 1.

Aim 3. Identify potential mechanisms linking resegregation and preterm birth risk among Black women in Northern California.

3.7. Summary

The conceptual model for this dissertation draws from ecosocial theory and Critical Race Theory to hypothesize that advanced gentrification and residential mobility to resegregated cities was associated with poor birth outcomes among Black women. These hypotheses are grounded in the perspective that political economic processes that increase racialized spatial inequality differentially allocate health promoting resources and increase the likelihood of exposure to stressors that may impact preterm birth. The following chapter outlines how I accomplished the three aims.

CHAPTER 4: METHODS

4.1. Overview

This dissertation builds on previous research that examines the relationship between spatial inequality and preterm birth. The study addresses important gaps in the literature by using a comprehensive measure of neighborhood exclusion (i.e., gentrification), focusing on a population disproportionately impacted by it, Black women, and using quantitative and qualitative methods to examine the influence of regional spatial inequality. This chapter outlines the methodological approaches used to address the research aims. It consists of eight sections. In Section 4.2, I provide the rationale for the study design. In Section 4.3, I describe the population and setting of the study. In Section 4.4, I describe each data source. In Sections 4.5-4.7, I describe and provide the rationale for the analytic strategies I used to address each of the study aims. In Section 4.8, I discuss how I integrated the qualitative and quantitative findings.

4.2. Study Design

The study uses a convergent mixed-method design that draws from different samples for quantitative associational analyses (Aims 1 and 2) and qualitative analyses (Aim 3). This convergent mixed-method design seeks complementarity. Its objective is to maximize the strengths of each method and compensates for the limitations associated with using one method only (Small, 2011). Large quantitative datasets can reveal associations and qualitative data can uncover new hypotheses about causal pathways. There is considerable debate (see: Krantz, 1995) as to whether qualitative and quantitative methods can be productively integrated, but I take the position that the underlying logic of causal inquiry is compatible across the methods. This logic suggests that causation "tends to involve a long sequence of decisions, actions, and institutional patterns, […] that connect the treatment to the outcome" (Seawright, 2016, p. 57). Thus, the integration, rather than triangulation, allows for deeper understanding of

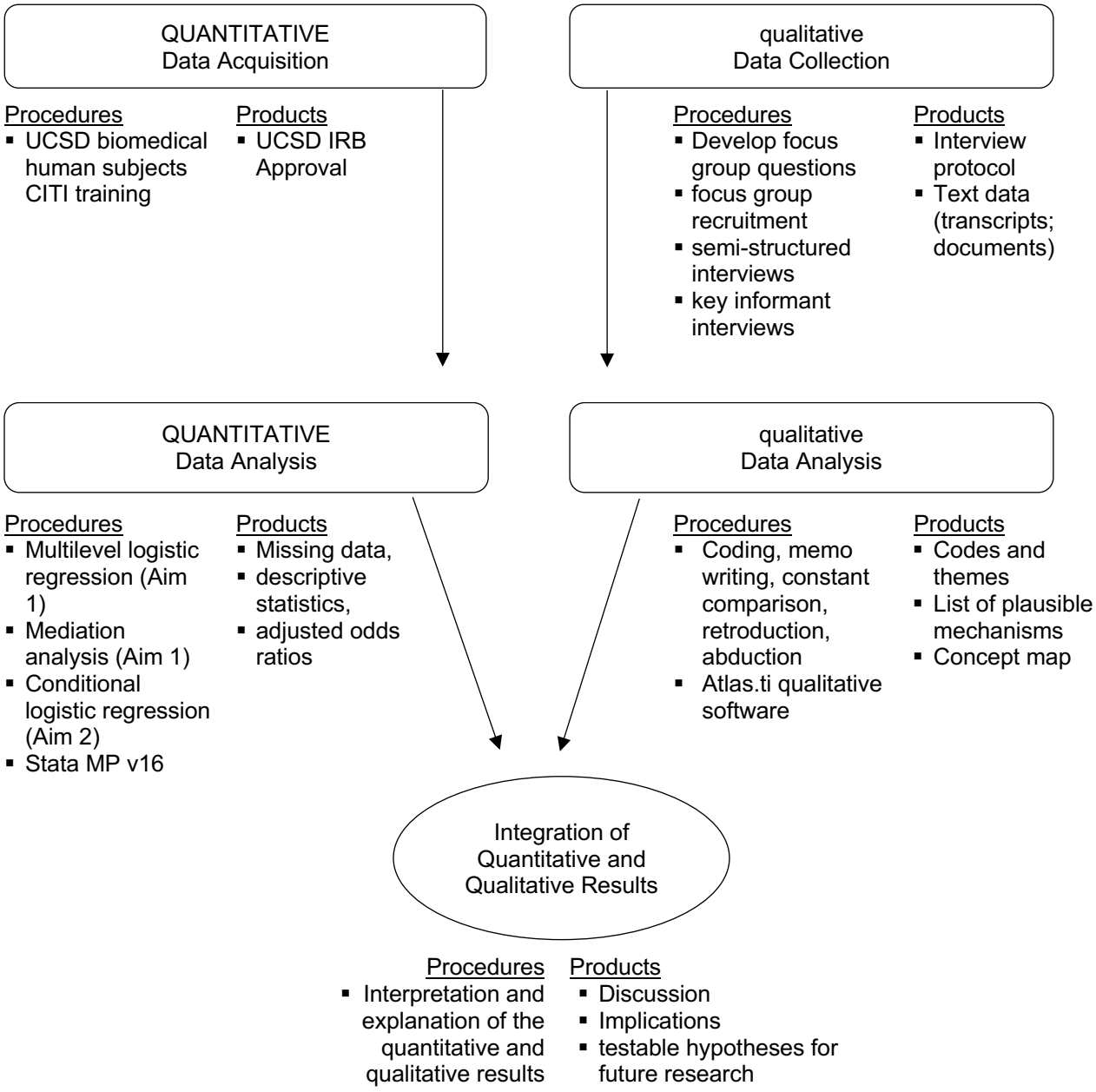
how one phenomenon is related to another. Figure 4.1. displays the procedures and products for each stage of the convergent mixed-methods design. QUANTITATIVE is capitalized to signal that the project will focus primarily on the quantitative analyses. The qualitative analyses were used to contextualize and explain the quantitative results in *Chapter 6: Discussion and Conclusions*.

For Aim 1, I used a non-experimental cross-sectional design to study the associations between neighborhood-level (i.e., gentrification) and individual-level (i.e., housing insecurity and prenatal care) explanatory variables and an individual-level pregnancy outcome (preterm birth) among Black birthing people.

For Aim 2, I used a retrospective cohort, matched sibling design to explore the relationship between inter-pregnancy residential mobility and preterm birth. This design is ideal to address this aim because it controls for individuals' previous pregnancy outcomes and prior residential contexts and compared to those who have move to resegregated areas of the region in-between pregnancies to those who did not.

For Aim 3, I used a grounded theory design to identify pathways Black birthing people believe may link racial resegregation and risk for preterm birth. I conducted primary data collection using semi-structured interviews with Black women, key informant interviews, and document analysis to explore pathways explaining the relationship between resegregation and preterm birth risk. The goals of Aim 3 were to explain the results from the quantitative analyses and generate hypotheses that can be tested in future research projects.

Figure 4.1 Visual Model for Convergent Mixed-Methods Design Procedure



4.3. Population and Setting

Study Population. The population for this study was Black birthing persons (i.e., individuals carrying a pregnancy) residing in the San Francisco Bay Area (See Appendix A).

Setting. The setting for this study was the San Francisco Bay Area which is an ideal region to study preterm birth among Black women and the processes of advanced gentrification. Preterm birth rates among Black women in the Bay Area varies across the 12 counties but are consistently higher than those of other racial groups (California Preterm Birth Initiative, 2020). The region is undergoing a third wave of gentrification referred to as Tech 2.0. The region is ideal to study the impact of gentrification and displacement for four main reasons. First, there is no scholarly or public debate as to whether gentrification is ongoing in the region. The Bay Area is characterized by both a large in-migration of upper-class workers and "creatives," forced displacement (i.e., out-migration) of working class, especially Black workers. According to one estimate, 83,000 Black residents have migrated out of the inner region of the Bay Area between 2000 and 2014 (Samara, 2016). The rising housing costs in the Bay Area are also consistent with typical understandings of gentrification in a U.S. context. Second, the patterns of resegregation happening in the Bay Area are happening in other regions in the country. Third, the Bay Area is ideal because housing justice activists, organizations and scholars in the Bay have produced a wealth of data that has not been developed at the same scale in other areas of the country. These data sources have been underutilized in public health research. Finally, the Bay Area, despite massive Black displacement, still has a sizable number of Black people. Twenty-six percent of the Black people (approximately 600,000) in the state live in the 12 counties that make up the Bay Area (U.S. Census Bureau, 2019).

4.4. Data Sources

Aims 1 and 2 rely on secondary data while aim 3 involves primary data collection.

San Diego Study of Outcomes in Mothers and Infants. For Aims 1 and 2, the main source of data on the outcome (i.e. preterm birth) intervening (i.e. housing instability and prenatal care) and control variables is the San Diego Study of Outcomes in Mothers and Infants (SOMI) database of birth records from all live births in California from the years 2011-2017 (*San Diego SOMI*, 2020). Each record in the SOMI database is linked to hospital discharge data from the Office of Statewide Health Planning and Development (OSHPD). The database also contains maternal identifiers allowing multiple birth records (i.e., siblings) to be linked to the same mother. Finally, mothers' addresses from birth records were geocoded to allow for linkage to Census data.

Neighborhood Change Database. The Neighborhood Change Database (NCDB), a longitudinal database compiled by the GeoLytics in partnership with the Urban Institute, provides long-form U.S. Census data at the tract level for the 1970, 1980, 1990, 2000, 2010 census and the 2006-2010 American Community Survey (Tatian, 2013). I used the NCDB to construct a 2010 measure of gentrification using the Urban Displacement Project's methodology and a 1990-2010 measure of racial resegregation. The NCDB is an ideal source for long-form census data because the data are harmonized to the 2010 census tract boundaries. This prevents the methodological challenges of dealing with inconsistent census tract boundaries as they have changed over time.

4.5. **Aim 1 Methods:** Determine if neighborhood-level gentrification stage is associated with preterm birth

4.5.1. Approach

For Aim 1, I used a cross-sectional non-experimental design to assess the relationship between *gentrification stage* and *preterm birth*.

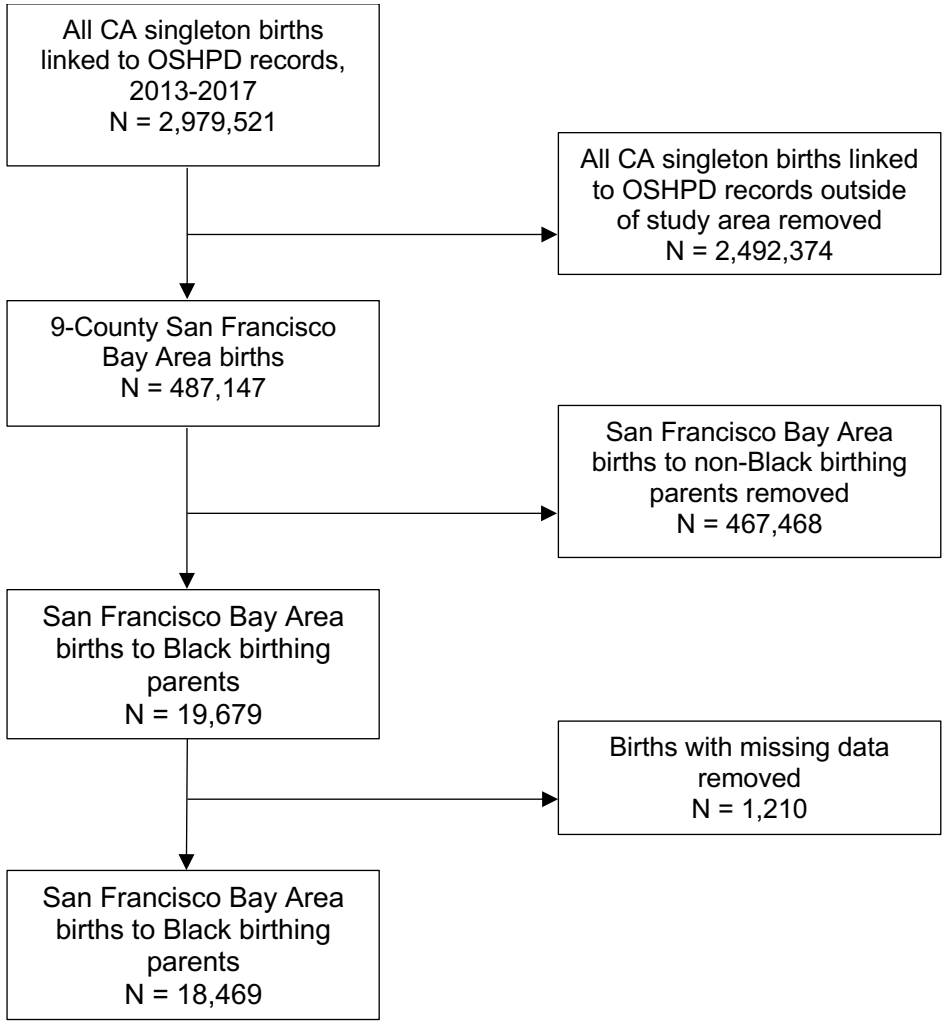
4.5.2. Sampling and Analytic Sample

The sample is drawn from the records of all women in the SOMI database who gave birth between 2013 and 2017 while residing in one of the nine counties that make up the San Francisco Bay Area (Appendix A). To be included, mothers had to have reported their race as Black/African American on their infant's birth certificate. The sample is inclusive of self-reported multi-racial women (N=3,107) who reported race as Black/African American and some other race/ethnicity. The sample excludes births to multiples (i.e., twins, triplets, etc.) and infants with congenital anomalies because both have increased likelihood of delivery prior to 37 weeks' gestation. The sample size for Aim 1 is n=28,820 individuals. To derive a sample that included multiracial Black women, I reviewed the raw self-reported race data from birth certificates. In these records, individuals were able to select up to 3 racial categories. First, I labeled each multi-racial category, then I created two variables, one (`subpop_black`) that included individuals who identified only as Black (i.e., no other racial or ethnic categories) and the other (`subpop_black_multi`) which was labeled 1 for Black alone and 2 for Black multiracial. I did not include hispanicity in the final variable but kept it separate. The final analytic sample derived from this process is N=18,469.

Given that this study is concerned with the ecological effects on individual outcomes, issues of selection bias may arise. At the contextual level, selection bias may occur if there is an inadequate representation of level-2 units (i.e., census tracts). There are limited concerns with selection bias because nearly all census tracts where births took place was represented in this sample. At the individual level, however, bias may arise if an ecologic variable influences

selection into the sample. Women living in gentrifying, expensive neighborhoods may choose not to have children. This may cause the sample to be biased to overrepresent women who are more able to afford to have children. Another form of selection bias occurs when women who have multiple pregnancies are overrepresented in the sample in a given time period (Platt & Buck Louis, 2011). To reduce this bias, I adjusted the standard errors to account for observation non-independence using the variance estimators command in Stata, `vce(cluster mom_id)`.

Figure 4.2. Aim 1 Sample Derivation Flow Chart



Note. Author received dataset with multiple births (i.e., twins, triplets, etc.) and births with infant congenital anomalies removed.

4.5.3. Measures

4.5.2.1. Dependent

Preterm birth is a binary variable < 37 weeks' gestation (0=no, 1=yes). It was obtained from the birth records from a hierarchy of sources: high quality clinical estimates from ultrasounds, obstetrician estimates from birth record and last menstrual period from birth record. For sensitivity analyses, I also created two additional outcome variables: *preterm birth type*, a categorical variable to differentiate between *extremely* (less than 28 weeks), *very* (28 to 32 weeks), and *moderate* (32 to 37 weeks) preterm birth as well as a continuous variable: *weeks' gestation*.

4.5.2.2. Independent

Gentrification stage.

At the census tract-level, *gentrification stage* was measured using the Urban Displacement Project's Neighborhood Displacement Typology (Zuk, 2015). The first step in the creation of the index was to divide census tracts into two categories based on the proportion of low-income households within them. Households are defined as low-income if they earned less than 80% of the county median income. Low-income tracts (LI) were defined as those in which 40% or more of the households are low-income. Moderate-to-high income tracts (MHI) were defined as those in which less than 40% the households are low-income.

After designating tract income, they divided them based on: [1] not losing low-income households or very early stages of displacement, [2] at risk of displacement, [3] undergoing displacement, and [4] advanced stages. Three different methodologies were combined to define gentrification at each of the stages and are described in Appendix B.

The following criteria were used to define gentrification between two time points:

a. Tracts had to have a population of at least 500 people at Time 1

b. Tracts were considered vulnerable to gentrification if they had at least three of the four characteristics
    - Proportion of low income is greater than the regional median
    - Proportion of college educated lower than the regional median
    - Proportion of renters is greater than the regional median
    - Proportion of nonwhite is greater than the regional median
c. Tracts experiencing demographic change between Time 1 and Time 2
    - Increase in proportion of college educated is greater than the region
    - Increase in median household income is greater than the region
d. Tracts experiencing investment between Time 1 and Time 2
    - Proportion of market rate units built between Time 1 and Time 2 is greater than the regional median
    - Increase in either:
        - Single family sales price per square foot is greater than regional median
        - Multifamily sales price per square foot is greater than regional median
        - Home value is greater than regional median

Table 4.1 summarizes the eight stages of gentrification based on the Urban Displacement Project's methodology. For the dissertation study, I used three specifications of neighborhood *gentrification stage*. The first is a categorical variable with seven categories. The second, which was limited to low-income tracts, was a categorical variable with four categories (0=not losing LI households, 1=at risk of displacement, 2=undergoing displacement, 3=advanced gentrification). And the third is limited to moderate-to-high income (MHI) tracts with three categories (0=not losing LI households, 1=at risk of displacement, 2=undergoing exclusion).

Table 4.1.
Urban Displacement Project Displacement/Gentrification Typologies

Low Income Tracts	Moderate-to-High Income Tracts
Not losing low-income households or very early stages ▪ None of the below characteristics	*Not losing low-income households or very early stages* ▪ None of the below characteristics
At risk of gentrification ▪ Strong housing market ▪ In transit-oriented development zone ▪ Old/historic housing stock ▪ Losing affordable housing units ▪ Employment center	*At risk of displacement* ▪ Strong housing market ▪ In transit-oriented development zone ▪ Old/historic housing stock ▪ Losing affordable housing units ▪ Employment center
Undergoing displacement ▪ losing low-income households ▪ losing naturally affordable housing ▪ decrease in low-income in-migration ▪ population size is growing or stable	*Undergoing exclusion* ▪ losing low-income households ▪ decline in naturally affordable housing *or* low-income in-migration ▪ population size is growing or stable
Advanced gentrification ▪ gentrified between 1990-2000 or 2000-2013 based on gentrification criteria: o vulnerability o demographic change o real estate investment	*Advanced exclusion* ▪ very low proportion of low-income households ▪ very low in-migration of low-income households

Note. Table adapted from Zuk 2015

4.5.2.3. Mediating Variables

Housing insecurity is a binary variable derived from hospital discharge data (0=no insecurity reported, 1=housing insecure). The International Statistical Classification of Diseases and Related Health Problems (ICD). social determinants of health screening tool includes two specific items related to housing insecurity (Torres et al., 2017). Based on the years of the data, I will use both ICD-9 and ICD-10 codes for "problems related to housing and economic circumstances" (ICD codes CDC 2020). Women with ICD-9 codes *V600 lack of housing* or *code V601 inadequate housing or V6089 Other specified housing or economic circumstances* on their hospital record was categorized as housing insecure. Women with ICD-10 codes *Z59.0 homelessness*, *Z59.1 inadequate housing*, or *Z59.8 other problems related to housing and economic circumstances* was categorized as housing insecure.

Adequacy of prenatal care was measured by the Kotelchuck index which combines two indicators: prenatal care initiation and number of prenatal visits into a summary score that captures the discrepancy between an individual's actual and expected number of visits based on their other numbers (Kotelchuck, 1994). The expected number of visits is based on the American College of Obstetricians and Gynecologists standards for prenatal care utilization for uncomplicated pregnancies (American Academy of Pediatrics & American College of Obstetricians and Gynecologists, 2017).

4.5.2.4. Other Variables

Moderating variables. I originally proposed to use education as a proxy for maternal SES however, in the SFBA, education is generally high and not a good indicator of SES. Therefore, I changed the moderating variable to *WIC participation* (binary) which serves as a better proxy for SES than education. Women who participate in WIC must earn below 185% of the Federal Poverty Level (FPL) which is $49,025 for a family of 4 (ASPE, 2021).

Control variables. I included control variables that are known to influence preterm birth. *Maternal age* is age at delivery. *History of preterm birth* and *history of small for gestational age* are binary variables included on the birth certificate. *Insurance payor* is a categorical variable (private, public, none). *Maternal birthplace* is a binary variable (born in USA or not). *Maternal education* is determined by mother's highest level of education. Categories include: less than high school, High school or equivalent, more than high school. *Smoking* is a binary variable that indicates if an individual smoked at any point during the pregnancy***.*** Though parity (birth order) is treated as a confounder in many studies on preterm birth, it may not meet the standard for a true confounder: (1) associated with the exposure, (2) associated with the outcome among the unexposed and (3) not on the causal pathway (Hernán et al., 2002). I did not control for parity because I conceptualize it as being on the causal path between gentrification and preterm birth.

I additionally controlled for county-level health expenditures. I calculated the annual county per capita health spending by averaging two fiscal years (July-June) of data for each birth (year of delivery and year prior to delivery). Data for this variable is provided publicly by the California State Controller's Office which provides open access data on California's expenditures by county dating back to FY 2002-2003 (California State Controller's Office, 2022b, 2022a). For each county and San Francisco, I added spending from four categories: Total public health, mental health, medical care, and drug and alcohol abuse services.

Table 4.2. Variables, Aim 1 (n=29,831), 2011-2017
Aim 1: Determine the association between gentrification stage and preterm delivery among Black women.

Name	Description	Type	Level	Data Source(s)
Outcome variables				
Preterm birth	Delivery < 37 completed weeks gestation 0 = no 1 = yes	Binary	1	SOMI/birth record
Preterm birth type	Type of preterm birth 1 = extremely (less than 28 weeks), 2 = very (28 to 32 weeks), 3 = moderate (32 to 37 weeks)	Categorical	1	SOMI/birth record
weeks' gestation	# of completed weeks' gestation	Continuous	1	SOMI/birth record
Exposure variables				
Gentrification stage	1 = LI - Not losing low-income housing 2 = LI - At risk of displacement 3 = LI - Undergoing displacement 4 = LI - Advanced gentrification 5 = MHI - Not losing low-income housing 6 = MHI - At risk of displacement 7 = MHI - Undergoing displacement 8 = MHI - Advanced exclusion	Categorical	2	Census, UDP
Gentrification stage_low-income tract	Stage of gentrification in low-income census tracts 1 = Not losing low-income housing 2 = At risk of displacement 3 = Undergoing displacement 4 = Advanced gentrification	Categorical	2	Census, UDP
Gentrification stage_high income tract	Stage of gentrification in moderate to high income census tracts 1 = Not losing low-income housing 2 = At risk of exclusion 3 = Undergoing exclusion 4 = Advanced exclusion	Categorical	2	Census, UDP
Mediating variables				

Housing insecurity	Lack of housing or inadequate housing on hospital records 0 = no 1 = yes	Binary	1	SOMI/OSHPD
Adequacy of prenatal care	Kotelchuck index (percent of expected prenatal care received.) 1 = Inadequate (received less than 50% of expected visits), 2 = Intermediate (50%-79%), 3 = Adequate (80%-109%), 4 = Adequate Plus (110% or more).	Categorical	1	SOMI/birth record
Moderating Variable				
WIC participation	Mother received WIC assistance at time of delivery 0 = no 1 = yes	Binary	1	SOMI/birth record
Control variables				
Maternal age	Mother older than 34 years old 0 = no 1 = yes	Binary		SOMI/birth record
Maternal education	Mother's highest level of education 0 = HS or less 1 = college degree or more	Binary	1	SOMI/birth record
Maternal birthplace	Born outside the USA 0 = no 1 = yes	Binary	1	SOMI/birth record
Insurance type	Payor of insurance 1 = no insurance 2 = public insurance 3 = private insurance	Categorical	1	SOMI/birth record
Smoking	Any smoking during pregnancy 0 = no 1 = yes	Binary	1	SOMI/birth record
History of preterm birth	History of preterm birth or other adverse pregnancy outcome 0 = no 1 = yes	Binary	1	SOMI/birth record
County health expenditures	Average of 2-year (year prior to birth and year of birth) annual per capita health expenditures	Continuous	3	DHCS

Note. LI= low-income census tract; MHI=moderate-to-high income census tract; UDP= Urban Displacement Project; SOMI=San Diego Study of Outcomes in Mothers and Infants database, OSHPD = California Office of Hospital Policy and Development; DHCS=California Department of Health Care Services

4.5.4. Analysis Plan

The first aim of the study is to determine if there is an association between gentrification stage and preterm delivery.

4.5.3.1. Data Preparation

Outcome data. Outcome data is provided by SOMI. The preterm delivery variable has been cleaned by prior investigators as have the covariates. The census tract variables were assessed in ArcGIS to ensure that each of the census tracts falls within the appropriate census place (i.e., city, town, or unincorporated place).

Exposure data linkage. Exposure data is provided by the Urban Displacement Project. The exposure variable was linked to birth record data via the many to one `merge` command in STATA. Gentrification is a dynamic process. Thus, the exposure data varies depending on the year. Deliveries between January 1, 2014 and December 31, 2015 were linked to the 2013 exposure variable. Deliveries between January 1, 2016 and December 31, 2017 were linked to the 2015 variable.

Sample derivation. I retained in the sample women categorized as "Black" on the birth records. I excluded the following from the sample, multiple births, and infants born with congenital abnormalities. Multiple births (twins, triplets, etc.) and those with congenital anomalies are at greater risk for preterm birth.

4.5.3.2. Descriptive Analysis

First, I described demographic, health care and neighborhood characteristics of the sample including age, education, marital status, insurance status, prenatal care, housing stability and gentrification stage. I calculated the number and percent of *preterm births* as well as the mean and SD for *weeks' gestation* (continuous).

4.5.3.3. Bivariate Analysis

I evaluated the unadjusted relationship between the exposure (gentrification stage) and the outcome (preterm birth) by cross-tabulating these variables (Table 4.6).

4.5.3.4. Multivariate Analysis

After conducting bivariate analysis, I prepared the data for multivariate analysis. The first step in this process was to calculate the intraclass correlation coefficient (ICC) to estimate the amount of variation in preterm birth between vs. within census tracts. An ICC value of zero suggests a one-level logistic regression analysis is appropriate. An ICC greater than zero indicates that there is variation between census tracts, which suggests a multilevel analysis is needed.

The intraclass correlation coefficient with the clustering at the census tract was 0.004 indicating a little variation in preterm birth across census tracts. Due to the small census tract ICC, I recalculated the ICC with clustering at the hospital-level. Conceptually, this would allow me to account for similarities among individuals who are delivering at the same hospitals who may be more similar than those living in the same neighborhoods. The hospital ICC was .066 indicating that there is more variation in preterm birth between hospitals than between neighborhoods; therefore, I conducted multilevel models with `hospital_id` as the clustering variable.

I used multilevel logistic regression to estimate the statistical relationship between *gentrification stage* and *preterm birth*. Odds ratios (ORs) and 95% confidence intervals will compare women living in census tracts with advanced gentrification to those living in neighborhoods at low risk of gentrification. Multilevel logistic regression is a common model used to assess area-level associations with preterm birth (Collins et al., 2015; DeFranco et al., 2008; Jahn et al., 2020; Messer et al., 2010; Nkansah-Amankra et al., 2010). A one-level logistic regression could be used but it would violate the assumption of independence of the residuals (Peugh, 2010). To determine which model was superior, I compared the 3 models: (1) single level, (2) multi-level clustered at the census tract, and (3) multi-level clustered at the hospital by comparing the AIC and BIC. I did not compare using likelihood ratio test because the models are not nested. In comparing the AIC and BIC amongst the models, the 3rd model (clustering at the hospital) had the lowest AIC and BIC indicating its superiority (Table 5.S1 in Appendix).

Aim 1 Sub-aims.

Aim 1: Determine if gentrification stage is associated with preterm delivery among Black women

Aim 1a: Determine whether this association is mediated by housing insecurity

> **Hypothesis 1a.:** The association between *gentrification stage* and *preterm birth* is partially explained by *housing insecurity*.

Aim 1b: Determine whether this association is mediated by housing insecurity

> **Hypothesis 1b.:** The association between *gentrification stage* and *preterm birth* is partially explained by *adequacy of prenatal care*.

I took the same approach to test the hypotheses 1a and 1b that two variables, *housing insecurity* and *adequacy of prenatal care,* are mediators in the relationship between gentrification stage and preterm birth. Ordinary least squares regression permits mediation analysis by adding intervening variables and comparing the coefficients. A smaller coefficient suggests that the impact of the predictor in the outcome is partially explained by the mediator. However, this is not possible with logistic regression as the logit scale is not fixed. Thus, changes in the coefficient reflect the additional variables and the rescaling, thus comparing coefficients after adding variables to the model is not meaningful (Aneshensel, 2013). Given these challenges, I used a mediation analysis technique described by Buis (2010). The method, which is adapted from Erikson et al. (2005), uses a counterfactual approach to compute direct and indirect effects in a logistic regression model. Specifically, this method (`ldecomp` in STATA) computes the direct effect by comparing the predicted probabilities of preterm birth across categories of neighborhood types, holding the probability of housing insecurity constant. The indirect effect is then estimated by comparing the predicted probabilities of preterm birth within one neighborhood type with the probabilities of preterm birth for the same group but assuming that the probabilities of housing insecurity are those of another neighborhood type.

4.5.3.5. Sensitivity Analysis to Address Potential Bias

To address the concern that logistic regression may overestimate effect size, I conducted a sensitivity analysis using multilevel OLS regression with a continuous outcome variable (*weeks' gestation*). To address potential selection bias induced by the inclusion of women with more than one birth in the dataset, I reran the analyses on nulliparous women (Platt & Buck Louis, 2011).

4.5.3.6. Data Management

Data was managed and analyzed using STATA 17.

4.6. **Aim 2 Methods:** Explore the association between residential mobility to resegregated cities and preterm birth

4.6.1. Approach

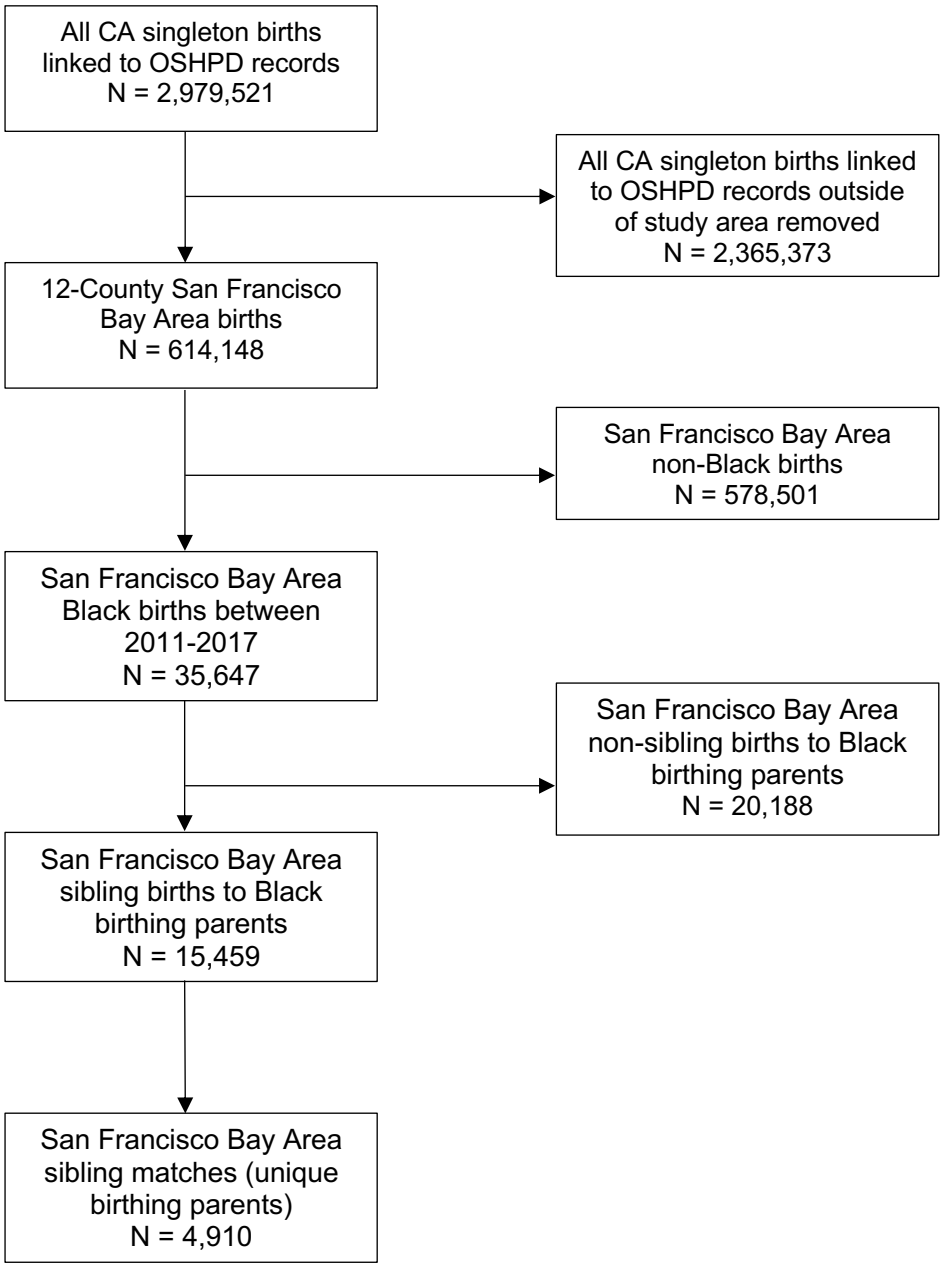
For Aim 2, I used a retrospective cohort, matched sibling study design to test the hypothesis that *suburban mobility* is associated with *preterm birth* among Black women.

4.6.2. Sampling and Analytic Sample

The sample is drawn from all women who have given birth between the years 2011-2017 residing in the 12 counties within the San Francisco Bay Area (Appendix A) who have Black/African American as their racial category on their infant's birth certificate. To test the hypotheses that residential mobility to racially resegregated places is associated with preterm delivery, I will use the SOMI data and limit the sample to women who have at least two births in the dataset to track residential mobility. The sample size for Aim 2 is n=4,910 sibling pairs. The overrepresentation bias discussed in Section 4.4.1 was eliminated for Aim 2 because each

sibling was matched to each other, and all non-siblings were removed from the dataset. Older siblings were used as controls for the younger siblings born after the residential relocation.

Figure 4.3 Aim 2 Sample Derivation Flow Chart



Note. Author received dataset with multiple births (i.e., twins, triplets, etc.) and births with infant congenital anomalies removed.

4.6.3. Measures

4.7.3.1. Dependent

Preterm birth is a binary variable < 37 weeks' gestation (0=no, 1=yes). This is obtained from the birth records from a hierarchy of sources: (1) high quality clinical estimates from ultrasounds, (2) obstetrician estimates from birth record and (3) last menstrual period from birth records. For sensitivity analyses, I used *weeks' gestation* as a continuous outcome variable.

4.7.3.2. Independent

Residential mobility. I created a residential mobility variable that captures the census place-level percent change in Black population at two time points. Census places (henceforth, cities) are cities, towns, and unincorporated areas smaller than the county subdivision. For each city, the percent change in Black population from 1990-2010 was calculated. I created a dataset containing the 182 cities in the region as observations using the Neighborhood Change Database merged with birth record data. First, I collapsed all census tracts to their corresponding city to get city-level population numbers. Then, I manually calculated the percent change (from 1990-2010) in the proportion of Black residents in each city in the 12-county study area. I used the formula RESEG = (R – P)/P *100 where R is the proportion of Black residents in a place at t_2 and P is the proportion of Black residents in a place at t_1. Table 4.9 displays the places (with complete information) with the highest Black population growth and loss in the 12-county region cross-tabulated with the 2010 population, and preterm birth rates.

Table 4.9. Census places extreme on Black population change in the San Francisco Bay Area, 1990-2010,

Place	% Black population change 1990-2010	Total population in 2010	% Black in 2010	Black preterm birth rate 2011-2017
Antioch	+ 635%	107,213	19%	11.2
Patterson	+ 1179.3	21,062	7.5	11.0
Oakley	+ 532.1	34,475	8.6	5.8
Atherton	+ 466.2	6,914	1.3	50*
Oakdale	+ 333.7	21,257	1.2	10
San Lorenzo	+ 276.9	24,867	6.7	5.4
San Francisco	-34.2	805,235	7.2	10.36
Berkeley	-36.6	112,580	11.8	10.2
East Palo Alto	- 55.7	29,126	17.7	11.7
Foster City	- 62.1	30,567	2.5	9.9

Note. *Only 2 births to Black women occurred in Atherton in the study period

The variable was then categorized into quartiles to determine which cities were experiencing Black population growth versus loss. Q1 represents places with greatest Black population loss and Q4 represents places with greatest population gain.

The residential trajectories collapsed into five mobility typologies. First, no mobility indicates that individuals live in a city with the same level of Black population change at both time points. Second, within inner region refers to residentials moves between cities losing Black population. Third, within outer region is residential mobility between cities gaining Black population. Fourth, out-migration indicates mobility patterns from cities losing Black population to those gaining Black population and finally, in-migration, refers to moves from cities gaining Black population to those losing Black population.

Table 4.10.
Residential Mobility Typologies

Typology	Residential trajectory	Description
No Change	No change in Q	live in a city with the same level of Black population change at both time points
Within Inner Region	Q1 ⇄ Q2	mobility between cities losing Black population
Within Outer Region	Q3 ⇄ Q4	mobility between cities gaining Black population
Out-migration	Q1 or Q2 → Q3 or Q4	mobility from cities losing Black population to those gaining Black population
In-migration	Q3 or Q4 → Q1 or Q2	from cities gaining Black population to those losing Black population

Note.

4.7.3.3. Other variables

Control Variables. The paired sibling design allows for time invariant maternal factors such as general health status to be controlled. Women with poorer health status may be more likely to relocate to segregated place than healthier women. To minimize this potential selection bias, I controlled for *preterm delivery* in the first birth before the residential relocation. Additionally, I will control for time-varying characteristics of the mother such as *maternal age*, *WIC participation*, *insurance type*, *education*, and *infant sex*.

Table 4.11. Variable Categorization, Aim 2 (n=4,910 unique birthing parents), 2011-2017
Aim 2: Explore residential mobility patterns relative to racial resegregation and preterm delivery among Black women

Constructs	Measures	Variable Type	Data Source(s)
Outcome variables			
Preterm birth (PTB)	< 37 weeks' gestation 0 = no 1 = yes	Binary	SOMI/Birth record
weeks' gestation	Continuous variable of number of weeks gestation	Continuous	SOMI/Birth record
Exposure variables			
Racial resegregation*	Place-level percent change in Black population	Continuous	NCDB
Racial resegregation*	Quartile of census place-level % change in Black population between 1990-2010 1 = Q1 (greatest Black population loss) 2 = Q2 3 = Q3 4 = Q4 (greatest Black population gain)	Categorical	NCDB
Residential mobility	Inter-pregnancy change in address 0 = no change 1 = within inner region (Q1 ⇄ Q2) 2 = within outer region (Q3 ⇄ Q4) 3 = out-migration (Q1 or Q2) → (Q3 or Q4) 4 = in-migration (Q3 or Q4) → (Q1 or Q2)	Categorical	SOMI/Birth record Geocoded
Control variables			
Maternal age	Mother older than 34 years old 0 = no 1 = yes	Binary	SOMI/Birth record
Insurance type	Payor of insurance 1 = no insurance 2 = public insurance	Categorical	SOMI/Birth record

	3 = private insurance		
WIC participation	Mother received WIC assistance at time of delivery 0 = no 1 = yes	Binary	1
Maternal education	Mother's highest level of education 0 = HS or less 1 = HS or equivalent 2 = college degree or more	Categorical	1
Smoking	Any smoking during pregnancy 0 = no 1 = yes	Binary	SOMI/Birth record

Note. NCDB=Neighborhood change database; SOMI= San Diego Study of Outcomes in Mothers and Infants; UDP=Urban Displacement Project; OSHPD= California Office of State Health Planning and Development
*Though resegregation is occurring at the regional level, it was measured at the census place (i.e., cities and towns) level.

4.6.4. Analysis Plan

The second aim of the study is to explore the association between residential mobility to resegregated cities and preterm delivery among Black women.

4.6.4.1. Data Preparation

Sibling linkage strategy. A probabilistic linkage strategy was used to identify siblings from all California birth certificates during the study time period. Linkage was first created using encrypted social security number and date of birth for the person giving birth. The quality of the match was scored based on the matching of other variables from hospital discharge and birth certificate records. These additional variables include: "name of the person giving birth (first, last, maiden), last name of the infant, last live birth date, infant birth date, residential address, hospital of birth, race/ethnicity, date of birth of person not giving birth (often identified as the father), last name of person not giving birth, in addition to other birth certificate variables that would be contained in both records such as gestational age/previous preterm birth, cesarean delivery/previous cesarean delivery, and total children born alive" (communication with Rebecca Baer, October 27, 2020). Exact matches on Social Security Number and DOB were given a score of 20 points. The quality of the match was scored based on all other matches mentioned

above to give a final match score. Matches with a score below a threshold of 60 were removed. Matches with the highest score were retained.

Sample derivation. Each mother (birthing parent) in the dataset was assigned a unique identifier based on the linkage strategy described above. To derive the linked sibling sample, I dropped all observations that only had one birth in the sample using the `duplicates` command in Stata.

4.6.4.2. Descriptive Analysis

First, I described the demographic, health, and residential characteristics of the sample including age, education, marital status, insurance status, prenatal care, health status, and residential patterns. I present frequencies and percentages for Time 1 and Time 2 for maternal characteristics.

4.6.4.3. Bivariate Analysis

Second, to assess whether residential patterns relative to resegregation are associated with preterm birth, I cross-tabulated the two variables. I reported the number of preterm births at Time 2 by quartile of Black population change at Time 1 and Time 2. Additionally, I reported the number and rate of preterm birth for each mobility category.

4.6.4.4. Multivariable Analysis

Third, I used conditional logistic regression to explore the relationship between constrained mobility and preterm delivery while controlling for individual-level risk factors. Conditional logistic regression is a common model used for matched designs, typically case-controls. In perinatal epidemiology, conditional logistic regression is used in matched-sibling designs to estimate the causal effect of an exposure occurring after the first birth (Bruckner et al., 2019; Downing &

Bruckner, 2019; Regan et al., 2019). Using the matched design, I can estimate whether risk for preterm delivery is higher than expected values when mothers relocate to resegregated cities.

Equation

$$ln\left(\frac{P}{1-P}\right) = ln\hat{o}^{Y+} = \beta_0 + \beta_1 mobility + \boldsymbol{X}_{ij} + \varepsilon$$

Where B_1 is the coefficient for women moving from Q1 or Q2 to Q3 or Q4 places. **X** is a vector of control variables.

4.6.4.5. Sensitivity Analysis

To address the concern that logistic regression may overestimate effect size, I conducted a sensitivity analysis using OLS regression with a continuous outcome variable (*weeks' gestation*). To explore the potential role of health selection, I examined whether preterm birth at Time 1 was associated with residential mobility type using multinomial logistic regression.

4.6.4.6. Data Management

Data was managed and analyzed using Stata 17.

4.7. **Aim 3 Methods:** Identify potential mechanisms linking regional inequality to preterm birth risk among Black women

4.7.1. Approach

The third aim of the study is to identify potential mechanisms linking resegregation to preterm birth risk among Black women. I used realist grounded theory approaches to address this aim. Realist grounded theory emphasizes the identification of social mechanisms to explain a phenomenon. It uses the techniques of grounded theory with the addition of abduction and retroduction (Hoddy, 2019; Oliver, 2012).

4.7.2. Protocol Development and Piloting

I used a semi-structured format that ensures both the coverage of specific topics and the flexibility to discuss topics not specifically mentioned. Protocol questions were developed with the goal of eliciting mediating mechanisms. The semi-structured in-depth interview guide included questions and probes organized into 5 categories (1) impressions of racial and class changes in the region (2) experiences with renting, owning, and/or homelessness; (3) navigating residential options in the region, (4) healthcare experiences before during and after childbirth; (5) transportation; and (6) social support and political engagement. The questions were guided by ecosocial theory and the review of the literature (Krieger, 2001, 2012). I piloted the protocol with a member of the Preterm Birth Initiative (PTBi) community advisory board and revised the questions as necessary.

4.7.3. Data Collection

Semi-Structured Interviews Sampling and Recruitment. The main data collection method was semi-structured interviews with Black women in Northern California. I originally proposed to conduct focus groups to better understand the experiences of Black birthing people who are navigating residential options for staying in increasingly expensive neighborhoods or relocating. Scheduling conflicts contributed to changing the data collection method to 1-on-1 semi structured interviews. Interview participants were compensated $50/hour for their time.

Theoretical and snowball sampling were used identify key informant and Black birthing people living in 12 Northern California: Alameda, Contra Costa, Marin, Merced, Napa, Sonoma, San Joaquin, Santa Clara, San Francisco, San Mateo, Solano, and Stanislaus. A member of the Preterm Birth Initiative community advisory board was hired as research assistant (RA) to recruit Black birthing people. Recruitment took place at post-partum group sessions facilitated by the RA. In addition to in-person recruitment, we used online recruitment via Facebook and

email listservs. Finally, I asked each interview participant to recruit other Black mothers who may be interested in participating in the study.

Key Informant Interviews Sampling and Recruitment. Prior to conducting the semi-structured interviews with Black birthing parents, I conducted key informant interviews. I use purposive sampling to identify birth workers, public health professionals, and researchers with expertise and experience in the study topics (housing insecurity, gentrification, and maternal and child health in Northern California). I recruited the key informants via email and conducted all interviews on Zoom. Appendix F lists key informants for the study

Memos. I wrote analytic memos throughout the data collection process. I memoed immediately following each interview to make note of important insights that may not have been captured in the transcript. Memos were entered in Atlas.ti v9 and analyzed for relevant codes and themes.

Documents and Literature. I systematically collected data from local newspapers, government documents, and academic and public scholarship that address the phenomenon of resegregation or demographic changes in Northern California. These documents were used to refine the protocol for the interviews and contextualize the participants' narratives. A list of documents is presented in Appendix G.

4.7.4. Analysis Plan

The analysis was informed by realist grounded theory approaches (Hoddy, 2019; Oliver, 2012). As explained below, the approach uses five key analytic techniques through the course of the analysis: (1) coding, (2) memo-writing, (3) constant comparison, (4) abduction and (5) retroduction.

4.6.5.1. Coding

Coding is the process by which raw data is transformed into theoretically meaningful categories (Creswell, 2013). Coding was performed by 3 coders (PI and two research assistants) to enhance reliability. We coded in two stages. In the first stage, we used open coding to develop a preliminary codebook that was stable and represented each of the coders' analysis. To achieve this, we read and openly coded one transcript from the interviews. After coding, we met and examined the codes, their names, and the text segments. This process formed the preliminary codebook. Then, we coded an additional transcript and compared codes. Intercoder agreement meant that all three coders agreed on the code to assign a particular passage (not necessarily that the exact same phrase was coded by each coder.

In the second stage, we used axial coding in which codes were related to one another to form central themes. Themes were analyzed in relation to the pathways outlined by ecosocial theory (Section 3.3.1). After all transcripts were coded, and codes collapsed into themes, I refined the codebook and reassessed all the transcripts with the new codebook.

4.6.5.2. Memo-writing

Throughout the data collection and analysis process, I generated informal analytic notes (i.e., memos) to critically reflect on the data and emerging insights. Memo-writing entails "analyzing your ideas about the codes in any and every way that occurs to you" (Charmaz, 2006, p. 72). Memos are analytic notes that capture thoughts, insights, comparisons, and connections the researcher makes through the act of writing. Memos were used as data in the abduction and retroduction phases of the analysis to support the identification of mechanisms.

4.6.5.3. Constant Comparison

Constant comparison refers to the continual checking of the data against other observations and of the previous literature. Here is where realist ground theory differs from a more traditional grounded theory. A realist grounded theory relies on previous literature in advance of data

collection and during data collection to support the identification of plausible mechanisms given what is known about the existing concepts and arguments related to neighborhoods, residential mobility, and preterm birth.

4.6.5.4. Abduction and Retroduction

Abduction and retroduction are two interrelated analytical tools. Abduction is the process of redescribing a phenomenon in terms of a particular theory to think about possible explanations within a conceptual framework or set of ideas. The set of ideas drew from ecosocial theory and critical realist concepts of structures, agency, and causal powers. Retroduction involves suggesting the most plausible explanations, describing these potential mechanisms and how they likely operate.

4.7.5. Data Management

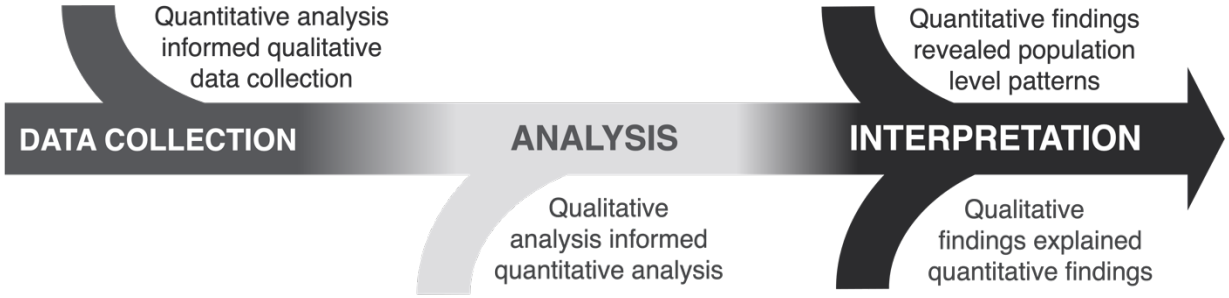
All interviews were transcribed verbatim using Otter.ai, an artificial intelligence transcription software. I performed a quality check on each transcript to ensure accuracy. This entailed listening to and editing each interview transcript (n=24) manually. All participants were assigned a unique identifier and pseudonym to maintain confidentiality. All transcripts were stored in a secured folder in Box, a password-secure cloud service available through the home academic institution; a backup copy was stored on an encrypted external hard drive. All qualitative data was analyzed with the assistance of Atlas.ti v9 software.

4.8. Integration of Qualitative and Quantitative Analyses

I analyzed the quantitative data during qualitative data collection. This facilitated integration of the two data sources at several points. First, the quantitative analysis informed the qualitative data collection. For example, when I found interesting or surprising results from the quantitative

data analysis, I sought explanations and reactions from interview respondents. Second, the quantitative analysis informed the quantitative analysis. For example, respondents with different income levels (high vs. low) reported different experiences with residential mobility, I reran the Aim 2 analysis with an interaction term to clarify the relationship between mobility and preterm birth by WIC participation. Finally, at the conclusion of all the data analysis, I integrated the qualitative and quantitative findings. I used the qualitative (Aim 3) findings to contextualize and explain the quantitative results (Aims 1 & 2). This allowed for a more complete understanding to emerge than that provided by the quantitative or the qualitative results alone.

Figure 4.4.
Visual representation of mixed methods integration during data collection, analysis, and interpretation



CHAPTER 5: RESULTS

5.1. Overview

This chapter presents the results by Aim. In Aim 1, the relationship between gentrification stage and preterm birth appears to vary by neighborhood income status. Among low-income tracts, residents of tracts undergoing advanced gentrification had lower odds of preterm birth compared to those residing in tracts at risk of gentrification. This association was not mediated by prenatal care or housing insecurity. In moderate-to-high income tracts, the association was not statistically significant. In Aim 2, out-migration was not associated with preterm birth. Instead, mobility between cities experiencing Black population growth was associated with higher odds of preterm birth. WIC participation moderated this association. In Aim 3, participants reported several mechanisms linking regional inequality and infant health, including (1) wealth and resource hoarding at different scales; (2) outsourcing of the social safety net; (3) policing of Black mothers and families; and (4) landlord discrimination and exploitation (5) community-driven resistance and advocacy.

5.1.1. Note on Terminology

Throughout the results, I use the term “birthing people” or “birthing parents” to refer to individuals whose records are recorded in the SOMI database because administrative data does not capture gender identity. Therefore, there are likely transgender men and nonbinary people included in the quantitative samples for Aims 1 & 2. I use the terms “women” and “mothers” to refer to participants in the in-depth interviews for Aim 3 because all participants were women. I expect some of the experiences described in section 5.4. will be relevant for transgender men and other birthing people. I also expect Black transgender men and Black gender

nonconforming people who give birth experience a range of issues related to housing healthcare and social support not experienced by the individuals in this study.

5.2. Aim 1 Results

Aim 1 sought to determine whether an association exists between gentrification stage and preterm birth among Black birthing people in the San Francisco Bay Area. Each original hypothesis and the corresponding set of findings are summarized below:

Hypothesis 1.1. *Residence in a low-income tract with advanced gentrification was positively associated with preterm birth relative to low-income neighborhoods at risk of gentrification controlling for individual characteristics.* Overall, the data do not support this hypothesis. Instead, the odds of preterm birth were *lower* for those residing in neighborhoods undergoing advanced gentrification.

Hypothesis 1.2. *Residence in a high-income tract with advanced exclusion is negatively associated with preterm birth relative to high-income neighborhoods at risk of exclusion controlling for individual characteristics.* Overall, the findings did not support this hypothesis. There was no difference in the odds of preterm birth among those residing in tracts undergoing exclusionary displacement vs. tracts in the early stages of exclusion.

Hypothesis 1.3. *Housing insecurity partially explains the association between gentrification and preterm birth.* The findings suggest this association is not mediated by housing insecurity. Instead, there is a slight suppression effect. Whereby, the association between gentrification and preterm birth is *stronger* in the model assessing indirect effects.

Hypothesis 1.4. *Adequacy of prenatal care partially explains the association.* This association is not mediated by prenatal care.

Hypothesis 1.5. *The association between gentrification stage and preterm birth is stronger for WIC participants (i.e., individuals with low income) vs. non-participants.* The data do not support this hypothesis. The direction of the association differs for individuals receiving vs. not receiving

WIC assistance in neighborhoods not losing low-income households but neither association is statistically significant.

5.2.1. Sample Characteristics

This section describes the characteristics of the sample with non-missing demographic information (N=18,327) based on the 2013-2017 SOMI dataset. The analytic sample represents 94.3% of the overall sample (N=19,679). About 80% of the sample is between the ages of 18-34, which is considered a healthy age range in perinatal epidemiology (Cnattingius et al., 1992; Fraser et al., 1995; Jacobsson et al., 2004). Nineteen percent of the sample is aged 34 and older, considered a geriatric pregnancy. Just over 1% were under the age of 18. Most of the sample (84.38%) was born in the United States, and 83.24% categorize themselves as only Black. The sample is highly educated with 62.7% having more than a high school diploma. Over 50% of the sample was receiving government assistance at the time of delivery in the form of the Supplemental Nutrition Program for Women, Infants, and Children (WIC). Less than 10% of the sample smoked tobacco at any point during their pregnancy. About 35% of the sample has less than adequate prenatal care, intermediate (23%) inadequate (12%). Only 1.2% of the sample had some form of housing insecurity on their hospital record. Table 5.1 shows the distribution of birthing parents by preterm birth. Notably, there is a statistically significant difference in birthplace, education, WIC participation, prenatal care, and housing insecurity between the sample and individuals who delivered preterm. It is important to note that for housing insecurity, the observed values of preterm birth are *lower* than the expected values.

[—Insert Table 5.1. here—]

5.2.2. Univariate Analysis

This section describes the distribution of the outcome and exposure variables. Table 5.2 describes the distribution of the outcome, preterm birth. In total, 1,583 (8.6%) of the births in the

sample were preterm. Most of these (83.8%) were moderately preterm or between 32-37 weeks' gestation. About 10% were very preterm or 28-32 weeks' gestation and 6.3% were extremely preterm or less than 28 weeks' gestation. Weeks' gestation ranged from 21-43 weeks among the sample with an average of 38.7 and a standard deviation of 2.07.

[—Insert Table 5.2. here—]

Table 5.3. presents the distribution of the exposure variable, Neighborhood Displacement Typology. Three quarters of the sample (76.4%, N=13,894) lived in low-income census tracts. Among these, about 36.7% lived in census tracts at risk of displacement. Another 34.5% lived in low-income tracts that are not (yet) losing low-income housing. Still another 20.2% lived in tracts undergoing displacement. Among low-income tracts, those undergoing advanced gentrification had the fewest residents at 8.5%. Fewer Black birthing people resided in moderate-/high-income tracts. Among this group, the bulk (64.3%) lived in tracts not yet undergoing exclusion. This amounted to about 15.5% of the total sample. The remaining neighborhood categories, at risk of exclusion and undergoing exclusion had the fewest residents, 4.5% and 3.6% of the total sample, respectively.

[—Insert Table 5.3. here—]

[—Insert Figure 5.1. here—]

5.2.3. Bivariate Analysis

Table 5.4 displays the number of live births and preterm births in each type of neighborhood between the years 2013-2017. These bivariate results assess whether preterm birth crudely varies by gentrification stage. The chi^2 for low-income census tracts was 4.435 p=0.218. The chi^2 for moderate-/high-income census tracts was 2.2622 p=0.520. This indicates that there is not a statistically significant difference in preterm birth among the different gentrification stages in the general sample.

[—Insert Table 5.4. here—]

5.2.4. Multivariable Analysis

Hypothesis 1.1. Residence in a low-income tracts with advanced gentrification was positively associated with preterm birth relative to low-income neighborhoods at risk of gentrification controlling for individual characteristics. Figure 5.1 displays the unadjusted and adjusted odds ratios of preterm birth. In the unadjusted multilevel logistic regression analyses, individuals living in low-income neighborhoods undergoing advanced gentrification had *lower* odds of preterm birth than those living in neighborhoods at risk of gentrification (OR= 0.789, 95% CI: 0.623,1.000). After adjusting for maternal characteristics, the confidence interval marginally includes one indicating that this association was no longer statistically significant. However, the point estimate remained relatively stable (OR= 0.818, 95% CI: 0.642,1.042). The data do not support the hypothesis that advanced gentrification was associated with higher odds of preterm birth. Instead, these results suggest the opposite: residence in neighborhoods undergoing advanced gentrification (relative to those at risk for gentrification) is associated with lower odds of preterm birth.

[—Insert Figure 5.2. here—]

Table 5.5 displays the unadjusted and adjusted odds ratios for neighborhood displacement typology in low-income (LI) tracts. Regarding the covariates, in the adjusted model, private insurance, smoking, nativity, WIC participation, age, and per capita county health expenditures had statistically significant associations with preterm birth. Individuals with private insurance had 22% lower odds of PTB than those with public or no insurance (OR= 0.789, 95% CI: 0.660,0.942). Individuals older than 34 had odds of PTB 49% higher than birthing people younger than 34 (OR= 1.488, 95% CI: 1.280,1.729). Odds of PTB were 82% higher for

individuals who smoked tobacco during pregnancy than nonsmokers (OR= 1.823, 95% CI: 1.533,2.168). Individuals born in the U.S. had odds of PTB 84% higher than those born outside of the US (OR= 1.844, 95% CI: 1.489,2.283). Odds of PTB were 22% lower for those participating in WIC (OR=0.782, 95% CI: 0.681,0.897). Finally, for every $100 increase in per capita county health expenditures, odds of PTB decreased by 8% (OR=0.916, 95% CI: 0.861,0.974).

[—Insert Table 5.5. here—]

Hypothesis 1.2. Residence in a high-income tract with advanced exclusion is negatively associated with preterm birth relative to high-income neighborhoods at risk of exclusion controlling for individual characteristics. Figure 5.3 displays the unadjusted and adjusted odds ratios for moderate-to-high-income tracts. In the unadjusted multilevel logistic regression analyses, individuals living in moderate/high income neighborhoods with advanced exclusion had 55% higher odds of preterm birth than those living in moderate/high-income neighborhoods at risk of exclusion (OR= 1.554, 95% CI: 0.703,3.437). The confidence intervals were wide and included one indicating that this association was not statistically significant. The point estimate and confidence interval remained stable after adjusting for maternal characteristics.

[—Insert Figure 5.3. here—]

Table 5.6 displays the unadjusted and adjusted odds ratios for neighborhood displacement typology in moderate/high-income (MHI) tracts. Regarding the covariates, only smoking during pregnancy had a statistically significant association with preterm birth. In this sub-sample, smoking during pregnancy was associated with 73% higher odds of preterm birth, controlling for neighborhood displacement typology and individual characteristics.

[—Insert Table 5.6. here—]

Hypothesis 1.3. *Housing insecurity would partially explain the association.* Table 5.7 displays the mediation analyses which used a counterfactual approach to estimate the indirect and direct effects of neighborhood typology on preterm birth through both adequacy of prenatal care and housing insecurity. This association is not mediated by housing insecurity. The mediation analysis demonstrated that housing insecurity slightly suppress the relationship between gentrification stage and preterm birth among Black birthing people. The odds ratio for the direct effect of advanced gentrification on preterm birth is slightly lower than the total effect (OR=0.807 vs 0.798, $p<0.10$).

Hypothesis 1.4. *Adequacy of prenatal care would partially explain the association between gentrification stage and preterm birth.* Mediation analysis demonstrated that prenatal care did not mediate the association between neighborhood typology (gentrification stage) and preterm birth.

[—Insert Table 5.7. here—]

Hypothesis 1.5. *The association between gentrification stage and preterm birth would be stronger for WIC participants (i.e., individuals with low income).* Figure 5.4 presents the adjusted odds ratios stratified by WIC participation (a proxy for socioeconomic status). Overall, the trends are similar across the two groups, with one exception. Residence in census tracts not losing low-income households, is associated with lower odds of preterm birth for individuals receiving WIC assistance (OR= 0.840, 95% CI: 0.687,1.027) and slightly higher odds of preterm birth for individuals not receiving WIC (OR= 1.023, 95% CI: 0.817,1.280). The confidence intervals for all point estimates include one; therefore, it is not possible to reject the null hypothesis.

[—Insert Figure 5.4. here—]

Table 5.8 displays the adjusted odds ratios for neighborhood displacement typology in low-income (LI) tracts stratified by WIC participation. Regarding the covariates, only smoking,

nativity and age were significantly associated with preterm birth for both groups. The magnitude of the association differed for the two groups. For example, for non-WIC participants, smoking was associated with 96% higher odds of preterm birth (OR= 1.958, 95% CI: 1.449,2.644). However, among WIC participants, those who smoke had 67% higher odds of preterm birth than those who did not smoke during pregnancy (OR= 1.665, 95% CI: 1.354,2.048). For nativity and age, the association is stronger for WIC participants. For example, among WIC participants, those born in the USA had 2-fold higher odds of preterm birth than those born outside of the USA (OR= 2.356, 95% CI: 1.698,3.270). Among non-WIC participants born in the USA also had higher odds of preterm birth than their foreign-born counterparts, but the point estimate was lower (OR= 1.579, 95% CI: 1.202,2.075).

[—Insert Table 5.8. here—]

5.2.5. Sensitivity Analysis

I used two procedures to check the robustness of the logistic regression analyses. First, to address the concern that there may be selection bias if individuals have more than one birth in the dataset, I ran the analysis on nulliparous sample. These are individuals with no previous births. Figure 5.5 displays the unadjusted and adjusted odds ratios for the nulliparous sample (n=5,766). The findings are consistent with the main analysis. Compared to individuals in neighborhoods at risk of gentrification, those in neighborhoods undergoing advanced gentrification had lower odds of preterm birth (OR= 0.652, 95% CI: 0.439, 0.968). In this model, the confidence interval did not include one.

[—Insert Figure 5.5. here—]

To address the concern that logistic regression may overestimate the effect size, I reran the analysis using a continuous outcome: number of weeks' gestation. Figure 5.6. displays the

unadjusted and adjusted coefficients. Residence in neighborhoods undergoing advanced gentrification was associated with slightly longer gestation. After controlling for individual characteristics, a similar association persisted though the confidence interval included the null value. The results are in the direction consistent with the main analysis.

[—Insert Figure 5.6. here—]

As a cross-sectional study, neighborhood selection may impact the results. Individuals at lower risk of preterm birth (i.e., those with more material resources) may be more likely to reside in or move into neighborhoods undergoing advanced gentrification. To assess the extent to which selection bias may impact the results, I conducted an additional bivariate analysis which is presented in Table 5.S4. Pearson chi^2 results show a statistically significant relationship between WIC participation and gentrification stage ($\chi^2 = 18.4804$; $P< 0.001$). In neighborhoods at risk of gentrification, the number of Black WIC participants is higher than expected values (3,339 vs. 3,216) and the number of non-WIC participants is lower than expected values (2,143 vs. 2,266). This difference contributed substantially to the total chi^2 statistic. The opposite pattern occurs in neighborhoods undergoing advanced gentrification. The number of Black WIC participants is lower than expected values (715 vs. 743) and the number of non-WIC participants is higher than expected 551 vs 523).

This indicates that there is a selection effect. WIC recipients are underrepresented in neighborhoods undergoing advanced gentrification. However, they are driving the negative association between gentrification and preterm birth (see Figure 5.4). Compared to their counterparts in neighborhoods at risk of gentrification, they have even lower odds of preterm birth than the general sample.

[—Insert Table 5.S4. here—]

5.2.6. Summary of Aim 1 Results

Overall, the hypotheses that residence in low-income neighborhoods with advanced gentrification is associated with higher odds of preterm birth were not supported by the data. Instead, it was associated with *lower* odds of preterm birth. This relationship was not mediated by prenatal care. There was, however, a partial suppression effect with housing insecurity, such that the association between advanced gentrification and odds of preterm birth was stronger holding housing security constant. The association was driven by WIC recipients.

5.3. Aim 2 Results

5.1.1. Overview

Aim 2 sought to determine if interpregnancy residential mobility was associated with preterm birth among Black birthing people in the San Francisco Bay Area. Each original hypothesis and the corresponding set of findings are summarized below:

Hypothesis 2.1. *Inter-pregnancy residential mobility is associated with preterm birth.* This hypothesis was not supported. In the adjusted models, the odds of preterm birth for individuals who experienced residential mobility between births was not significantly different from those who had no mobility.

Hypothesis 2.2. *The association between residential mobility and preterm birth is present among women who move from cities experiencing Black population loss to those experiencing Black population gain (i.e., out-migration).* This hypothesis was partially supported. In addition, those experiencing mobility within the outer region (i.e., between cities with Black population growth) had higher odds of preterm birth.

Hypothesis 2.3. *The association between residential mobility and preterm birth is moderated by WIC participation at Time 1*. This hypothesis was supported. WIC participants who moved within the inner region and non-WIC participants who moved within the outer region had higher odds

of preterm birth. Non-WIC participants experiencing out-migration had higher odds of preterm birth but the confidence interval for this association marginally included the null.

5.1.2. Sample Characteristics

This section describes the sample characteristics at Time 1 (first birth) and Time 2 (second birth). Table 5.9 presents frequencies and percentages of all analytic variables. The rate of preterm birth increased slightly from 8.4% at Time 1 to 8.5% at Time 2. Insurance type remained relatively stable across the two time periods. About half of the sample had public health insurance at both time periods,, while about 42% and 6% had private insurance and no insurance, respectively. Adequacy of prenatal care remained relatively the same for this sample with one exception, the proportion of people receiving inadequate care increased from 14.2% to 15.8%. Less than 1% of the sample was under the age of 18 at Time 2 compared to 3.5% at Time 1. Similarly, the proportion of birthing parents over the age of 34 increased from 9.0% at Time 1 to 19.9% at Time 2. Other significant changes included gains in education and a decrease in WIC participation. The percentage of those with more than a high school education increased from 54.9% to 58.8%. And WIC participation decreased from 61.7% to 55.4%.

[—Insert Table 5.9. here—]

5.1.3. Univariate Analysis

This section first describes the change in Black population across the region. Then, describes in general terms where the sample members lived at each time point the describes their mobility patterns. Figure 5.7 displays the census place-level (i.e., city/town-level) change in Black population from 1990-2010. The general pattern is that cities toward the coast, San Francisco, Oakland, Richmond, Berkeley lost Black population. Cities and towns inland gained Black population in the same time frame.

[—Insert Figure 5.7. here—]

Table 5.10 displays residential mobility trajectories by quartile of Black population (BP) change at Time 1 and quartile of Black population change at Time 2. At both time points, most of the persons lived in one of two types of cities: those experiencing high Black population loss and those with low Black population gain at both time points. At Time 1, 83% of the sample resided in cities the first and third quartile of Black population change. At Time 2, the proportion of individuals living in cities with High BP loss decreased from 32.1% to 29.8%.

[—Insert Table 5.10. here—]

Table 5.11 displays the distribution of residential mobility typologies. Most of the sample (81.5%) experienced no interpregnancy mobility relative to Black population change. In other words, most of the sample lived in a city with the same level of Black population change at Time 1 and Time 2. This does not mean that they did not relocate but rather that their resident cities during both deliveries are either gaining or losing Black residents at similar rates. The remaining 18.5% of the sample experienced residential mobility between the two births. Of those that moved, 333 (36.8%) experienced out-migration, moving from cities losing Black population to those gaining Black populations. Another 298 (33.0%) moved within the outer region of the Bay Area, between two cities that were both gaining Black population. About 21.9% of movers experienced in-migration or moved from cities gaining Black population to those losing Black population. Finally, 8.3% of movers relocated within the inner Bay Area region between two cities losing Black population.

[—Insert Table 5.11. here—]

Figure 5.8. displays the inter-pregnancy residential mobility trajectories between Time 1 and Time 2 among individuals who changed city/town of residence. Cities in the region served as both origin and destination for this sample. Oakland, which experienced high Black population loss between 1990-2010, received a high number of relocations from San Francisco

at Time 2. At the same time, Oakland also was the origin residential location for relocations to Vallejo, Stockton, and Hayward which had low Black population gains and Antioch which had a high Black population gain.

[—Insert Figure 5.8. here—]

5.1.4. Bivariate Analysis

This section describes the unadjusted associations between preterm birth rate and residential mobility typologies. Table 5.12 displays the preterm birth rate by residential mobility typology. The preterm birth rate among those who had no mobility was 8.11. Two mobility typologies had a higher rate of preterm birth: mobility within the inner region and mobility within the outer region. About 12.0% of individuals who made such moves delivered preterm. By contrast, about 8.1% of individuals who experienced in-migration and out-migration delivered preterm. The chi^2 results indicate that the bivariate relationship is not statistically significant (χ^2= 6.9927; P=0.136).

[—Insert Table 5.12. here—]

5.1.5. Multivariable Analysis

This section describes the results of the multivariable analysis used to assess the relationship between interpregnancy residential mobility trajectories and preterm birth. Individuals experiencing no mobility (i.e., individuals who lived in cities undergoing the same level of Black population change at both Time 1 and Time 2) were used as the reference group. Table 5.13 displays the odds of preterm birth at Time 2 as a function of mobility type, preterm birth at Time 1, and covariates. Preterm birth at Time 1 was associated with 5-fold higher odds of preterm birth at Time 2 (OR= 5.418; 95% CI:4.224,6.950), controlling for residential mobility and individual-level characteristics. In general, the association between the covariates and preterm birth at Time 2 hovered near the null value. For example, compared to private

insurance, the point estimates for public (OR=1.098; 95% CI: 0.852,1.416) and no insurance (OR=1.198; 95% CI:0.783,1.834) were close to the null and the confidence intervals included 1. Similar patterns existed for education, maternal age, and infant sex. The exception was smoking at Time 2 which was associated with 70% higher odds of preterm birth (OR= 1.702; 95% CI: 1.263,2.294).

Hypothesis 2.1: Inter-pregnancy residential mobility was associated with preterm birth. Overall, none of the mobility typologies was associated with differences in the odds of preterm birth compared to the odd of preterm birth among those with no mobility. For example, compared to no residential mobility, residential moves within the inner region (i.e., between cities losing Black population) was associated with 64% lower odds of preterm birth but the confidence interval included 1. indicating this association is not statistically significant (OR= 1.639, 95% CI: 0.786,3.415). Residential relocation within the outer region, was also associated with higher odds of preterm birth and the confidence interval marginally included 1 (OR= 1.406; 95% CI: 0.960,2.059).

Hypothesis 2.2: The association between interpregnancy residential mobility and preterm delivery will be present among Black birthing people who moved from cities experiencing Black population loss to those experiencing Black population gain. This hypothesis was partially supported by the data. Interpregnancy out-migration was associated with a negligibly lower odds of preterm birth (OR= 0.988; 95% CI: 0.648,1.506) in the general sample. The confidence interval included one and was wide enough to indicate no difference in preterm odds for individuals experiencing out-migration compared to those with no mobility. To elucidate how the hypothesis was partially supported, I included an interaction term to determine whether these patterns differed for individuals who participated in WIC at Time 1. Those results are discussed in the following paragraphs.

[—Insert Table 5.13. here—]

Hypothesis 2.3: The association between interpregnancy residential mobility and preterm birth among Black birthing people was moderated by WIC participation at Time 1.

Table 5.14 displays the unadjusted and adjusted odds of preterm birth at Time 2 as a function of the interaction between mobility type and WIC participation at Time 1. For the moderation analysis, the reference group consisted of individuals who experienced no mobility and who did not participate in WIC at Time 1. Compared to the reference group, three groups had higher odds of preterm birth at Time 2 in the unadjusted model. First, individuals participating in WIC who experienced no mobility had 36% higher odds of preterm birth (OR= 1.360; 95% CI: 1.067,1.734). Second, those who moved within the inner region who participated in WIC had 3-fold higher in the odds of preterm birth (OR= 3.190; 95% CI: 1.284,7.926). Third, individuals who moved within the outer region who did not participate in WIC at Time 1 had two-fold higher in odds of preterm birth (OR= 2.560; 95% CI: 1.425,4.601).

[—Insert Table 5.14. here—]

In the unadjusted model, two additional groups had higher odds of preterm birth though the corresponding confidence intervals marginally included 1. First, WIC participants relocating within the outer region had 60% higher odds of preterm birth than the reference group (OR=1.604; 95% CI: 0.979,2.629). Second, non-WIC participants experiencing interpregnancy out-migration had 55% higher odds of preterm birth (OR=1.548; 95% CI: 0.875,2.736).

After controlling for preterm birth at Time 1, insurance type, education, maternal age, WIC participation at Time 2, infant sex, and smoking, these associations remained statistically significant and the point estimates, decreased for two groups and increased for one. For example, in the adjusted model, individuals participating in WIC who experienced no mobility had 34% higher odds of preterm birth (OR= 1.340; 95% CI: 1.006,1.785) compared to the reference group. The statistical adjustment decreased the odds ratio from 1.36 to 1.34. The odds ratio also decreased after adjustment for non-WIC participants who moved within the outer region. In the adjusted model, the odds ratio decreased from 2.5 to 2.1 (OR= 2.141; 95% CI:

1.153,3.979). Finally, for WIC participants who moved within the inner region, the odds ratio increased from 3.2 to 3.5 (OR= 3.481; 95% CI: 1.363,8.889).

Similarly, in the adjusted model, the point estimates for the two groups approaching statistical significance reduced slightly. For example, for WIC participants experiencing mobility within the outer region the odds ratio decreased from 1.60 to 1.50 (OR=1.496; 95% CI: 0.883,2.534). For Non-WIC participants, the post-adjustment decrease in the odds ratio was even smaller: 1.55 vs 1.54 (OR=1.543; 95% CI: 0.856,2.782).

[—Insert Figure 5.9. here—]

Figure 5.10. displays the predicted probability of preterm birth at Time 2 for WIC participants and non-WIC participants by residential mobility type. First, it is important to note that for each category of residential mobility, the confidence intervals for both groups overlap at least partially. Still, a clear pattern emerged. Among those with no mobility and those who moved within the inner region, WIC participants had a higher predicted probability of preterm birth than non-WIC participants. The gap is most prominent among those who moved within the inner region. Among this group, WIC participants have a predicted probability of 20% compared to 7% for non-WIC participants. The plot shows that for remaining residential mobility trajectories, the pattern reverses, non-WIC participants have higher predicted probabilities of preterm birth than WIC participants. These differences are smaller but still statistically significant.

These results, taken together, indicate hypothesis 2.3 was supported – the relationship between residential mobility trajectory and preterm birth is conditional on WIC participation at Time 1.

[—Insert Figure 5.10. here—]

5.1.6. Sensitivity Analysis

I performed two procedures as sensitivity analyses. First, ordinary least squares regression was used as a sensitivity analysis to address the concern that logistic regression may overestimate effect sizes of the association between residential mobility type and preterm birth. Table 5.15 displays the unadjusted and adjusted beta coefficients with weeks' gestation as a continuous outcome. Here, negative coefficients are consistent with shorter pregnancy. In the unadjusted model, three groups have shorter pregnancies than non-WIC participants who had no mobility. First, WIC participants who experienced no mobility had pregnancies on average about 1 day shorter than the reference group (β= -0.152; 95% CI:-0.272,-0.0318). Second, WIC participants who moved within the outer region had pregnancies 4.4 days shorter on average than the referent (β= -0.627; 95% CI: -1.015,-0.238). Third, Non-WIC participants who moved withing the outer region had pregnancies on 2.6 days shorter than the referent. (β= -0.374; 95% CI:-0.651,-0.0979).

In the adjusted model, the confidence interval for the first group (i.e., WIC participants with no mobility) included zero indicating that this association was no longer statistically significant. The point estimates for the WIC and non- WIC participants who moved within the outer region remained statistically significant. Specifically, WIC participants (β=-0.502-95% CI: 0.880,-0.124] and non-WIC participants (β= -0.281; 95% CI: -0.559,-0.00324).

These results differ slightly from the logistic regression model presented in Table 5.14. The key difference in that in the OLS regression, the association between residential mobility between cities losing Black population (i.e., within the inner region) among WIC recipients was not associated with weeks' gestation. The beta coefficient is negative indicating the point estimate is in the expected direction, but the confidence interval includes zero. Additionally, the OLS regression differs from the logistic model in that the coefficient for WIC participants moving within the outer regions became statistically significant. The point estimates are all in the consistent directions indicating that results found in the main logistic regression model was not an artefact of the model itself.

[—Insert Table 5.15. here—]

The second sensitivity analysis was undertaken to assess the potential role of selection, in the preterm birth finding. Here, I examined whether preterm birth at Time 1 predict residential moves using multinomial logistic regression with residential mobility type as the outcome. Table 5.16 displays the relative risk of residential mobility within the outer region as a function of preterm birth at Time 1. The multinomial logistic model shows that individuals who delivered preterm on their first birth are more likely to move within the outer region (i.e., between cities gaining Black population) relative to those with no mobility. Specifically, for those who delivered preterm at Time 1 relative to those who had full term births at Time 1, the relative risk for relocation within the outer region relative to no mobility would be expected to increase by a factor of 1.594 (RRR=1.594; 95% CI: 1.104,2.300) given the other variables in the model are held constant. The results also show that proxies for socioeconomic status (WIC at Time 1 and education) are also predictive of moving within the outer region. For WIC participants at Time 1, the relative risk for relocation within the outer region relative to no mobility would be expected to increase by a factor of 1.434 (RRR=1.434, 95% CI: 1.067,1.927). While for those with greater than greater than HS education, the relative risk would be expected to decrease by 33% (RRR= 0.669; 95% CI: 0.459,0.974).

[—Insert Table 5.16. here—]

This analysis suggests that there is a health selection bias in that individuals who delivered preterm at Time 1 are more likely to move within the outer region and ultimately more likely to deliver preterm at Time 2. To determine if this relationship held among people who delivered full term at Time 1, I reran the initial logistic regression model and excluded women who delivered preterm at Time 1 (N=431). Table 5.17 displays the adjusted and adjusted odds ratios for this analysis. The results here show that among women who delivered full term at Time 1, the relationship between mobility within the outer region (i.e., between two cities with

Black population growth) and preterm birth at Time 2 still held. Among non-WIC recipients, this type of move was associated with preterm birth odds 2.8 times higher than those with no mobility (OR= 2.755; 95% CI: 1.344,5.646).

[—Insert Table 5.17. here—]

In light of the results presented in the interaction analysis, these results suggest individuals with moderate/high socioeconomic status may be less likely to move within the outer region compared to low socioeconomic status, but that when they do, they are more likely to deliver preterm at their second birth.

5.1.7. Summary of Aim 2 Results

Generally, Black birthing people in this sample experienced low rates of interpregnancy residential mobility. Among those who did relocate, moving from one city with growth in the Black population to another city with Black population growth was associated with higher odds of preterm birth. The relationship between residential mobility type and preterm birth is conditional on WIC participation, a proxy for socioeconomic status. For people receiving WIC assistance, moving within cities losing Black population (e.g., from Oakland to Richmond) was associated with higher odds of preterm birth. Conversely, among those not receiving WIC assistance, moving between cities gaining Black population was associated with higher odds of PTB. Out-migration, moving from cities losing Black population to those gaining Black population, was marginally associated with preterm birth for non-WIC participants. There may be a cyclical relationship between residential mobility and health as health status may contribute to decisions to relocate.

5.4. Aim 3 Results

5.4.1. Overview

Aim 3 sought to identify potential mechanisms explaining the unequal distribution of preterm birth risk among Black women in the region. The results presented in this section are guided by ecosocial theory with attention to who and what is responsible for the distribution of health and illness. Racial resegregation in Northern California is a result of macro-scale economic restructuring of the region. On the surface, racial resegregation is most visible by the influx of wealthy white workers into San Francisco and Oakland and the out-migration and displacement of Black middle- and working-class people. This section eschews individual-level behavioral, genetic, and demographic explanations in favor of attention to macro- and meso-level forces that may shape the distribution of the outcome rather than the outcome itself. These macros-level forces have implications for preterm birth risk because of the various interconnected processes that shape where people can live and the resources they have access to. The qualitative analysis uncovered several processes that help to explain the relationship between regional inequality and preterm birth risk. These processes are (1) wealth and resource hoarding by corporations and non-profit organizations at different scales; (2) outsourcing of the social safety net; (3) policing of Black mothers and families; and (4) landlord discrimination and exploitation (5) community-driven resistance and advocacy.

5.4.2. Sample Characteristics

Table 5.18 summarizes the sample characteristics of the Black mothers interviewed in the study. They shared their experiences regarding securing housing, health care and social support before during and after pregnancy. The sample varies with respect to income, age, and housing tenure. They also live in various parts of the region. Of the n=12 respondents, n=3 reported at least one preterm birth, n=2 experienced the death of an infant before their first birthday, and n=3 reported major childbirth complications. Regarding housing tenure, most of the respondents were renters, four were owners and one was homeless.

[—Insert Table 5.18. here—]

Table 5.19 summarizes the expertise of the key informant interview respondents.

[—Insert Table 5.19. here—]

5.4.3. Wealth and resource hoarding by corporations and non-profits leaves Black people behind

A consistent observation among participants in the study is that wealth and resources are hoarded in the places where the fewest Black people live. This hoarding happens on a regional scale whereby San Francisco and Silicon Valley have increased wealth at the expense of other areas in the region. Even though people from across the region commute into San Francisco for work, building up the wealth of corporations, other parts of the region do not share in that wealth creation. This creates, according to some, an overabundance of resources where they are not needed. Anna, an employee at the Alameda County Department of Public Health says, “I always make this joke…San Francisco has so many resources for the five Black people that live in San Francisco.”

There is a sense among the participants that Black people in the region are especially left behind. They acknowledge that the region has resources and that politicians are well-aware of Black people’s needs. However, they agree that there is a willful exclusion of Black people from the overall infrastructure of community and regional development. This results in the material deprivation of poor Black people and the disregard of Black places. As described in the quote above, there is a concentration of wealth, resources, and structural supports in the places where more and more Black people are leaving, creating an imbalance between where the money is being spent and where most Black people in the region are living (i.e., where money is needed).

This concentration impacts the health services available to Black people outside of the inner core cities. As a result of this unequal distribution, individuals who move to afford housing

may need to present a different address to continue accessing the resources available in their previous neighborhood or county. Brittney a new mother, birth worker, and case manager discussed her client's situation,

> "And the crazy part is like people will move to Stockton so they can afford but still get their care and resources in Oakland. So, they keep their addresses you know, everything so they can so like, […] I just had this happen: girl's address is in Oakland. But she lives in Modesto. So, she drove all the way to Highland to have her baby. But she's living in Modesto because that's what she can afford to live but her mail go to her granny house in Oakland."

Black women are incentivized to use different addresses to access resources that are not available outside of San Francisco and Oakland. These include diaper pantries, peer support programs and even Black healthcare providers. The distribution of Black providers is skewed to the inner core (i.e., San Francisco and Oakland). This is partly because providers earn more money working in the inner core but many of them also struggle to afford housing. As a result, like other workers, they commute from more affordable cities leaving few Black providers working in areas where the Black population is growing. So, when Black mothers and pregnant people move for better access to housing, they often make the decision to commute regularly back into the inner core for prenatal care and other services with Black providers.

Beyond access to Black providers, access to specific services for Black pregnant people are limited by address. In other words, mothers who live their social and working lives in San Francisco but live in Alameda County, for example, cannot access certain supportive services reserved for San Francisco residents.

On the surface, then, San Francisco residents, have an abundance of services. But the concentration of wealth and resources in the city of San Francisco do not trickle down to Black residents. According to Leah, a Black physician in San Francisco,

> “We have incredible services, but for a lot of them, you have to negotiate racism. Very few of them were actually built for Black people, even when a lot of times like they got their funding on the backs of our disparities and like how terrible our health outcomes are, then they're not actually built for us to use them.”

As Leah explains, much of the public health and health services money that comes into the city is because of the disparate outcomes experienced by Black people, but Black people are not always directly benefitting from those funds. The barriers to access are manifold and include interpersonal racism and employment barriers. Leah continues,

> “What we see in San Francisco with that number of our Black mamas have hourly jobs, and the second they start taking time off to go to prenatal appointments, for instance, they don't have necessarily protected sick time. And so now they just stopped getting as many hours as they used to have in their employer brings on somebody new, who was not pregnant, and could work whatever crazy hours. And so, we have these laws that are supposed to protect you for breastfeeding and pregnancy and whatnot. But they do not work for hourly workers. And it's so hard to get a non-hourly job when you are Black in the city.”

Here, Leah makes the connection between housing, employment, and pregnancy in San Francisco underscoring the reality that substantial barriers exist for working class Black people even amidst all the resources in the city.

5.4.4. Outsourcing social and health services creates logistical hurdles for Black mothers

In the past three decades, the Bay Area has seen several shifts in its approach to regional governance, in the 1970s “big liberal pro-region” ideas were supported and funded but during the 1990s, the shift to hyper-local approaches exacerbated inequalities including those related to the provision of social and health services. Black Infant Health, the longstanding program in the state of California, was recently built upon with the explicit mandate to outsource of services

from the government to community-based organizations despite its successes as a centralized program.

> "And so, building upon that work that's been going on for 30 years now is the investment in perinatal equity, and that the money came down from the state to the Black Infant Health counties that were administering the program to do an environmental scan. Looking at the current data where people live, work and play, to develop a community advisory board, think collectively and collaboratively with community members. So, it cannot be like a top-down intervention, it had to be one where we were integrating the voice and centering the voice of black birthing people and mothers from the beginning to really find out what would be helpful, what isn't working, what are again, some of the drivers that we can support Black birth birthing people with. […] And so, *we prioritize funding for subcontractors to implement that work*. And they had to be with community-based organizations, again, *it could not be government run*"
>
> Natasha, Contra Costa County Department of Health

As Natasha explains, the PEI program was designed to be fragmented with different community organizations providing different services. The outsourcing of the social safety net was intended to center the needs of community but has had unintended consequences for the day-to-day experiences of Black people preparing for childbirth and childrearing. Because this approach increases service fragmentation, pregnant people must make multiple appointments, endure long commutes between appointments, spend considerable time waiting on the phone or in person for services, take time off from work, and be subject to increased surveillance (which I discuss in section 5.4.5).

Ironically, these programs intended to provide support for pregnant people often reinforce and exacerbate Black mothers' self-reliance and the pressures of the "Strong Black Woman." To fully find and use the resources available, Black mothers report relying heavily on

their own efforts to manage their various responsibilities and deal with barriers. For some moms, engaging with all the different service providers is just something they must do for the support they need. But for others, fragmentation of services creates barriers to fully engaging. As one mom explained,

> "You have to be very persistent. So, I was back and forth with someone. Like, you call no one answers, you call again, no one answers you call. You get someone and they kind of put you through to someone else. And it's like, it's a lot of back and forth."
>
> Lauren, 37, preschool teacher, Berkeley

Danielle, a mother of two children, discusses how she deals with the stress of trying to find support while also caring for two small children,

> "I don't know that I do. I don't know if there's not really an opportunity to I just kind of got to keep going. Yeah, especially with the children and everything, just got to go figure it out. Like it's not. I mean, I can't really like [deal with the stress], I just got to figure it out."
>
> Danielle, 25, unemployed, Oakland

In addition to creating logistical hurdles for Black mothers, the outsourcing of social and health services also increases jurisdictions' reliance on philanthropic provision of social goods which is problematic because charitable foundations have their own priorities and reinscribe spatial inequality. As Matt explains,

> "Solano County, for example, has the lowest philanthropic receipt of philanthropic dollars across the nine counties of the region. We started this conversation, talking about housing and talking about resegregation of the region. So, you have a county that is the one part of the region where they're one of two places in the region where the Black population is growing, it is the place where many people of color who are priced out of the inner Bay are facing other types of displacement pressures are moving. And yet, the

disparities in philanthropic support are really stark, between Solano County and other parts of the region."

Matt, former policy director, Bay Area Regional Health Inequalities Initiative

In this quote, Matt describes how the charitable giving landscape reinforces the wealth hoarding described in section 5.4.4. Solano County which is home to an increasing number of Black families using Housing Choice Vouchers, gets the least amount of charitable dollars among the counties in the region. This inequity is also evident in other Bay Area Counties. In Contra Costa County, for example, residents of West County, which is geographically closer to Oakland, have higher per capita philanthropic funding than those in East County.

5.4.5. Policing Black mothers and families negatively impacts engagement with support services

There is a consensus among the participants that there is a relationship between the services that are provided for Black mothers and the policing of Black mothers. Child Protective Services (CPS) is used to punish Black women under the guise of helping. Mothers engaging in a wide range of services, report the perceived threat and the experience of being reported to CPS. Alana talks about this from the perspective of someone who is living with a disability and whose son also has a disability. She is keenly aware how she is treated by social service providers as if she does not have agency.

"I was getting the resources but the resources that I got now, I don't have them no more. Because something happened the lady lied and [caused a] big ole' mess. There was this company that was helping me, who get people with disabilities was helping me. And so, she lied and called Child Protective Services and a whole bunch of mess. So, I fired that agency, and I'm not working with them no more and I'm advocating for myself. I'm know how to advocate for myself, I'm not no baby."

She continued,

"They treat the clients like slaves and like kindergarteners up in there."

Alana, 49, unemployed, Vallejo

Alana goes on to describe the additional effort she had to make to dispute the lie. Additional meetings, home visits, interviews with her son to determine whether he should stay in their home. For Alana and other participants, navigating some of these services involves surviving ongoing mistreatment or engaging in a way that avoids mistreatment.

This surveillance also extends into healthcare service providers. For example, Brittney a 39-year-old case worker in Oakland describes how women avoid telling providers about their experiences with housing insecurity to avoid CPS,

> "A pregnant woman it's not about to tell some sort of doctor that she doesn't have a place to live because that's CPS, you know what I mean? [The doctor will say] 'I'm calling CPS and then the social worker [and they're] about to take your baby away.' So, they're not gonna tell the provider that [they're homeless but] they'll tell me that because I'm a Black person and I'm a friendly face and they know me from the hood. But they're not about to tell a white doctor or a Black doctor. They're not about to tell nobody they're homeless or living in a car because they're gonna get their baby taken. They'll say 'Nah, I live at my auntie house. I just sleep on the couch' Because they gotta prove that they have still stable shelter."

The threat of punitive action is talked about by participants as common sense. When asked about women experiencing homelessness and other forms of housing insecurity, a Black woman physician replied, "No Black person is gonna say they're housing insecure to a hospital, because we already know what will happen." These participants described the hospital as one of many sites where many vulnerable Black women must prove themselves stable to avoid

punishment. These passages suggest a balance that Black women must strike when engaging with the myriad of services meant to support them: engagement enough to seem worthy of the support but disengaged enough to protect oneself and one's family from punishment.

5.4.6. Landlord discrimination and exploitation of poor Black mothers exacerbates stress

Several low-income respondents received housing assistance via the voucher program. They all describe, in different ways, how the voucher program was both helpful and harmful. Helpful because the subsidy allows them to afford their housing costs. Harmful because the voucher program puts additional power into landlords' hands making it easier for them to geographically sort and financially exploit poor Black mothers. Respondents reported high levels of housing discrimination in seeking new housing and in trying to remain in housing. Source of income discrimination among these respondents does not seem to be a matter of "lack of awareness." Respondents and the landlords they sought to rent from knew that discrimination was illegal but there is little recourse for people who are in desperate need of finding housing. Kellie, for example, describes her failed attempts at securing housing with a voucher,

> "When I did learn about [California's anti-discrimination law], I kind of just held off on telling them [about my voucher]. And then I would get there, and I will look at the place and they'd seem to like me. And then I tell them about the section 8 program. They're like, 'Okay, that sounds great.' And then when I send like my application, they're like 'oh, no, it's no longer available. We just rented it out.'"
>
> Kellie, 33, chef, Deep East Oakland

Adrienne describes a time when she was made homeless because of flood and was unable to return to her home.

> "And everything was cool until the apartment I lived in got flooded. And the landlords were like, basically, slum lords. And I was pregnant again, now third time. And they just

dropped the ball. Oh, well, and people are always like, well, you can go, they can't do that. And it's like, yeah, legally, but when you're in the situation, and you don't have the finances to get legal representation, or anything like that, you're kind of just stuck accepting what it was. And so, I ended up having to clear out my entire 401k as like the best strategy I could come up with. And we were living out of hotels, living out of hotels, paying for hotels every night. Almost that was like, maybe two or three months."

She continues,

"And in the meantime, my building's not even communicating with me. Like, I had a neighbor that I was friendly with. And she was like, 'They're showing the apartment to people.' And meanwhile, they haven't even gotten back to me about anything. And so, I was like, 'let me look for another place.' She said 'No, they can't do that!' But they're doing it and in the interim I'm homeless with my kids living out of hotels. And I was pregnant at the time."

Adrienne, 39, public health program director, San Francisco

In these passages, Kellie and Adrienne demonstrate that landlords can determine, through illegal means, if, when, and how long voucher holders can rent their property.

In addition to discrimination against voucher holders, the lacking regulatory environment creates unhealthy living conditions for Black pregnant people, moms, and young children. Respondents reported rats, roaches, and mold in their homes and highlighted the fact that landlords were largely unresponsive. At the time of our interview Alana, for example, mentioned that her house had had rodents for at least 2 months before the landlord decided to inspect the home, causing both her and her son distress.

"My baby was just traumatized; he was just scared to stay here. I have never experienced anything like this, never in my life. […] I was scared, they was eating up all

my food. I had to hide all the food in the cabinets, and it was just, I have never seen it like this ever in my life."

Despite the insecurity and health hazards that voucher landlords can create, the design of the program allows them to generate large profits through the guaranteed collection of rent and other costs such as security deposits which are not provided by the government.

5.4.7. Community driven resistance and advocacy arise differently across the region

Respondents reported that collective community agency plays an important role in how inequalities manifest in the Bay Area in two ways. First, some newly incorporated cities have less political opposition to community-led efforts to establish needed health support systems. For example,

> "The city of Oakley incorporated in 2003, or so, very recently, so it's the newest incorporated entity in that sort of east county grouping. And they have a group of folks who worked really hard to get La Clinica to open there, because they recognized, really early on, that they had a lack of health infrastructure that they needed. And a part of that [was because] Oakley was a new town, and it had that energy of a new municipal infrastructure. So, they didn't have a city council or like, it was all new relations. Whereas, you know, the Antioch City Council was founded in 1850. [Antioch has a] very old guard, it's very different to displace an old guard politically. The Oakley politics was largely born when Oakley was already had become this sort of somewhat diverse suburb."
>
> Alex Schafran, urban geographer, Bay Area native

In this passage, Alex describes the political differences between old towns like Antioch and the newly incorporated Oakley. While Oakley and Antioch both have increasing Black populations, the political infrastructure in Antioch creates barriers for change in ways that continue to shape

health resources. In Oakley, residents demanded a clinic in a bottom-up health development process whereas other places in the region were not as amenable to the direct needs of the residents. These differences across jurisdictions contribute to an uneven landscape of healthcare provision.

At the same time, cities and towns with histories of resistance to racist urban development schemes have an infrastructure of “development from below.” In places hardest hit by urban renewal, residents have created collectives and organizing bodies to ensure maximum community input in subsequent development plans. Matt explains how this has played out in exacerbating inequalities between the eastern and western parts of Contra Costa County.

> “The differences between West County and East County are really profound. And as these regional displacement forces play out across the Bay Area, you are seeing the Far East County see a large growth of people who are leaving Oakland, or leaving other parts of the inner Bay, and the philanthropic infrastructure, the CBO infrastructure, the basic social safety net infrastructure is so much stronger in West County than it is in East County, you know, so it's not simply a question of San Francisco, and Solano, it's about one geography where Richmond, El Cerrito. All of these communities that have been working hard for decades to address deep inequities. They built up infrastructure in West County in a way that East County, the [racial] changes have been so rapid. And the political dynamics and community dynamics are such that they're racing to catch up.”

In this passage, Matt describes how collective community agency complicates the resource landscape. Previous histories of discrimination that shape health inequalities can also be catalysts for local community mobilization to ameliorate present and future inequalities. Zooming out to the regional scale, the lack of robust mobilization in certain localities may entrench the geographic patterning of preterm birth and other adverse health outcomes.

Community development from below occurs on smaller scales through creative uses of property. Ashley, an engineer in Oakland, owns multiple properties on one block and converted one property into a childcare center to provide affordable care for families in the community. The other property she owns is being rented by a senior on limited income. This elder “will have an affordable place to live for the rest of her life.” Ashley sees real estate not only as an opportunity to build wealth for herself but to provide needed services and housing for people in the community.

5.4.8. Summary of Aim 3 Findings

Both the interviews with public health workers, researchers, and Black mothers, as well as the analysis of government documents and newspapers reveal 5 mechanisms linking the neoliberal restructuring of the San Francisco Bay Area to preterm birth risk among Black mothers: (1) wealth and resource hoarding by corporations and non-profit organizations at different scales; (2) outsourcing of the social safety net; (3) policing of Black mothers and families; and (4) landlord discrimination and exploitation (5) community-driven resistance and advocacy. These mechanisms highlight how large-scale inequity shapes the healthcare, housing, and community support landscapes in the Bay Area. Community members across the region respond to these conditions in ways that produce needed supports for vulnerable residents. However, the different histories and jurisdictional capacities limit community efforts to reduce inequity.

5.5. Summary of Key Findings

Living in a neighborhood undergoing advanced gentrification is associated with lower, not higher, odds of preterm birth among black people living in the San Francisco Bay Area. This finding held constant when examining different models and a nulliparous sample.

The relationship between residential mobility and preterm birth is conditional on WIC participation which is a proxy for socioeconomic status. Out-migration is not associated with preterm birth in the general sample. However, preterm birth odds were higher for WIC participants moving within the inner region and for non-WIC participants moving within the outer region. Experiences with basic needs insecurity, quality health care, and community support differ widely by class among Black women. These differences reflect regional and local patterns of racialized economic inequality.

CHAPTER 6: DISCUSSION & CONCLUSIONS

6.1. Overview

This chapter discusses the major findings of the dissertation study considering previous scholarship and the study's methodological limitations. The chapter has eight sections. In the second section, I summarize, interpret, and explain the findings from each of the aims. I also integrate the findings from the qualitative and quantitative components of the dissertation. In the fourth and fifth sections, I discuss the limitations and strengths of the study, respectively. In the sixth section I consider the implications of the study for research, practice, and policy. The seventh section reflects on how I used the Public Health Critical Race Praxis throughout the study. In the final section, I conclude with the overall contributions of the study.

6.2. Summary of Findings

6.2.1. Summary for Aim 1

Gentrification stage did not increase risk of preterm birth. Results suggest that, overall, gentrification stage is not associated with preterm birth among Black birthing people in the San Francisco Bay Area. The relationship becomes clearer when analyzing the low-income and high-income neighborhood separately. Compared to low-income tracts at risk of gentrification, residence in tracts undergoing advanced gentrification was associated with lower odds of preterm birth. This finding diverges from the only other published study on gentrification and preterm birth (Huynh & Maroko, 2014). The divergence may be explained by several factors. The two studies examined different populations and settings. The Huynh study used a population-based sample of white and Black women in New York City. Another factor that might explain the divergence is the measure used to classify gentrifying neighborhoods. While the Huynh and Maroko study compared neighborhoods "eligible" for gentrification to those undergoing gentrification, the present study compared those at risk with those undergoing

advanced stages. A more comparable analysis with the present data would compare low-income neighborhoods undergoing gentrification to low-income neighborhoods not losing low-income households.

Other studies of gentrification and health have shown that residents who are able to remain in gentrifying neighborhoods have better health. One longitudinal study using data from Los Angeles Family and Neighborhood Survey found that the longer individuals stayed in a gentrifying neighborhood, the better the self-reported health (Agbai, 2021). The present could not differentiate between incumbent residents and new residents, but the protective effect of gentrification was driven by WIC participants suggesting that low-income residents (who are more likely to be incumbent than newcomers) may benefit from neighborhood enhancements.

This “protective effect” is also consistent with other studies on neighborhood exclusion and pregnancy outcomes. For example, Mendez (2014) found that residence in census tracts with high rates of mortgage discrimination against Black people was “protective” of preterm birth. As in this study, this protective effect may be a reflection that those who have the resources to live in exclusive neighborhoods, may already be at lower risk of preterm birth and may benefit from the resources available in those neighborhoods.

One explanation for the seemingly protective effect of advanced gentrification is neighborhood selection. This explanation takes the results at face value that individuals residing in a neighborhood with advanced gentrification have lower preterm birth odds. However, it is not the neighborhood, per se, that is protective. Instead, it may be that is individuals with the financial ability to move into gentrified neighborhoods are already at lower risk of preterm birth than those who cannot afford to live in such neighborhoods. As a cross-sectional study, selection into neighborhoods cannot be ruled out. There is limited research on Black residential mobility into previously gentrified neighborhoods. Research on Black women and residential mobility suggests that downward mobility is more common among Black women than other groups (Gailey et al., 2021; Sharkey, 2012). This multidisciplinary body of work also suggests

that when Black women move into neighborhoods undergoing gentrification, it is at the *early* stages of the process (Moore, 2009). These neighborhoods are more likely to be working-class urban neighborhoods. These studies do not specifically examine health prior to or after moving.

The protective effect of gentrification in this study may also be partially explained by the rent gap theory which was developed by Neil Smith (1987). It proposes that neighborhoods begin to undergo gentrification when there is the greatest gap between actual land value and the potential land value. At this point, landlords, developers, and other parties interested in maximizing profits begin to aggressively displace residents via evictions and other forms of violence. Slater describes the actions used to clear out properties and land in neighborhoods at early stages of gentrification (extended quote):

> The [emptied properties] referred to above do not simply "appear" as part of some naturally occurring neighbourhood obsolescence and "decay"—they are *actively produced* by clearing out existing residents via all manner of tactics and legal instruments, such as landlord harassment, massive rent increases, redlining, arson, the withdrawal of public services, and eminent domain (or "compulsory purchase orders" in the UK). Closing the rent gap requires, crucially, separating people currently obtaining use values from the present land use providing those use values—in order to capitalise the land to the perceived "highest and best" use. The rent gap thus highlights specific social (class) interests, where the quest for profit takes precedence over the quest for shelter (Slater, 2017, pp. 119–120).

These violent removals at earlier stages may help explain the lower odds of preterm birth in neighborhoods with advanced gentrification. There is growing evidence that separating people from shelter is related to preterm birth. The research on evictions and foreclosures at the individual level suggests that being forcefully removed from one home while pregnant can increase the likelihood of preterm birth. Eviction at any point in the life course is a stressful

experience (Hoke & Boen, 2021). The stress may be exacerbated during pregnancy. A study conducted in Georgia found that eviction during the second or third trimester was associated with reduced birth weight and gestational age (Himmelstein & Desmond, 2021). Additionally, the threat of homelessness may impact a pregnant person's health even without the formal process of eviction (Leifheit et al., 2020). Matthew Desmond's research on eviction demonstrates that not all removals are formal evictions. Landlords engage in several tactics ranging from threats, increasing rent, and neglecting repairs to forcefully remove residents.

Even when individuals are not experiencing evictions or the threat of eviction, there may be spillover effects of neighborhood-level evictions on preterm birth outcomes (Sealy-Jefferson et al., 2021). The rent gap theory suggests that evictions may be more prevalent in neighborhoods at risk of gentrification compared to those with advanced gentrification. If this is case, the protective effect seen in neighborhoods with advanced gentrification may be a function of the displacement-related violence in at-risk neighborhoods.

Housing insecurity slightly suppresses the relationship between advanced gentrification and preterm birth. Given the unanticipated protective effect of gentrification stage, the suppression (rather than mediation) effect of housing insecurity was expected. The indirect and direct effects were in opposite directions causing a suppression of the odds ratio in the regression model. This relationship makes conceptual sense. Holding housing insecurity constant, the protective effect is slightly stronger. Still, the suppression effect is minimal. One explanation for this small effect size might be how housing insecurity is measured. The variable was derived from medical records and the data used may not be valid. The findings from Aim 3 offer support for this post-hoc analysis. When discussing housing insecurity with study participants in the Bay Area, they suggested that it is unlikely that Black women experiencing housing insecurity will report it in a medical setting due to the punitive disposition of child protective services. I explain this in further detail in the limitations section.

6.2.2. Summary for Aim 2

The second aim of the study sought to examine whether interpregnancy residential mobility was associated with preterm birth.

Out-migration is not associated with preterm birth in the general sample. There are three plausible explanations for why this association was null. First, the scale at which out-migration was measured in the study. Second, the short timeframe of the study (2011-2017) may not have captured many instances of out-migration. Third, out-migration may provide Black birthing people with benefits that improve, rather than harm their health. Historically and contemporarily, Black people move have chosen to move to the suburbs for different reasons. In his historical study of Black post-war suburbanization, Wiese complicates this mobility pattern on one hand the "dream of suburbia" promises a different, perhaps better life than the city.

> Their struggles for quiet streets, open spaces, and places of their own—whether defined as homes, institutions, neighborhoods, municipalities, or even extraterritorial communities—were not simply a recent phenomenon, the inevitable flip side to urban crisis or the fruits of a misguided integrationism. Rather, black suburbanization was a migration shaped variably over time by jobs, family ties, and social networks, as well as values for housing, strategies of wealth accumulation, and desires to use and control space that African Americans nourished and remade throughout the century. (Wiese, 2005, p. 288).

On the other hand, the decision to pursue the "suburban dream" is not made outside of the context of spatialized exclusion in cities. Furthermore, the suburban dream has been sullied by the forces of financialization. This sentiment is reflected in the qualitative interviews, middle- and high-income Black mothers made decisions to move to the suburbs to have more living space and access to better schools for their older children. Low-income mothers who moved to the suburbs did so mainly because their housing vouchers were accepted there. They, too, were able to access more space but the quality of the home was not ideal. Low-income suburban

movers complained about rodents and undealt with structural issues. Their experience with out-migration is qualitatively different from their higher-income counterparts. What they have in common, though, is that neither group could afford a dwelling like theirs if they were in San Francisco or Oakland. In other words, both groups of women experienced due to varying degrees of external pressure and their out-migration resulted in different outcomes. These nuanced experiences with out-migration help to explain why there were null findings for this hypothesis.

Out-migration among non-WIC recipients trended toward statistical significance. For these individuals, the odds of preterm birth were higher than the reference group. This finding is somewhat unexpected given that the assumption is that non-WIC participants may be more likely to have the resources to move. However, it is possible that sizeable proportion of the non-WIC participants are eligible for WIC and thus misclassified as "non-poor." If that is the case, these individuals would have fewer resources and less support than similarly positioned birthing parents who receive WIC assistance. This would explain why outmigration is not associated with preterm birth for WIC participants.

The association between residential mobility and preterm birth is conditional on WIC participation. The finding that different mobility trajectories relate to odds of preterm birth for WIC participants and non-participants differently suggests that there may be different mechanisms influencing preterm birth for these populations. For WIC participants, the higher odds of preterm birth may be related to the fact that they are more likely to move into declining neighborhoods. Whereas residential moves among non-WIC participants, particularly within the outer regions, may be related to the geography of foreclosure (Schafran, 2013; Walker & Schafran, 2015). I describe these plausible mechanisms below.

Preterm birth odds were higher for WIC participants moving within the inner region. There are several plausible explanations for this finding. Staying within the region may have adverse impacts on pregnancy outcomes if individuals are forced to move into neighborhoods

with more chronic stressors or toxic exposures. Low-income individuals are more likely to move to more affordable neighborhoods than their previous neighborhood (Gailey et al., 2021). Chronic (e.g., stress) and acute (e.g., lead) exposures often concentrate in neighborhoods with cheaper rents (McDonald & Richards, 2008). This clustering of hazardous exposures is due to the cycle of capital investment and disinvestment. Disinvestment causes the concentration of poverty and unhealthy social environments by making “declining neighborhoods” more affordable for poor individuals, poor businesses, and hazardous industries (Slater, 2013). In addition, landlords often delay or forgo maintenance of rental properties in declining neighborhoods to maximize profits (Desmond & Wilmers, 2019; Rosen, 2020). This adds to the increased risk of exposure to toxins such as lead in these types of neighborhoods (Eisenberg et al., 2020).

A recent report on healthy housing explains the connection between housing affordability and health, “As the housing crisis deepens in Oakland and throughout the Bay Area, tenants are at greater risk of exposure to deteriorating housing conditions in order to keep their rents from rising or from losing their housing” (Nguyen et al., 2018). In Oakland, for example, neighborhoods with an increasing number of Black residents have high rates of lead exposure in children and pregnant women (Tobias, 2021). The report highlights the inadequate tenant protections and enforcement that should result in lead remediation and the prevention of lead exposure. The minimal progress on lead remediation could have long-term impacts on the health of pregnant women and their babies. A scoping review of studies on intrauterine metal exposure found that people exposed to lead during the first and second trimesters delivered preterm at higher rates than those not exposed. Three studies demonstrated that there was a dose-response relationship between lead and preterm birth (Khanam et al., 2021).

A related plausible explanation for the finding that inner-region mobility is associated with higher odds of preterm birth is that this type of move may increase birthing people’s direct exposure to violence. Rates of intracommunity and police violence are often high in areas where

the cost of rent is the cheapest. Exposure to violence is mechanistically related to preterm birth via stress pathways and environmental pathways. In a study based in Chicago, Lee and colleagues (M. J. Lee et al., 2021) sought to understand how neighborhood violence impacted biomarkers of stress in low-income Black mothers. They used two measures of violence, administrative (i.e., from police records) and self-reported. They found that Black mothers who lived in neighborhoods with high crime and reported high neighborhood stress had greater expression in the genes regulated by the glucocorticoid receptor (GR). The authors could not determine if this expression was related to increased cortisol or GR sensitivity. However, the findings suggest that subjective experiences of neighborhood violence is related to stress responses in Black women.

These chronic and acute exposures are related to one another insofar as individuals who try to avoid exposure to violence may spend more time in their homes which could increase exposure to harmful toxins. Thus, the relationship between residential relocation within the inner core might be explained by the neighborhood and housing conditions of individuals' new residential locations. The connection between neighborhood conditions and housing conditions is not always straightforward, however. In a study seeking to explain why Moving to Opportunity participants moved back to high poverty neighborhoods, DeLuca and colleagues (DeLuca et al., 2012) found that families make trade-offs to prioritize quality housing conditions over neighborhoods with low poverty rates. So Black families may move to declining neighborhoods to have more control over their immediate environment.

Preterm birth odds were higher among non-WIC participants moving within the outer region. Despite having more residential options than their low-income counterparts, moderate- and high-income Black birthing people whose moves occurred within the outer region had higher preterm birth than odds those who did not move. This unexpected result might be explained by mechanisms altogether different than those described in the previous paragraphs.

After the subprime lending housing market crash in 2008, Northern California suburbs were hit hard with a wave of foreclosures. Urban geographer Alex Schafran (2018, p. 255) explains how Northern California suburbs, with their increasing racial diversity, became one of the nation's epicenters of the foreclosure crisis,

> [N]ew forms of geographic inequality and new forms of racialized space are not just a result of redlining, racial covenants, and divestment in inner cities, but of the many decisions that have been made in the aftermath of that era, often as a reaction to that era. Subprime lending may have been a poison manufactured by the financial industry, but it was allowed and even encouraged to flourish in part because it was seen as a long-awaited arrival of mass credit to communities of color who were denied it in an earlier era. The fact that the terms of the deal were invariably worse than for white borrowers was seemingly less important that the intention behind it.

The study years overlap precisely with the rise in mortgage foreclosures, employment loss and business closures in the area. It is unclear, then, what the role of residential mobility is in this context. The context of the foreclosure crisis could be both a confounder and an antecedent to residential mobility. One could argue that the crisis caused massive displacements, which may have increased residential mobility within the outer region, and that the ensuing recession influenced stress among pregnant women resulting in higher rates of preterm birth. In this scenario, the crisis would be a confounder with the Great Recession impacting both residential mobility via foreclosure and preterm birth via stress pathways.

Only one study has examined the multi-level impact of the Great Recession on preterm birth rates. However, the authors do not include mortgage foreclosure rates as one of the exposure variables (Finch et al., 2019). Nevertheless, they found that increases in recession-induced unemployment is associated with preterm birth. Another study examined the individual-level impact of foreclosure on birth outcomes in California during the height of the subprime crisis (Downing & Bruckner, 2019). They found that individuals who were pregnant during or

after a foreclosure had lower weight babies. Due to the study period and the concentration of foreclosures in the outer region of the Bay Area, I cannot rule out that the Recession and foreclosure crisis played a role in the observed association.

6.2.3. Summary for Aim 3

The relationship between the changing geography of inequality and preterm birth cannot be explained in a linear way. In this study, I identified 5 potential mechanisms that help to explain (1) the connection between the geography of regional inequality and preterm birth risk and (2) why some of the associations in Aims 1 and 2 were found. I discuss each of the mechanisms—wealth hoarding and the distribution of resources; outsourcing the social safety net; policing Black mothers and families; deregulation of low-income housing through housing choice vouchers; and community-driven resistance—below.

Wealth hoarding and the distribution of resources. In general, at least two types of wealth hoarding may have implications for needed resources for Black pregnant and birthing people. First, at the regional level, most of the resources, including wealth, philanthropic donations, non-profit and public services, are concentrated in the inner core. This regional concentration leaves individuals and families with limited options when services are needed. Some of the access inequities are related to the shifting geography of inequality in unexpected ways. For example, Black healthcare providers are priced out of places like Oakland and San Francisco, so they commute long hours into the inner region because the pay is better. This dynamic leaves individuals living in the suburbs with fewer Black providers. This may be problematic for pregnancy outcomes (Greenwood et al., 2020). Second, drilling down to specific jurisdictions, necessary resources are not always accessible to Black people. As a result, they may go underutilized or even wasted on ineffective programs and services in improving preterm birth outcomes among Black people.

Outsourcing of the social safety net. The findings also point out the consequences of outsourcing social and health support services. The drive to use the market to take the place of a robust welfare state creates a fragmented system with logistical barriers for poor Black mothers. It contributes to the internalization of individual responsibility (rather than collective care) (Elliott & Reid, 2016). Women reported expecting to engage in high-effort coping before, during, and after pregnancy to ensure their babies were taken care of. Poor women must engage more frequently with "charitable" organizations and individuals. In doing so, they must navigate racism, paternalism, advocate for themselves against unfair treatment, and actively persist in their pursuits to access the supports they need. On one hand, the active pursuit of material needs at one's own expense may provide them with the resources they would not have otherwise gotten.

On the other hand, high effort coping could exacerbate stress, especially during a sensitive period of pregnancy. Descriptions of how they respond to and navigate these barriers are consistent with the Superwomen Schema (SWS) described by Cheryl Woods-Giscombé (2010), which conceptualizes how Black women are forced to take on overwhelming responsibilities while suppressing their own needs. One of the key components of the SWS is the embodiment of stress. Bottling emotions, downplaying difficult conditions, and pushing though because "I just have to do it" can all contribute to increased stress that may impact Black women's pregnancy outcomes in several ways.

Policing Black mothers and families. Central to the urban restructuring that fuels racial resegregation in Northern California is the "transfer of services from the welfare state to the private realm of the market and family" (Roberts, 2011, p. 134). The splintering of social support increases the number of "providers" Black mothers interact with to receive necessary support. This increased engagement is potentially problematic for Black mothers because, as Patricia Hill Collins (2009) writes, "bureaucracies, regardless of the policies they promote, remain dedicated to disciplining and controlling their […] clientele." The goal of these bureaucracies,

according to Collins, is to create “quiet, orderly docile and disciplined populations of Black women” (Hill Collins, 2009, p. 299). Attempts to change the ‘poor’ behavior of poor Black women who are stereotyped as being ‘bad’ mothers has been a longstanding strategy. As Dorothy Roberts explains, “Over the last two decades the welfare system, prison system, and foster care system have clamped down on poor minority communities, especially inner-city black neighborhoods, thereby increasing many families’ experience of insecurity and surveillance” (Roberts, 2011, p. 135). In the case of new mothers, as reported by Black mothers in the Bay Area, this surveillance is carried out via the ever-present threat of child protective services (CPS). Prior research has demonstrated that poor Black mothers only partially engage in these systems to avoid being reported to CPS under these conditions. However, this partial engagement may have consequences in terms of the resources they are able to obtain (Fong, 2019). Participants reported partial engagement, “firing” an agency (i.e., forgoing the services), and active efforts to prove themselves stable mothers. In the context of individual responsibility and the splintering of services, the sites that should ameliorate preterm risk for Black women may have the opposite effect as sites of surveillance and criminalization that force women into hypervigilance.

Landlord discrimination and exploitation. Poor Black mothers are extremely disadvantaged in the rental market. Housing vouchers help expand their housing options in that market, but there are limits to the program and constraints on residential location and housing quality remain. This finding is consistent with ethnographic research conducted in Baltimore which demonstrated that landlords sort low-income tenants into neighborhoods, and those with the lowest incomes into the hardest to rent units to maximize profit (Rosen, 2014, 2020). In the Bay Area, this locational sorting pushes low-income renters out of neighborhoods experiencing capital investments. The decrease in voucher accessibility in Oakland, for example, coincides with Black out-migration and concentration into particular neighborhoods (Anti-Eviction Mapping Project, 2016). Participants talked about being pushed further and further into neighborhoods

with more violence and out of the city altogether while being illegally denied suitable homes. Other scholarship on low-income renting which demonstrates that many landlords use the voucher system to their own benefit by overcharging voucher holders (Desmond & Perkins, 2016). Though none of the participants talked about overcharging, one discussed how the obligation to pay security deposit out of pocket made renting with a voucher especially difficult. One important study on this topic presents a nuanced picture of landlord motivations by exploring the different logics of landlords. The author finds that not all landlords are interested solely in the pursuit of profit maximization. Those that are do so at the expense of poor tenants (Shiffer–Sebba, 2020).

Community-driven resistance. Communities resist and respond to the unequal regional landscape in various ways. While the resistance addresses health inequities (e.g., the lack of health care infrastructure) in some places, it also reinforces, or recreates inequalities because towns and cities across the region have different propensities to incorporate community needs. This finding is consistent with other research in the Bay Area. For example, Lawrence Vale argues that suggests that San Francisco's previous experiences with urban renewal created an organizing infrastructure that was able to resist and negotiate wins in future proposals for mass displacement such as HOPE VI (Vale, 2019). In these instances, redevelopment happens from above and below. Similarly organizing for health resources comes from below, and places that do not have an organizing infrastructure may bear the brunt of health and social problems.

6.3. Methodological Considerations

Multilevel logistic regression. I used a generalized linear model (GLM), multilevel logistic regression, for Aim 1. An alternative could have been generalized estimated equation (GEE) model. There are two main differences between GEE and GLM. The GEE does not run random effects. It treats the clustering as a nuisance and simply controls for it. This would have been an appropriate approach because conceptually, was not interested in whether census tracts have

different slopes but rather whether variation in neighborhood typology is associated with variation in preterm birth. The other difference is that GEE determines effect sizes by using an average across the cells. As a result, it is more tolerant than GLM of small cell sizes. However, this approach would not have allowed me to do a mediation analysis because it averages the effect across the population so any individual-level estimates would not be able to be assessed.

Conditional logistic regression. Conditional logistic regression is a GLM that allows for individuals in panel data to act as controls for themselves. As mentioned above, the GEE would have been a suitable alternative. To determine whether the conditional GLM or the GEE is a better model, Hancock et al. (Hancock et al., 2007) compared the type I error, power odds ratios, and confidence intervals. They found that the GEE had more power in detecting an effect, but that GLM had less bias and more variability. It is likely, then, that the GLM estimates were conservative.

Generalizability. These findings are generalizable to Black birthing people residing in the San Francisco Bay Area during the study periods. To establish generalizability to a population of Black birthing people would require that this sample be representative of Black birthing people in other metro-regions in the United States. The fact that the sample was drawn from all births in the region strengthens generalizability claims. However, selection bias (discussed in the limitations) excludes some of the most marginalized birthing parents, tempering regional generalizability. Furthermore, generalizing these results to other geographic regions should be done with caution. Black birthing people in the San Francisco Bay Area may not be like those in other regions regarding education, occupation, nativity, and other demographic factors. In addition, the San Francisco Bay Area is unique in its experience of regional inequality. Further, the region's racial and ethnic diversity has been exploited by political decision-makers to manufacture scarcity and competition. These dynamics were not examined in this study but may play a role in the relationships observed.

The extent to which gentrification and residential mobility related to preterm birth in another geographic setting is unclear. Although gentrification and racial resegregation are phenomena happening across the United States, how they unfold is different. Therefore, the UDP gentrification measure, may not capture the process in other settings. The Urban Displacement Project has taken on this work to develop similar measures in different regions including Atlanta, Los Angeles, Portland (Oregon), Austin, Chicago, Denver, and New York City.

6.4. Limitations

This study is limited in several ways.

Causal inference. For the cross-sectional analysis in Aim 1, findings should be interpreted as associational, not causal. The strength of the associations found in the study is weak-to modest. Additionally, temporality is difficult to establish because both the exposure and outcome were measured at the same time. A dose-response relationship was also difficult to establish because it is not possible to determine how long women have been living in their neighborhoods. It may be that women who are long term residents have different outcomes than those who are newcomers. The assessment of neighborhood tenure is complicated by homeownership, which is unmeasured in this study. It is not possible to determine who in the sample owns vs. rents their home. Even though the wealth accrued from homeownership is not as beneficial to Black families as it is to white families, it may provide financial and social benefits relative to Black tenants (Finnigan, 2014; Markley et al., 2020; Taylor, 2019). Therefore, it is plausible that homeownership may affect the relationship between gentrification and health for this population.

For Aim 2, the retrospective cohort longitudinal design, improves causal inference because the exposure occurred before the outcome. Still, these findings should be interpreted with caution. As the sensitivity analysis shows, there is a health selection effect into residential mobility trajectories. Individuals who deliver preterm at Time 1 are move likely to move within the outer region. This health selection does not negate the association between mobility and

preterm birth at Time 2, however. It is more likely that the causal links are not linear—mobility and health influence one another. And both are influenced by larger contextual factors.

Selection bias: selection into the sample. The administrative dataset used for the empirical analyses in Aims 1 and 2 include most births in the region which minimized sampling bias as the population allowed for adequate statistical power. However, due to the deterministic (birth record to hospital discharge data) and probabilistic (sibling to sibling) linking strategies, missed matches are possible. This could have biased the results if, for example, a particular hospital was more likely to have errors in their reporting. Similarly, these analyses include individuals with complete data on all covariates which excluded about 5% of the total observations. This exclusion likely introduced selection bias toward the null as those data were missing not at random. Most of the missing data can be attributed to one hospital in Oakland that disproportionately serves Black and working-class mothers and birthing parents.

Selection bias: selection into neighborhoods and health selection. In studies of place, mobility, and health, the concern about neighborhood selection is always present. The argument is, "people who are more similar tend to live closer together, so associations between place and health might be an artifact of individuals selecting into neighborhoods rather than the neighborhood itself." Regarding mobility, the argument goes, "people of a certain health status are more able to move than others, so the relationship between mobility and health may be an artifact of their health at baseline rather than the move, per se." Studies typically run sensitivity analyses (as I have done here) to isolate the impact of the neighborhood (or mobility). However, these issues are precisely what this study seeks to understand. When scholars are tied to estimating a causal effect, we sometimes ignore important findings or treat them as a statistical nuisance. Health selection into mobility matters. The sensitivity analysis revealed that women who delivered preterm at Time 1 were more likely to move within the outer region. That is not just a nuisance. Instead, that tells us something about who can move vs. being forced to move

vs. able to stay. Other health conditions—not available in birth records—likely impact whether and where people can stay or move.

Census tracts as neighborhood proxies. Neighborhoods are dynamic spatial entities. A common challenge in neighborhood-based research is the use of administrative boundaries as proxies. These operationalizations can be described as atheoretical and apolitical (Riley, 2018; Schafran, 2018). In this study, it is unclear if census tracts are meaningful boundaries in terms of measuring gentrification. There may also be concern that census tracts (vs. block groups or another scale) was inappropriate. Despite these limitations, using the census tract in this study was advantageous because of the Neighborhood Displacement Typology measure. The Urban Displacement Project conducted qualitative case studies in 9 Bay Area communities to assess the extent to which the measure was consistent with "on the ground" interpretations of gentrification. In addition, other studies comparing health outcomes in census tract boundaries and "natural neighborhoods" (Ross et al., 2004) and spatial density measures (Kramer et al., 2010b) found similar results.

WIC receipt as a proxy for poverty status. There are two issues with using the receipt of Special Supplemental Nutrition Program for Women, Infant, and Children (WIC) assistance as a proxy for poverty status. First, fewer than half of the families eligible for WIC participate in WIC (K. Smith, 2016). Families are eligible for WIC if there is a child under five years old in the household and the household income is less than 185% of the federal poverty level. However, in a national study of WIC eligibility, only 44% of eligible urban Black households were enrolled in WIC (K. Smith, 2016). In these samples, then, poverty status is likely underestimated. The second issue is that WIC, itself, is a policy intervention. WIC provides women with nutritious food and baby formula as well as breastfeeding support, health education sessions, and referrals to other support services. As a result, WIC participation has health-promoting benefits (B. J. Lee & Mackey-Bilaver, 2007). Therefore, if a study compares individuals who participate

in WIC to those who are eligible but do not participate, WIC participants generally have better outcomes. This may be because the nutrition assistance may free up funds for other expenses such as housing. This also may be because the WIC program uses incentives to encourage nutritious food consumption and breastfeeding (Rasmussen et al., 2016). Therefore, WIC participation as a proxy for poverty status is a limitation because it is not necessarily capturing poverty status. With the administrative data available, WIC eligibility is unclear. There may be poor individuals in the dataset who are not receiving WIC. This misclassification would likely bias the results (i.e., the expectation that poor mothers have worse health outcomes) to the null because poor individuals would be classified as non-poor.

Racial and spatial inequality is embedded in administrative data. Qualitative data analysis revealed that individuals who experience housing insecurity or have been displaced from their neighborhood might use inaccurate addresses on their medical records for at least two reasons. First, access to resources. Second, people may use different addresses in their medical records to protect themselves and their children from the child welfare system. Therefore, some of the addresses in the SOMI dataset may not be accurate as individuals electronically select into neighborhoods to prevent being treated as unfit mothers.

Place-level mobility measures mask neighborhood-level mobility. Aim 2 examines the relationship between residential mobility between census places experiencing different levels of Black population change and preterm birth. I was especially interested in women moving from cities losing Black population to cities and towns gaining Black population. This was the operational definition of out-migration. However, the interview participants spoke about frequent residential mobility within the inner core (i.e., cities losing Black population). In Oakland, for example, women were moving to more affordable neighborhoods with a greater proportion of Black people. This suggests that using the census tract as the geographic unit of analysis would have been another meaningful exploration. This is still out-migration but at a smaller scale.

Residential mobility at the census tract level might reveal some nuanced understanding of how the racialization of space is related to pregnancy outcomes for Black people.

Did not measure mobility intention. I was unable to differentiate, quantitatively, between voluntary and involuntary mobility. For many Black women in Northern California, both push and pull factors likely influence residential mobility. Affordability is but one push factor. This limitation was supplemented with qualitative data from women living in the Bay Area. Their experiences provided greater depth in understanding relocation decisions in the context of regional inequality. Still, the experience of displacement (i.e., forced moves) cannot be gleaned from this study.

Two time points only capture partial mobility histories. For Aim 2, exploring the relationship between residential mobility and preterm birth, several limitations arise because I only have residential data at each birth. First, I do not have data on when women relocated to their subsequent addresses between pregnancies. It could be that women who recently moved (for example, during pregnancy) have different outcomes than those who moved months or years before conception. This limitation is difficult to address with the available administrative data. However, evidence suggests that the timing of residential mobility matters for birth outcomes (Bond et al., 2019). There is little evidence to suggest that the variation in timing should differ across the exposure categories. In other words, I do not expect that *length of time in new residence* and *type of residential mobility* is highly correlated. Second, I do not know if there were multiple moves in-between each pregnancy. Third, some studies have found that there may be a time lag on the health impacts of moving (Popham et al., 2015). It might be that for some individuals, the health impact of mobility might not be experienced until their third child even if they moved before the second child. Despite these limitations, this study has two time periods for each birthing person and specific locations. These study design elements improve cross-sectional mobility and health research that operationalizes mobility as a binary variable (Morris et al., 2018).

Percent change in black population as a proxy for displacement and resegregation. The descriptive analysis in this study shows a clear pattern of Black population loss in the inner Bay Area region and Black population gain in the outer region. I used the percent change in Black population between 1990 and 2010. This is an imprecise proxy because cities with low Black populations at both time points may have an artificially large percent change. For example, Atherton in San Mateo County has high Black population gain because it was 0% Black in 1990 and 1% Black in 2010. The median income of Atherton is over $200,000. Thus, this is not the typical place one thinks of when discussing resegregation. However, Atherton was not in the final Aim 2 analysis because, unsurprisingly, there were no Black births in the city. This was the case for many of the exclusive enclaves.

Interview recruitment Due to scheduling conflicts, I changed the format of data collection from focus groups to semi-structured interviews. I originally proposed doing focus groups with a sample size of 20 (four focus groups with five 5 individuals each). I was unable to reach the targeted sample size of 20. Several enrolled participants were ultimately not interviewed despite intensive follow-up. It is possible that Black birthing people in the Bay Area are experiencing "research fatigue." Research fatigue occurs when over-studied individuals or groups withdraw from or decide not to participate in research activities (Clark, 2008). However, the change from focus groups to interviews increased my hours of exposure from 4 (in the original proposal) to 13 hours. It is unclear, however, if I reached theoretical saturation, a goal of qualitative data collection.

6.5. Strengths

The study has several strengths.

Plausibility. The finding that advanced gentrification is associated with lower odds of preterm birth was not in the expected direction, but it is plausible. This finding is consistent with other research on neighborhoods and maternal health. Gentrification is a neighborhood process

that can be viewed in two (non-mutually exclusive) ways: as neighborhood exclusion and as neighborhood upgrading. Both are usually happening at the same time. Other measures of neighborhood exclusion (e.g., mortgage discrimination) is associated with a protective effect of preterm birth for Black women (Mendez et al., 2014). Additionally, poor neighborhoods with more health resources are also protective of adverse pregnancy outcomes (Headen et al., 2019).

Robust measure of gentrification. The Urban Displacement Project measure of gentrification captures gentrified, gentrifying, and non-gentrifying neighborhoods. In a comparison of measures, Mujahid and colleagues found that the UDP measure was able to identify gentrified tracts that were missed with other measures (Mujahid et al., 2019). The results demonstrate differences in preterm birth in particular neighborhood typologies that may be overlooked when just examining gentrification as a binary variable. This may help explain why the findings from this study differ from the only other published study on gentrification and preterm birth (Huynh & Maroko, 2014). More qualitative research should be conducted to understand the substantive differences in neighborhood typologies (i.e., what is happening in the neighborhoods that matter for health). The UDP measure, like other census-derived measures may mask important nuances in neighborhood processes that could be further explored to better understand how health and illness is produced across space.

Testing pathways linking gentrification and preterm birth. This study is the first, to my knowledge, to test pathways linking gentrification to preterm birth. I tested two potential mediators as indicators of financial strain: housing insecurity and adequacy of prenatal care Gentrification is defined, in part, by increasing housing costs and could influence women's experience of housing insecurity which, in turn, could increase risk for preterm birth. I also hypothesized that the financial strain of living in a gentrifying neighborhood might reduce women's access to and utilization of prenatal care. Neither variable mediated the relationship between advanced gentrification and preterm birth. However, holding housing insecurity

constant, strengthened the association slightly. Future research should explore other factors that may explain this relationship.

Integration of quantitative and qualitative data. The study uses a range of quantitative and qualitative data and methods to approach the research questions. This integration of data and methods led to several important insights. For example, that the fear of punitive healthcare practices inscribes racism in electronic medical records. This insight came from asking participants (key informants and Black mothers) why rates of housing insecurity were so low in the administrative data. Integration of data, which includes processes of seeking divergence (i.e., initiation) and convergence (i.e., triangulation) allows for a fuller understanding that strives to "forge an overall or negotiated account" of the findings (Bryman, 2007, p. 21). In this study, the quantitative data and analysis provide a description of patterns of racialized spatial inequality in preterm birth while the qualitative data and analysis provide an interpretation of why those patterns exist (Spillman, 2014).

6.6. Implications of the Research

6.6.1. Future Research

Testing the rent gap theory. The finding that residence in neighborhoods with advanced gentrification is associated with lower odds of preterm birth suggests that future research should empirically test the rent gap theory and health outcomes. There is a small but growing body of literature that examines evictions and health. These studies tend to use data from the EvictionLab which compiles formal evictions and eviction filings down to the Census block group. The EvictionLab data is then linked to survey or administrative data to examine potential associations with health outcomes. Work exploring the health implications of other forms of dispossession may be an important area. Scholars could examine how the production and exploitation of rent gaps by landlords, developers, and police are related to health outcomes

and health-related resources. This would place dispossession in the larger context of housing commodification.

Reconceptualizing segregation measures. Due to the demographic shifts, scholars should reconceptualize the centralization dimension of segregation. Centralization refers to how minoritized people are concentrated in "center cities." Geographers David Folch and Sergio Rey (2016) have undertaken adaptations to the centralization measure. Their technique allows investigators to find racial concentrations outside a region's city center. This technique measures the disproportionate concentration of a group in a neighborhood relative to the region as a whole. However, because this technique focuses on one neighborhood at a time, it cannot shed light on regional patterns of segregation, where populations are more dispersed. Therefore the Folch & Rey measure is an improvement but it still does not fully reflect "segregation at a larger scale" (Schafran, 2018) where people are moving outside of cities altogether. Future conceptualizing and operationalizing might incorporate the urbanization of suburbs and the multimodal patterns of concentration outside of cities which vary across regions.

Combining administrative data with other data sources. The study also highlights the limitations of administrative data for social research. While administrative data provides useful (and precise) information on health conditions and diagnoses, it falls short in providing accurate data about people's social lives. The purpose of the ICD Z-codes is to identify health-related social needs (American Hospital Association, 2022); however, there is little incentive to use these codes because the codes are not currently billable (Bensken et al., 2022). In addition to their limited use on the provider's side, there is limited reporting of the social needs on the patient's side due to fear of being penalized. For research on social exposures, scholars should temper the inferences made especially about individuals who have historical and contemporary experiences with racism or discrimination in medical settings. In many cases, these data may be substantially underreported.

Future research on health inequalities should strive to integrate narratives to gain a fuller understanding of the mechanisms linking structural forces and health inequalities. The qualitative analyses demonstrate that narratives are essential to understanding motivations, needs and desires related to neighborhood change and residential mobility. Population health funding mechanisms tend to favor large-scale analyses of secondary data. These data make visible population distributions of certain exposures and health outcomes. They are also useful for describing inequities between populations. However, they are limited in explaining how those distributions come to be. Mixed methodologist, Evan S. Lieberman, lists ways quantitative and qualitative approaches can be generatively mixed,

> statistical analyses can guide case selection for in-depth research, provide direction for more focused case studies and comparisons, and be used to provide additional tests of hypotheses generated from small-N research. Small-N analyses can be used to assess the plausibility of observed statistical relationships between variables, to generate theoretical insights from outlier and other cases, and to develop better measurement strategies (Lieberman, 2005, p. 435).

Research on racial health inequalities could benefit from using such integration approaches.

Black mobility studies. The findings and limitations of this study highlight the need for more research on Black mobility and migration. We especially need more studies that examine mobility as a form of Black resistance and liberation. Much of the literature on mobility among Black people focuses on the extent to which Black people are immobilized by white supremacist policies. Ghettoization, segregation, transportation, have all been used as tools to keep Black people in place or to force them to move. Still more evidence is needed about which Black people are moving where and why. We also need more studies exploring Black mobility or immobility as resistance and outside of the constraints of white supremacy.

Prioritize class analysis. The study highlights the need for better measures of class. In this study, I used participation in WIC as a proxy for socioeconomic status, but the qualitative

interviews revealed very different experiences with housing, mobility decisions, healthcare experiences, and pregnancy outcomes based on class that may not have been captured in the administrative data. For example, people whose income disqualifies them for WIC still may have challenges with paying for housing costs. These challenges ultimately impact decisions on where to live.

6.6.2. Practice

Basic needs provision and linkage during pregnancy. Prioritize linkage between health service providers and basic needs security such as housing, food, and baby supplies. Participants reported that group prenatal sessions, diaper and food pantries were helpful during their pregnancy. Hospital staff during the prenatal and postnatal period should emphasize linking women with needs to appropriate resources. Additionally, appointments may present barriers but given the number of mandatory biological testing pregnant women undergo, there surely can be a social inventory that makes the linkage more seamless. Furthermore, outside of hospitals, the public health department, which facilitates many of the Black Infant Health programming would benefit from the ability to assist with housing needs for vulnerable clients. There are special housing programs for pregnant women but DPH staff are limited in housing referrals.

Regional coordination of health and social services. Currently the political and service fragmentation in the region does not align with how Black birthing people live their lives day-to-day. They are often working, providing child or eldercare or have children in school in different counties than their residential counties. This makes attending multiple appointments difficult. The difficulty is exacerbated when they are limited to only accessing services within their county or city of residence. Services with Black Infant Health (BIH) and Perinatal Equity Initiative (PEI) might be more accessible if anyone who lives within the region can access them anywhere and if offerings were available during evenings and weekends.

Current regional coordinating efforts involving the Bay Area Regional Health Inequities Initiative include a taskforce on housing for Black Bay Area residents as well as advocacy for state legislation to ease the burden of housing costs for all Californians. These efforts should continue and be appropriately funded. Where appropriate, payment for services (for example, doula services) should be universal (i.e., through MediCal).

6.6.3. Policy

If health and cultural resources are concentrated in exclusive neighborhoods, policies should prioritize neighborhood inclusion. Several tenant organizations in the Bay Area have targeted rent control, just cause eviction as key policies to foster neighborhood inclusion.

Tenant protections. On January 1, 2020, AB 1482 the California Tenant Protection Act of 2019 went into effect. The two main protections offered by AB 1482 are rent control and just cause eviction. Rent control prevents rent increases above a 5% plus inflation for units older than 15 years (Tenant Protection Act of 2019, 2019). The second protection, just cause eviction, prevents the eviction of tenants for arbitrary reasons. It is designed to prevent the removal of tenants for the explicit sake of raising rents to maximize profits. Just cause eviction allows for eviction to proceed for reasonable (or "just") cause such a chronic nonpayment of rent. However, in many cases, non-payment of rent is still not an evictionable offense. This is especially the case with landlord neglect. For example, if repairs, pest problems, heat and cooling issues go unattended, tenants are within their rights to withhold rent without fear of eviction. Low-income Black birthing people should particularly benefit from Just Cause Eviction laws as Black mothers have the highest rates of eviction in the region. Monitoring enforcing of these protections will be necessary to ensure that landlords are adhering to the law.

Housing vouchers. Housing Choice Vouchers are a tenant-based housing subsidy that should be able to give working-class families access to resourced neighborhoods. Several shortfalls of the policy limit its utility. First, it is underfunded at the federal level so only 25% of those eligible for vouchers receive them. In Oakland, for example, this translates to voucher

waitlists that can last two or more years. Second, discrimination against voucher holders, though illegal, is common. Third, the voucher program does not cover the costs of rental deposits. This creates an additional barrier for tenants who do not have readily available funds. Finally, the voucher system does not undermine the exploitation of tenants (Burawoy, 2017; Rosen, 2020; Slater, 2021). Several Black mothers in this study discussed how landlord negligence negatively impacted their wellbeing. An expansion of the voucher system under these circumstances might give low-income mothers rent relief, but it would not necessarily improve their living conditions.

Universal basic income. Throughout this section, I have discussed various housing levers that could facilitate more equitable neighborhood inclusion for Black birthing parents. Another, more fundamental policy solution, could increase families' disposable income. While home values and rents have increased drastically, wages have remained stagnant. Thus, neighborhood inclusion can also be fostered through universal basic income policies which would increase families' funds to spend on housing and other basic needs. One such policy is being piloted in San Francisco. Delivering Birth Justice provides Black and Pacific Islander birthing people with a no-strings attached $1000 per month to improve birth outcomes. Evaluation is underway but many of the recipients use the funds for housing costs (Z. Malawa, personal communication, November 10, 2021).

A combination of tenant protections and universal basic income could increase Black mothers' and birthing people's the decision-making power in Northern California regarding if, when, and where they move.

6.7. Public Health Critical Race Praxis Reflection

This study was guided by the Public Health Critical Race Praxis (PHCRP). In this section, I reflect on how I incorporated the principles of PHCRP throughout the research process.

Contemporary mechanisms. While analyzing I was attentive to the ways in which neoliberal ideology pervades collective understanding (including my own) of health, place, and

racism. "Neoliberalism is a theory of political economic practices proposing that human well-being can best be advanced by the maximization of entrepreneurial freedoms within an institutional framework characterized by private property rights, individual liberty, unencumbered markets, and free trade" (Harvey, 2007, p. 22). Under these circumstances, the argument goes, people can make the choices that best fit their own needs. With this backdrop, I started this project from the premise that “choice” is not equally distributed across populations. Class structures choice among Black women but more choice does not necessarily mean better health. As seen with Aim 2 results, residentially mobile women with higher incomes still had higher odds of preterm birth relative to those who did not move. Exploring residential mobility trajectories quantitatively and analyzing narratives about residential and health choices available to Black mothers highlighted the ways in which “actually existing” neoliberal policies and practices shape their everyday lives (Brenner & Theodore, 2002).

Voice. PHCRP emphasizes the importance of centering the voice of marginalized people. During this project, I prioritized speaking with Black mothers living in the Bay Area to better understand their experiences. Their stories contributed immensely to the study findings and raised important questions for future study and advocacy. I also used the principle of *voice* to be attentive to the power relations with participants. Prior to beginning data collection, I met with TaNefer, the research assistant on the project, to discuss common concerns she had heard from Black women participating in research. She mentioned how paternalism in the research relationship is fueled by compensation incentives. She argued that “people don’t want gift cards” because they are a way of telling people how to use their money. Therefore, I got approval from IRB to use popular money sharing phone applications: Zelle, CashApp and Venmo and for women without bank accounts, I used a wire transfer service via WalMart. I sent their compensation immediately after each interview. This relatively small gesture was mentioned by at 60% of the participants who expressed relief at the idea of being able to spend the money how they wanted.

Social construction of knowledge. This principle highlights the importance of clarifying the researcher's "subjectivities relative to the work" (Ford & Airhihenbuwa, 2010a, p. 1395). I approached this work with several relevant subjectivities. I use the term subjectivity in two ways: as a positioned perspective as a nonneutral political stance. My interest in spatial and racial inequality in Black pregnancy outcomes is inherently personal and political. I was pregnant throughout much of the data collection process. I am also a mother to an older child with whom I had pregnancy complications. These facts shaped the research aims and my decisions to highlight structural rather than individual factors.

PHCRP calls on investigators to engage in critical self-reflection to attend to the ways our subjectivities might impact the research process. To do this, I practiced journaling to acknowledge and process my own racist experiences as I was preparing for childbirth and enduring two residential relocations during the data collection period. This practice became a way to critically reflect on my own assumptions about my similarities to the participants. Articulating those assumptions in writing throughout the research process helped me stay present and focused during interviews and avoid imposing my experiences during data collection and interpretation.

Some participants also took care to acknowledge my pregnancy. One non-Black key informant said explicitly that she was being very delicate with me because she did not want to increase the amount of stress that I was under, as I was about to go into labor. I might not have gotten as many details regarding the challenges for Black birthing people in Alameda County. I appreciated her concern because some of the interviews were, in fact, distressing. However, in subsequent interviews, I brought up my pregnancy and birthing experience only if participants explicitly asked to avoid having them hold back potentially important information. This was a fine balance. In some instances, talking about pregnancy was a way to gain rapport but I was careful to not to take too much time away from telling their stories.

Structural determinism. Throughout analysis and interpretation, I focused on who and what is responsible for the distribution of health and disease. Accountability is important to situate power relationships in the production of health and for the development of policy and other interventions. To do this, I explicitly did not ask participants about their behaviors during pregnancy. In some interviews, comments about 'poor behavior' came up and I did not dwell on them or probe further unless they were talking about behavior in the context of social and structural factors. I made this decision because individual behaviors are influenced by social factors. I intentionally sought to avoid situations where participants felt the need to defend why they made certain choices. Rather, I sought to have them explicate *how* they came to making health-related decisions. In other words, I focused on probing about how their decisions reflected their desires, the choices they had available to them, and their thought processes.

6.8. Conclusions

This mixed methods study sought to examine racialized spatial inequality using relational approaches that consider how places change and how people are mobile across place. These approaches extend understandings about how racism impacts the health of Black mothers and infants through place. In this study, I tested the associations between racial resegregation and preterm birth using two relational measures of place: gentrification and residential mobility. I used qualitative data from multiple sources to help explain the associations. The findings demonstrate that gentrification and residential mobility can influence preterm birth among Black individuals in the San Francisco Bay Area in unexpected ways. Residents in neighborhoods undergoing advanced gentrification had lower odds of preterm birth. While the relationship between mobility and preterm birth differs for individuals who do and do not receive WIC assistance. This highlights the need to understand the role of class in studying preterm birth and other outcomes that disproportionately burden Black women. The findings in this study suggest that greater attention should be given to the forces that sort people into places and the policies

that provide people with more control in their residential environments. Policies that maximize poor and working people's ability to remain in or move to places that are supportive and safe may reduce chronic stress, and preterm birth among Black women in the Bay Area.

TABLES

Table 5.1.
Distribution of maternal characteristics among Black birthing parents by preterm birth, San Francisco Bay Area, SOMI, 2013-2017, N=18,327

Characteristic	All live births		Preterm birth		χ^2 (p)
	n	%	n	%	
Age					
<18	241	1.30	23	1.45	19.67 (< 0.001)
18-34	14,610	79.11	1184	74.79	
>34	3,618	19.59	376	23.75	
Birthplace					
USA	15,584	84.38	1408	88.95	27.38 (< 0.001)
Outside USA	2,885	15.62	175	11.05	
Insurance payor					
private	13,155	48.36	1044	45.0	20.78 (0.002)
Public	13,564	49.86	1219	52.55	
None/self-pay	375	1.37	48	2.07	
other	110	0.4	179	7.72	
Education					
Less than HS	1,764	9.55	180	11.37	6.75 (0.034)
HS or equivalent	5,125	27.75	436	27.54	
Greater than HS	11,580	62.70	967	61.09	
WIC Participation					
Yes	9,807	53.10	790	49.91	7.09 (0.008)
No	8,662	46.90	793	50.09	
Smoking					
Yes	1,568	8.49	222	14.02	68.25 (<0.001)
No	16,901	91.51	1361	85.98	
Adequacy of prenatal care					
Adequate Plus	3,658	19.81	703	44.41	721.91 (<0.001)
Adequate	18,304	44.96	565	35.69	
Intermediate	4,208	22.78	132	8.34	
Inadequate	2,299	12.45	183	11.56	
Housing insecurity					
Yes	220	1.20	46	2.93	43.2749 (<0.001)
No	18,101	98.80	1,524	97.07	

Table 5.2.
Distribution of preterm birth among Black women in the San Francisco Bay Area, SOMI, 2013-2017, N=18,327

	N / mean	% / SD	range
Preterm Delivery (binary)	1,583	8.57%	
Preterm Delivery Type (categorical)			
Extremely (less than 28 weeks)	99	6.25%	
Very (28 to 32 weeks)	157	9.92%	
Moderate (32 to 37 weeks)	1327	83.83%	
Weeks' Gestation (continuous)	38.7	2.07	21-43 weeks

Table 5.3.
Distribution of Neighborhood Displacement Typology measure among Black women in the San Francisco Bay Area, SOMI, 2013-2017, N=18,327

Neighborhood Income Categorization	N	%	Neighborhood Displacement Type	N	% within category	% total
Low-income tracts	13,894	76.36	Not losing low-income housing	4796	34.52	26.17
			At risk of displacement	5099	36.70	27.82
			Undergoing displacement	2819	20.29	15.93
			Advanced gentrification	1180	8.49	6.44
Moderate/high-Income tracts	4,433	23.64	Not losing low-income housing	2848	64.25	15.54
			At risk of exclusion	829	18.70	4.52
			Undergoing exclusion	656	14.80	3.58

Table 5.4.
Risk per 100 live births of preterm birth (< 37 weeks' gestation) by Neighborhood Displacement Typology, San Francisco Bay Area, SOMI, 2013-2017, N=18,327

Neighborhood Displacement Type		Live Births	Preterm Birth	
			Cases	Cases per 100 live births
Low-income tracts	Not losing low-income housing	4796	391	8.15
	At risk of displacement	5099	464	9.10
	Undergoing displacement	2819	261	9.26
	Advanced gentrification	1180	91	7.71
Moderate-high income tracts	Not losing low-income housing	2848	247	8.67
	At risk of exclusion	829	61	6.84
	Undergoing exclusion	656	54	8.23

Pearson $chi^2_{\text{low-income census tracts}} = 4.4358$; P= 0.218
Pearson $chi^2_{\text{moderate to high income census tracts}} = 2.2622$; P=0.520

Table 5.5.
Odds of preterm birth as a function of Neighborhood Displacement Typology and covariates, low-income tracts, SOMI 2013-2017, N=13,994

	(1) Unadjusted OR [95% CI]	(2) Adjusted OR [95% CI]
Not Losing Low Income Households	0.960 [0.827,1.114]	0.942 [0.809,1.097]
At Risk of Gentrification	(ref)	(ref)
Ongoing Gentrification	0.960 [0.818,1.128]	0.972 [0.822,1.148]
Advanced Gentrification	0.789* [0.623,1.000]	0.818 [0.642,1.042]
College Edu		0.870* [0.764,0.991]
Private Insurance		0.789** [0.660,0.942]
Any smoking during pregnancy		1.823*** [1.533,2.168]
USA born		1.844*** [1.489,2.283]
sex		0.988 [0.877,1.113]
Age – older than 34		1.488*** [1.280,1.729]
WIC participation		0.782*** [0.681,0.897]
Year Categories – UDP methodology		0.986 [0.863,1.127]
Per Capita County Health Expenditures (Hundreds)		0.916** [0.861,0.974]
Observations	13994	13994
AIC	8167.4	8047.8
BIC	8205.2	8153.5
ll	-4078.7	-4009.9
chi2	3.853	142.9

Note. Exponentiated coefficients; 95% confidence intervals in brackets
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Adjusted model controls for all variables in the table.

Table 5.6.
Odds of preterm birth as a function of Neighborhood Displacement Typology and covariates, moderate/high-income tracts, SOMI, 2013-2017 N=4,333

	(1) Unadjusted OR [95% CI]	(2) Adjusted OR [95% CI]
Not Losing Low Income Households	1.314 [0.965,1.791]	1.324 [0.945,1.855]
At Risk of Exclusion	(ref)	(ref)
Ongoing Exclusion	1.126 [0.753,1.685]	1.126 [0.750,1.689]
Advanced Exclusion	1.568 [0.714,3.446]	1.554 [0.703,3.437]
College Edu		1.096 [0.825,1.456]
Private Insurance		0.880 [0.656,1.181]
Any smoking during pregnancy		1.728* [1.099,2.718]
USA born		1.108 [0.818,1.501]
sex		0.989 [0.796,1.230]
Age – older than 34		1.132 [0.881,1.455]
WIC participation		0.843 [0.643,1.104]
Year Categories – UDP methodology		1.019 [0.810,1.283]
Per Capita County Health Expenditures (Hundreds)		0.986 [0.882,1.101]
Observations	4333	4333
AIC	2485.7	2495.2
BIC	2517.6	2584.4
ll	-1237.9	-1233.6
chi2	3.704	12.71

Note. Exponentiated coefficients; 95% confidence intervals in brackets
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Adjusted model controls for all variables in the table

Table 5.7.
Decomposition of the effect of advanced gentrification on the odds of preterm birth, Low-Income Tracts, SOMI 2013-2017, N=13,994

	OR	SE	P
Advanced gentrification			
Total	0.828	(0.101)	0.123
Indirect (via adequacy of prenatal care)	0.999	(0.001)	0.811
Direct	0.828	(0.101)	0.123
% Mediated by adequacy of prenatal care	0.2%	(0.591)	0.997
Advanced gentrification			
Total	0.807	(0.099)	0.080
Indirect (via housing insecurity)	1.011	(0.006)	0.065
Direct	0.798	(0.097)	0.064
% Mediated by housing insecurity	-5.5%	(1.859)	0.976

Note. Odds ratios with standard errors in parentheses. Based on Table 5.5, model 2. Comparison group = individuals residing in low-income census tracts at risk of gentrification.
Decomposition model controls for age, birthplace, education, WIC, insurance type, smoking, and per capital county health expenditures

Table 5.8.
Odds of preterm birth as a function of Neighborhood Displacement Typology and covariates, stratified by WIC participation, SOMI, 2013-2017

	(1) No WIC Adjusted OR [95% CI]	(2) WIC Adjusted OR [95% CI]
LI – Not Losing Low Income Households	1.023 [0.817,1.280]	0.840 [0.687,1.027]
LI – At Risk of Gentrification and/or Displacement	(ref)	(ref)
LI – Ongoing Gentrification and/or Displacement	0.988 [0.771,1.266]	0.963 [0.774,1.198]
LI – Advanced Gentrification	0.896 [0.632,1.271]	0.735 [0.530,1.019]
College Edu	0.850 [0.690,1.047]	0.896 [0.762,1.053]
Private Insurance	0.827 [0.653,1.047]	0.815 [0.636,1.044]
Any smoking during pregnancy	1.958*** [1.449,2.644]	1.665*** [1.354,2.048]
USA born	1.579** [1.202,2.075]	2.356*** [1.698,3.270]
sex	1.175 [0.985,1.403]	0.861 [0.735,1.008]
Age – older than 34	1.343** [1.094,1.649]	1.773*** [1.432,2.196]
Year Categories – UDP methodology	1.022 [0.837,1.249]	0.935 [0.787,1.112]
Per Capita County Health Expenditures (Hundreds)	0.919 [0.841,1.004]	0.961 [0.889,1.039]
Observations	5913	8469
AIC	3654.2	4689.5
BIC	3741.1	4781.1
ll	-1814.1	-2331.7
chi2	57.45	94.00

Note. Exponentiated coefficients; 95% confidence intervals in brackets
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Adjusted model controls for all variables in the table.

Table 5.9.
Maternal characteristics and preterm birth at Time 1 (first birth) and Time 2 (second birth) for Black birthing parents with consecutive singleton births in the San Francisco Bay Area, SOMI, 2011-2017, N=4,910

Maternal Characteristics	Time 1		Time 2	
	n	%	n	%
Preterm birth	431	8.36	438	8.50
Age				
<18	181	3.51	14	0.27
18-34	4,508	87.48	4,111	79.78
>34	464	9.00	1,028	19.95
Insurance payor				
None	321	6.26	326	6.35
Public	2,612	50.94	2,624	51.10
Private	2,195	42.80	2,185	42.55
Education				
Less than HS	799	15.83	544	10.90
HS or equivalent	1478	29.28	1,510	30.27
Greater than HS	2771	54.89	2,935	58.83
Smoking				
Yes	464	9.00	519	10.07
No	4689	91.00	4,634	89.93
WIC participation				
Yes	3,158	61.68	2,835	55.38
No	1,962	38.32	2,284	44.62
Adequacy of prenatal care				
Inadequate	721	14.42	792	15.89
Intermediate	1,086	21.72	1,080	21.67
Adequate	2,243	44.85	2,151	43.16
Adequate Plus	951	19.02	961	19.28

Table 5.10.
Residential mobility trajectories by quartile of Black population (BP) change at Time 1 and quartile of Black population change at Time 2 among Black birthing people in the San Francisco Bay Area, SOMI, 2011-2017, N=4,910

Place-level Black population change		Time 2				
		Q1 High BP loss	Q2	Q3	Q4 High BP gain	Row Total
Time 1	Q1 High BP loss	1,336 (81.27)	45 (2.74)	167 (10.16)	96 (5.84)	1,644 (32.08)
	Q2	36 (6.70)	417 (77.65)	54 (10.06)	30 (5.59)	537 (10.48)
	Q3	108 (5.41)	35 (1.75)	1,694 (84.83)	160 (8.01)	1,997 (38.97)
	Q4 High BP gain	49 (7.65)	19 (13.82)	154 (6.18)	725 (76.56)	947 (18.48)
	Column Total	1,529 (29.83)	516 (10.07)	2,069 (40.37)	1,011 (19.73)	5,125

Note. Percent in parenthesis; χ^2 = 7.2e+03 P = 0.000
Q1 = High black population loss; Q4= High Black population gain

Table 5.11.
Distribution of residential mobility typologies among Black birthing people in Northern California, SOMI, 2011-2017, N=4,910

	Frequency	Percent	Mobility Percent
No Change	4006	81.45	
Mobility			
Within Inner Region	75	1.53	8.30
Within Outer Region	298	6.07	32.96
Out-migration	333	6.78	36.84
In-migration	198	4.03	21.90
Total	4,910	100.00	

Table 5.12.
Preterm birth rate by residential mobility typology, SOMI, 2011-2017, N=4,910

Mobility Typology	Live births	Preterm Birth	
		Cases	Cases per 100 live births
No Change	3681	325	8.11
Mobility			
Within Inner Region	66	9	12.00
Within Outer Region	262	36	12.08
Out-migration	306	27	8.11
In-migration	182	16	8.08

Note. Pearson $chi^2(4)$ = 6.9927 P = 0.136

Table 5.13.
Odds of preterm birth at Time 2 as a function of mobility type, preterm Birth at Time 1, and Covariates, SOMI, 2013-2017, N=4,910

	(1) Adjusted OR [95% CI]	(2) Adjusted OR [95% CI]
Mobility Type		
No Change	(ref)	(ref)
Within Inner Region	1.544 [0.763,3.128]	1.639 [0.786,3.415]
Within Outer Region	1.556* [1.079,2.245]	1.406 [0.960,2.059]
Out-migration	0.999 [0.664,1.505]	0.988 [0.648,1.506]
In-migration	0.996 [0.590,1.681]	0.933 [0.544,1.602]
Preterm birth at Time 1		5.418*** [4.224,6.950]
Insurance Type		
Private		(ref)
MediCal		1.098 [0.852,1.416]
None/Self		1.198 [0.783,1.834]
WIC Participation at Time 2		0.971 [0.767,1.228]
Age		
18-34		(ref)
<18		2.262 [0.476,10.75]
>34		0.817 [0.612,1.089]
Education at Time 2		
less than HS		(ref)
HS or equivalent		1.251 [0.875,1.788]
greater than HS		1.116 [0.779,1.600]
Smoking during pregnancy Time 2		1.702*** [1.263,2.294]
Male infant Time 2		1.121 [0.911,1.381]
Observations	4910	4910
AIC	2838.8	2679.2
BIC	2871.3	2776.7
ll	-1414.4	-1324.6
chi2	6.297	185.9

Note. Exponentiated coefficients; 95% confidence intervals in brackets
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Adjusted model controls for all variables in the table.

Table 5.14.
Odds of preterm birth at Time 2 as a function of mobility type x WIC at Time 1, SOMI, 2013-2017, N=4,910

	(1) Unadjusted OR [95% CI]	(2) Adjusted OR [95% CI]
Mobility Type # WIC at Time 1		
No Change # No	(ref)	(ref)
No Change # Yes	1.360* [1.067,1.734]	1.340* [1.006,1.785]
Within Inner Region # No	1.037 [0.315,3.409	0.987 [0.286,3.406]
Within Inner Region # Yes	3.190* [1.284,7.926]	3.481** [1.363,8.889]
Within Outer Region # No	2.560** [1.425,4.601]	2.141* [1.153,3.979]
Within Outer Region # Yes	1.604 [0.979,2.629]	1.496 [0.883,2.534]
Out-migration # No	1.548 [0.875,2.736]	1.543 [0.856,2.782]
Out-migration # Yes	0.965 [0.520,1.790]	0.924 [0.483,1.768]
In-migration # No	1.406 [0.593,3.334]	1.503 [0.618,3.657]
In-migration # Yes	1.124 [0.572,2.207]	0.991 [0.487,2.016]
Preterm birth at Time 1		5.549*** [4.316,7.134]
Insurance Type		
Private		(ref)
Public		1.052 [0.812,1.364]
None/Self		1.143 [0.744,1.756]
WIC Participation at Time 2		0.921 [0.719,1.181]
Age		
18-34		(ref)
<18		2.368 [0.502,11.18]
>34		0.852 [0.637,1.139]
Education		
less than HS		(ref)
HS or equivalent		1.253 [0.876,1.791]
greater than HS		1.132 [0.789,1.625]
Smoking during pregnancy Time 2		1.703*** [1.263,2.295]
Male infant at Time 2		1.127 [0.915,1.389]
Observations	4910	4910
AIC	2836.9	2678.8
BIC	2901.9	2808.8
ll	-1408.4	-1319.4
chi2	18.19	196.3

Note. Exponentiated coefficients; 95% confidence intervals in brackets
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Adjusted model controls for all variables in the table.

Table 5.15.
Sensitivity analysis, weeks' gestation at Time 2 regressed on mobility type x WIC at Time 1, SOMI, 2011-2017, N=4,910

	Unadjusted Beta [95% CI]	Adjusted Beta [95% CI]
Mobility Type # WIC at Time 1		
No Change # No	(ref)	(ref)
No Change # Yes	-0.152* [-0.272,-0.0318]	-0.1000 [-0.238,0.0383]
Within Inner Region # No	-0.00991 [-0.581,0.561]	0.00815 [-0.547,0.564]
Within Inner Region # Yes	-0.293 [-0.953,0.366]	-0.284 [-0.928,0.361]
Within Outer Region # No	-0.627** [-1.015,-0.238]	-0.502** [-0.880,-0.124]
Within Outer Region # Yes	-0.374** [-0.651,-0.0979]	-0.281* [-0.559,-0.00324]
Out-migration # No	-0.241 [-0.558,0.0761]	-0.221 [-0.529,0.0877]
Out-migration # Yes	-0.0569 [-0.345,0.231]	-0.00314 [-0.292,0.286]
In-migration # No	-0.254 [-0.722,0.214]	-0.272 [-0.727,0.182]
In-migration # Yes	-0.205 [-0.538,0.129]	-0.0923 [-0.427,0.242]
Preterm birth at Time 1		-1.549*** [-1.736,-1.362]
Insurance Type		
Private		(ref)
Public		-0.0708 [-0.198,0.0567]
None/Self		-0.0440 [-0.269,0.181]
WIC Participation at Time 2		-0.0571 [-0.181,0.0671]
Age		
18-34		(ref)
<18		0.392 [-0.609,1.393]
>34		-0.0159 [-0.150,0.118]
Education		
less than HS		(ref)
HS or equivalent		-0.0787 [-0.262,0.105]
greater than HS		-0.0932 [-0.275,0.0889]
Smoking during pregnancy Time 2		-0.383*** [-0.560,-0.207]
Male infant at Time 2		-0.0539 [-0.157,0.0489]
Constant	38.73*** [38.64,38.83]	39.09*** [38.83,39.35]
Observations	4910	4910
AIC	20163.1	19887.8
BIC	20228.1	20017.8
ll	-10071.6	-9923.9
chi2		

Note. 95% confidence intervals in brackets
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Adjusted model controls for all variables in the table.

Table 5.16.
Sensitivity analysis, odds of residential mobility within the outer region as a function of preterm birth at Time 1, SOMI, 2011-2017, N=4,910

	Unadjusted OR [95% CI]	Adjusted OR [95% CI]
Within Outer Region		
Preterm birth at Time 1	1.594* [1.104,2.300]	1.516* [1.032,2.226]
Insurance Type		
Private		(ref)
Public		0.625** [0.471,0.830]
None/Self		0.389** [0.199,0.761]
Age		
18-34		(ref)
<18		0.811 [0.410,1.608]
>34		0.546* [0.313,0.951]
Education		
less than HS		(ref)
HS or equivalent		0.786 [0.541,1.142]
greater than HS		0.669* [0.459,0.974]
WIC Participation at Time 1		1.434* [1.067,1.927]
Smoking during pregnancy Time 1		1.182 [0.791,1.766]
Male infant at Time 1		0.920 [0.724,1.169]
Observations	4910	4818
AIC	7000.8	6799.6
BIC	7052.7	7084.7
ll	-3492.4	-3355.8
chi2	6.314	110.6

Note. Exponentiated coefficients; 95% confidence intervals in brackets
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Adjusted model controls for all variables in the table.

Table 5.17.
Sensitivity analysis, odds of preterm birth at Time 2 as a function of mobility type, and covariates among those who delivered full term at Time 1, SOMI 2013-2017, N=4,479

	(1) Non-WIC Unadjusted OR [95% CI]	(2) Non-WIC Adjusted OR [95% CI]	(3) WIC Unadjusted OR [95% CI]	(4) WIC Adjusted OR [95% CI]
Mobility Type				
No Change	(ref)	(ref)	(ref)	(ref)
Within Inner Region	1.040 [0.245,4.402]	1.152 [0.269,4.931]	3.034* [1.228,7.499]	2.855* [1.144,7.129]
Within Outer Region	2.747** [1.357,5.563]	2.755** [1.344,5.646]	1.054 [0.597,1.858]	1.043 [0.589,1.846]
Out-migration	1.385 [0.675,2.840]	1.400 [0.674,2.910]	0.546 [0.252,1.183]	0.556 [0.256,1.206]
In-migration	1.717 [0.667,4.424]	1.523 [0.576,4.031]	0.790 [0.362,1.723]	0.795 [0.363,1.740]
Insurance Type				
Private		(ref)		(ref)
Public		1.157 [0.673,1.992]		1.117 [0.781,1.595]
None/Self		2.077 [0.908,4.751]		0.947 [0.506,1.775]
WIC participation at Time 2		1.017 [0.605,1.712]		0.833 [0.599,1.159]
Age				
18-34		(ref)		(ref)
<18		--		3.825 [0.784,18.65]
>34		0.719 [0.432,1.197]		0.925 [0.588,1.456]
Education				
less than HS		(ref)		(ref)
HS or equivalent		0.530 [0.201,1.396]		1.449 [0.915,2.296]
greater than HS		0.730 [0.290,1.841]		1.087 [0.677,1.747]
Smoking during pregnancy at Time 2		2.894** [1.390,6.027]		1.716** [1.170,2.515]
Male infant at Time 2		1.463 [0.951,2.250]		1.000 [0.749,1.335]
Observations	1710	1708	2793	2793
AIC	736.2	732.4	1452.1	1454.8
BIC	763.4	803.1	1481.8	1537.9
ll	-363.1	-353.2	-721.1	-713.4
chi2	7.613	27.18	8.057	23.41

Note. Exponentiated coefficients; 95% confidence intervals in brackets
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5.18.
Sample Characteristics for Black mothers living in Northern California, N=12

	N	Average	Min	Max
Age		37.18	25	45
25-34	3			
35-44	8			
45-54	1			
Annual Household Income		$104,413	$24,000	$210,000
< $30k	1			
$30k–50k	3			
$50k–100k	3			
$100k–200k	2			
$200k+	3			
# of children		2.72	1	6
1	3			
2	3			
3	2			
4+	3			
Public Assistance				
Yes	6			
No	6			
Tenure				
Rent	7			
Own	4			
Homeless	1			
Marital Status				
Married	3			
Single	4			
Divorced/Separated	4			
Adverse Birth Outcomes				
Preterm Birth	3			
Infant Death	2			
Other delivery complications	3			

Note. Regional median income in the San Francisco Bay Area is $113,200. To qualify for WIC, household must have an annual income below $51,000 for a household of 4.
Source: California Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)

Table 5.19.
Key informant interview role and expertise

Sector	Role	Expertise
Public Health	Maternal Child Health Alameda County DPH	Barriers and resources for Black maternal and child health in Alameda County
	Solano Heals, Solano County DPH	Implementation of PEI programs in Solano County
	Perinatal Equity Initiative (PEI) Community Board member	Racial inequities in birth outcomes; CA state initiatives to reduce disparities
	Perinatal Equity Initiative (PEI), Contra Costa County DPH	Implementation of PEI programs in Contra Costa County
	Perinatal Equity Initiative (PEI), Alameda County DPH	Implementation of PEI programs in Alameda County
	Former Policy Director, Bay Area Regional Health Inequalities Initiative	Public health policies and plans at the local, regional, and state level
Medicine / Policy	Physician	San Francisco policy initiatives to reduce racial inequities in birth outcomes
Research	Academic scholar	Displacement and Resistance in the San Francisco Bay Area
	Academic scholar	Political economy of resegregation in the Bay Area;
	Academic scholar	Community health and resegregation in the San Francisco Bay Area

Supplementary Tables

Table 5.S1.
Aim 1 Model comparison

	(1) Single level	(2) Cluster at CT	(3) Cluster at Hospital
Low- income early stage	-0.0861	-0.0844	-0.0977
	[-0.253,0.0812]	[-0.254,0.0851]	[-0.268,0.0721]
Low-income at risk	0.0254	0.0275	-0.0211
	[-0.142,0.192]	[-0.142,0.197]	[-0.195,0.153]
Low-income undergoing	0.0108	0.0121	-0.0669
	[-0.181,0.202]	[-0.182,0.206]	[-0.267,0.133]
Low-income advanced gentrification	-0.187	-0.185	-0.250
	[-0.445,0.0701]	[-0.444,0.0747]	[-0.513,0.0122]
Moderate-high income early stage (ref)	0	0	0
	[0,0]	[0,0]	[0,0]
Moderate-high income at risk of exclusion	-0.179	-0.177	-0.278
	[-0.475,0.116]	[-0.474,0.120]	[-0.578,0.0223]
Moderate-high income undergoing exclusion	-0.0980	-0.0949	-0.157
	[-0.409,0.213]	[-0.408,0.218]	[-0.473,0.159]
College	-0.0515	-0.0503	-0.113
	[-0.164,0.0612]	[-0.163,0.0626]	[-0.229,0.00185]
Private insurance	0.146***	0.147***	0.137***
	[0.0819,0.211]	[0.0824,0.212]	[0.0612,0.212]
Smoked during pregnancy	0.550***	0.551***	0.588***
	[0.394,0.707]	[0.394,0.707]	[0.430,0.747]
Born in USA	0.480***	0.479***	0.481***
	[0.315,0.645]	[0.313,0.644]	[0.309,0.653]
sex	-0.000540	-0.000270	-0.00384
	[-0.103,0.102]	[-0.103,0.102]	[-0.107,0.0992]
Older than 34	0.352***	0.353***	0.320***
	[0.226,0.478]	[0.227,0.479]	[0.193,0.447]
WIC participation	-0.284***	-0.284***	-0.225***
	[-0.397,-0.171]	[-0.397,-0.171]	[-0.345,-0.106]
Per Capita Health Spending (100s)	-0.00816	-0.00837	-0.0774**
	[-0.0471,0.0308]	[-0.0480,0.0312]	[-0.133,-0.0223]
_cons		-2.344*	-0.673***
		[-4.360,-0.328]	[-1.003,-0.343]
N	18756	18756	18756
AIC	10904.7	10906.4	10813.7
BIC	11030.1	11039.7	10947.0

Note. 95% confidence intervals in brackets
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5.S2.
Sensitivity analysis, odds of preterm birth as a function of neighborhood gentrification/displacement typology and covariates, nulliparous sample, SOMI 2013-2017, n=5,766

	(1) Unadjusted OR [95% CI]	(2) Adjusted OR [95% CI]
LI – Not Losing Low Income Households	0.933 [0.741,1.174]	0.908 [0.717,1.148]
LI – At Risk of Gentrification and/or Displacement	(ref)	(ref)
LI – Ongoing Gentrification and/or Displacement	0.798 [0.611,1.040]	0.783 [0.595,1.031]
LI – Advanced Gentrification	0.649* [0.441,0.955]	0.652* [0.439,0.968]
College Edu		0.899 [0.727,1.112]
Private Insurance		1.146** [1.040,1.263]
Any smoking during pregnancy		0.936 [0.720,1.216]
USA born		0.626*** [0.566,0.693]
sex		1.766*** [1.262,2.471]
Age – older than 34		0.732*** [0.668,0.803]
WIC participation		1.573** [1.130,2.189]
Year Categories – UDP methodology		0.951 [0.882,1.026]
Per Capita County Health Expenditures (Hundreds)		0.881 [0.729,1.066]
Observations	5766	5766
AIC	3273.5	3239.9
BIC	3306.8	3333.1
ll	-1631.8	-1605.9
chi2	6.406	58.46

Exponentiated coefficients; 95% confidence intervals in brackets
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5.S3.
Sensitivity analysis, ordinary least squares regression using weeks' gestation as outcome, SOMI 2013-2017

	(1) Unadjusted β [95% CI]	(2) Adjusted β [95% CI]
LI – Not Losing Low Income Households	-0.0727 [-0.158,0.0123]	-0.0548 [-0.140,0.0307]
LI – At Risk of Gentrification and/or Displacement	(ref)	(ref)
LI – Ongoing Gentrification and/or Displacement	-0.0133 [-0.107,0.0806]	-0.00669 [-0.102,0.0890]
LI – Advanced Gentrification	0.157* [0.0261,0.288]	0.114 [-0.0180,0.247]
College Edu		0.0707 [-0.00238,0.144]
Private Insurance		0.137** [0.0394,0.234]
Any smoking during pregnancy		-0.517*** [-0.634,-0.400]
USA born		-0.468*** [-0.570,-0.367]
sex		-0.00113 [-0.0684,0.0662]
Age – older than 34		-0.311*** [-0.403,-0.220]
WIC participation		0.135*** [0.0559,0.214]
Year Categories – UDP methodology		-0.0500 [-0.125,0.0253]
Per Capita County Health Expenditures (Hundreds)		0.0943*** [0.0576,0.131]
Observations	13994	13994
AIC	59826.4	59593.0
BIC	59871.7	59706.2
ll	-29907.2	-29781.5
chi2	11.38	267.2

Beta coefficients; 95% confidence intervals in brackets
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5.S4.
Observed and expected births in low-income tracts by WIC participation, SOMI, 2013-2017, N=13,994

	UDP Displacement Typology, Low-Income Tracts				
WIC participation	Not losing low-income housing	At risk of gentrification	Ongoing gentrification	Advanced gentrification	Total
No	2,134 2,077.9 1.5	2,143 2,266.0 6.7	1,338 1,298.8 1.2	551 523.3 1.5	6,166
Yes	2,893 2,949.1 1.1	3,339 3,216.0 4.7	1,804 1,843.2 0.8	715 742.7 1.0	8,751
Total	5,027	5,482	3,142	1,266	14,917

Note. Pearson $chi^2(3) = 18.4804$; $P<0.001$
First line in each internal (non-total) cell=observed counts; second line is expected counts, third line is each categories contribution to the overall chi^2 score

Table 5.S5.
San Francisco Bay Area Cities and Percent Change in Black population, Neighborhood Change Database

City/Town	County	% Black 1990	% Black 2010	% Change	Category
Foster City	San Mateo	7	2	-62	High BP loss
East Palo Alto	San Mateo	40	18	-56	High BP loss
Atwater	Merced	9	5	-40	High BP loss
Highlands-Baywood Park	San Mateo	4	2	-40	High BP loss
Winton	Merced	4	2	-40	High BP loss
Daly City	San Mateo	8	5	-40	High BP loss
Tamalpais-Homestead Valley	Marin	3	2	-39	High BP loss
Mountain View	Santa Clara	5	3	-38	High BP loss
Emerald Lake Hills	San Mateo	2	1	-37	High BP loss
Berkeley	Alameda	19	12	-37	High BP loss
Pacifica	San Mateo	6	4	-36	High BP loss
Menlo Park	San Mateo	9	6	-36	High BP loss
Dos Palos	Merced	9	6	-35	High BP loss
San Francisco	San Francisco	11	7	-34	High BP loss
West Modesto	Stanislaus	6	4	-34	High BP loss
Milpitas	Santa Clara	6	4	-33	High BP loss
Hilmar-Irwin	Merced	1	1	-30	High BP loss
Oakland	Alameda	44	30	-30	High BP loss
North Fair Oaks	San Mateo	3	2	-29	High BP loss
Richmond	Contra Costa	38	27	-28	High BP loss
Hillsborough	San Mateo	1	1	-26	High BP loss

Sunnyvale	Santa Clara	3	3	-22	High BP loss
French Camp	San Joaquin	17	13	-22	High BP loss
East Foothills	Santa Clara	4	3	-21	Low BP loss
San Martin	Santa Clara	1	1	-21	Low BP loss
Emeryville	Alameda	25	20	-21	Low BP loss
Alum Rock	Santa Clara	4	3	-19	Low BP loss
San Pablo	Contra Costa	21	17	-18	Low BP loss
East Richmond Heights	Contra Costa	18	15	-17	Low BP loss
Portola Valley	San Mateo	1	1	-17	Low BP loss
Yountville	Napa	2	2	-17	Low BP loss
Albany	Alameda	6	5	-17	Low BP loss
Palo Alto	Santa Clara	3	2	-15	Low BP loss
San Bruno	San Mateo	4	3	-14	Low BP loss
Union City	Alameda	9	7	-14	Low BP loss
San Jose	Santa Clara	5	4	-13	Low BP loss
Alameda	Alameda	9	8	-12	Low BP loss
South San Francisco	San Mateo	4	3	-12	Low BP loss
Santa Venetia	Marin	4	4	-11	Low BP loss
Redwood City	San Mateo	4	3	-8	Low BP loss
Dublin	Alameda	11	10	-6	Low BP loss
Mill Valley	Marin	1	1	-6	Low BP loss
El Cerrito	Contra Costa	10	10	-5	Low BP loss
San Mateo	San Mateo	3	3	-5	Low BP loss
Lockeford	San Joaquin	1	1	-4	Low BP loss
Strawberry	Marin	3	3	-3	Low BP loss
Cupertino	Santa Clara	1	1	0	Low BP gain
San Rafael	Marin	3	3	5	Low BP gain
Sausalito	Marin	1	1	7	Low BP gain
Bay Point	Contra Costa	13	14	9	Low BP gain
Benicia	Solano	7	8	9	Low BP gain
San Carlos	San Mateo	1	1	9	Low BP gain
Fremont	Alameda	4	4	9	Low BP gain
Merced	Merced	7	7	10	Low BP gain
Pittsburg	Contra Costa	18	21	17	Low BP gain
Windsor	Sonoma	1	1	18	Low BP gain
Vallejo	Solano	21	25	19	Low BP gain
Broadmoor	San Mateo	3	4	24	Low BP gain
Rohnert Park	Sonoma	2	3	25	Low BP gain
Millbrae	San Mateo	1	1	28	Low BP gain
Tara Hills	Contra Costa	11	15	31	Low BP gain
St. Helena	Napa	1	1	31	Low BP gain
Newark	Alameda	4	6	32	Low BP gain
Danville	Contra Costa	1	1	33	Low BP gain
Fairview	Alameda	15	20	35	Low BP gain
Stanford	Santa Clara	6	8	36	Low BP gain
Kensington	Contra Costa	3	4	37	Low BP gain
Vacaville	Solano	9	12	37	Low BP gain
Delhi	Merced	1	2	38	Low BP gain
Woodside	San Mateo	0	1	38	Low BP gain

Belmont	San Mateo	2	2	41	Low BP gain
Fairfield	Solano	13	18	42	Low BP gain
Novato	Marin	3	4	43	Low BP gain
Martinez	Contra Costa	3	5	43	Low BP gain
Stockton	San Joaquin	9	13	44	Low BP gain
Cotati	Sonoma	2	3	44	Low BP gain
Hayward	Alameda	9	13	45	Low BP gain
Santa Clara	Santa Clara	2	4	50	Low BP gain
Healdsburg	Sonoma	1	1	51	Low BP gain
Lafayette	Contra Costa	1	1	54	Low BP gain
San Anselmo	Marin	1	1	58	Low BP gain
Rodeo	Contra Costa	12	19	59	Low BP gain
Ashland	Alameda	13	22	63	Low BP gain
Planada	Merced	0	1	67	Low BP gain
Waterford	Stanislaus	1	1	68	Low BP gain
Fairfax	Marin	1	2	68	Low BP gain
Orinda	Contra Costa	1	1	74	Low BP gain
Saratoga	Santa Clara	0	1	75	Low BP gain
Santa Rosa	Sonoma	2	3	75	Low BP gain
American Canyon	Napa	5	9	76	Low BP gain
Hercules	Contra Costa	11	20	76	Low BP gain
Manteca	San Joaquin	3	5	77	Low BP gain
Morgan Hill	Santa Clara	2	3	77	Low BP gain
Pacheco	Contra Costa	3	5	77	Low BP gain
Castro Valley	Alameda	5	9	78	Low BP gain
Petaluma	Sonoma	1	2	79	Low BP gain
Los Banos	Merced	3	5	79	Low BP gain
El Sobrante	Contra Costa	7	12	79	Low BP gain
Pleasanton	Alameda	1	2	84	Low BP gain
Sonoma	Sonoma	0	1	85	Low BP gain
Discovery Bay	Contra Costa	3	5	87	Low BP gain
Bret Harte	Stanislaus	1	2	91	Low BP gain
Lucas Valley-Marinwood	Marin	1	2	92	Low BP gain
East Oakdale	Stanislaus	0	1	96	Low BP gain
Hughson	Stanislaus	1	1	97	Low BP gain
Pinole	Contra Costa	8	16	100	High BP gain
Los Altos	Santa Clara	0	1	104	High BP gain
Livermore	Alameda	1	3	105	High BP gain
Tracy	San Joaquin	4	9	111	High BP gain
Tiburon	Marin	1	2	113	High BP gain
Concord	Contra Costa	2	5	116	High BP gain
Livingston	Merced	0	1	116	High BP gain
San Ramon	Contra Costa	2	4	117	High BP gain
San Leandro	Alameda	6	14	117	High BP gain
Boyes Hot Springs	Sonoma	1	1	118	High BP gain
Modesto	Stanislaus	2	5	125	High BP gain
El Granada	San Mateo	1	1	126	High BP gain
Campbell	Santa Clara	2	5	129	High BP gain
Dixon	Solano	2	4	137	High BP gain

Alamo	Contra Costa	1	1	140	High BP gain
Turlock	Stanislaus	1	2	142	High BP gain
Clayton	Contra Costa	1	2	144	High BP gain
Walnut Creek	Contra Costa	1	2	144	High BP gain
Los Altos Hills	Santa Clara	0	1	147	High BP gain
Bystrom	Stanislaus	1	2	148	High BP gain
Ceres	Stanislaus	1	3	152	High BP gain
Lathrop	San Joaquin	4	11	153	High BP gain
Keyes	Stanislaus	0	1	156	High BP gain
Cherryland	Alameda	5	13	157	High BP gain
Los Gatos	Santa Clara	0	1	159	High BP gain
Gilroy	Santa Clara	1	2	159	High BP gain
Sebastopol	Sonoma	1	2	172	High BP gain
Brisbane	San Mateo	1	3	183	High BP gain
Burlingame	San Mateo	1	2	190	High BP gain
Lincoln Village	San Joaquin	4	13	206	High BP gain
Piedmont	Alameda	1	2	209	High BP gain
Kentfield	Marin	0	1	210	High BP gain
Gustine	Merced	0	1	221	High BP gain
Half Moon Bay	San Mateo	0	1	233	High BP gain
Corte Madera	Marin	1	2	242	High BP gain
Escalon	San Joaquin	0	1	243	High BP gain
Lodi	San Joaquin	0	1	261	High BP gain
San Lorenzo	Alameda	2	7	277	High BP gain
Country Club	San Joaquin	2	9	279	High BP gain
Empire	Stanislaus	0	1	281	High BP gain
Pleasant Hill	Contra Costa	1	3	300	High BP gain
Salida	Stanislaus	1	3	306	High BP gain
West Menlo Park	San Mateo	0	1	309	High BP gain
Shackelford	Stanislaus	1	4	317	High BP gain
August	San Joaquin	1	4	333	High BP gain
Oakdale	Stanislaus	0	1	334	High BP gain
Atherton	San Mateo	0	1	466	High BP gain
Larkfield-Wikiup	Sonoma	0	2	493	High BP gain
Oakley	Contra Costa	1	9	532	High BP gain
Antioch	Contra Costa	3	19	635	High BP gain
Larkspur	Marin	0	2	720	High BP gain
Calistoga	Napa	0	1	799	High BP gain
Newman	Stanislaus	0	3	839	High BP gain
Denair	Stanislaus	0	1	990	High BP gain
Patterson	Stanislaus	1	7	1179	High BP gain
Crockett	Contra Costa	0	5	1265	High BP gain
El Verano	Sonoma	0	1	1377	High BP gain
Garden Acres	San Joaquin	0	3	2509	High BP gain
Ripon	San Joaquin	0	2	2875	High BP gain

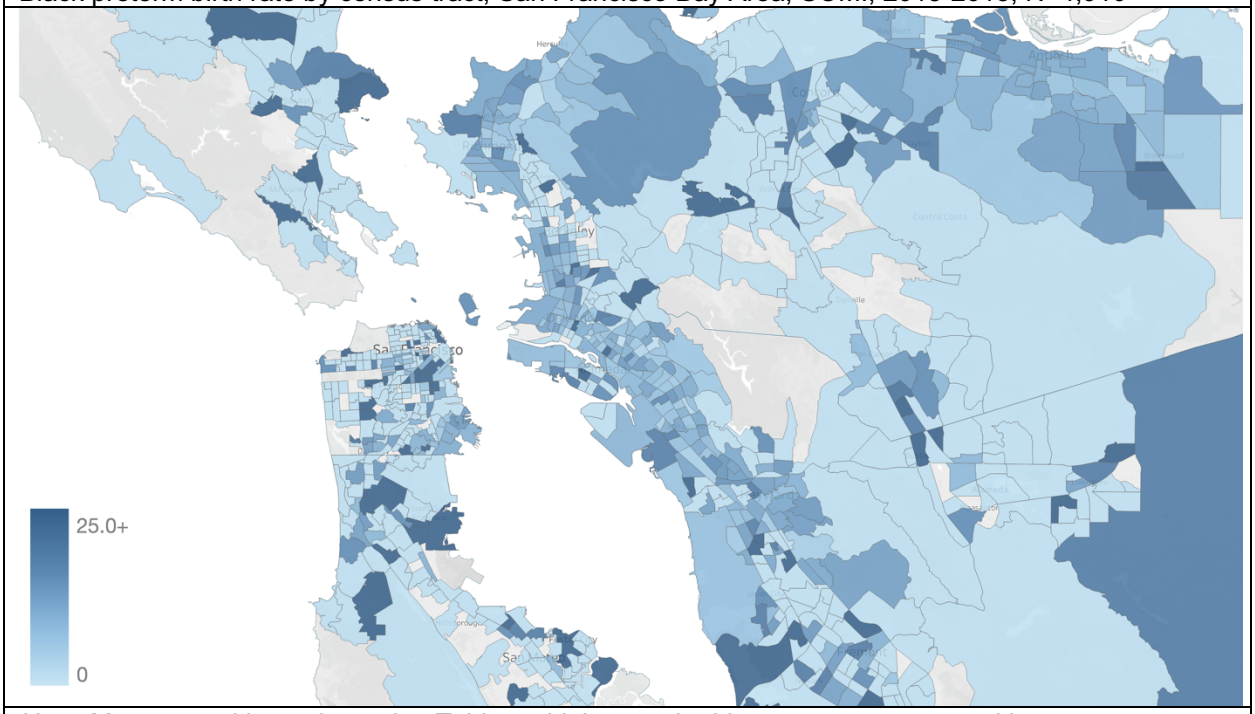
Table 5.S6.
Observed and expected births at time 2 in each residential mobility trajectory by WIC at Time 1

	Residential Mobility trajectory					
WIC participation	No change	Inner	Outer	Out-migration	In-migration	Total
	1,527	43	96	149	65	
No	533.9	28.7	114.1	127.5	75.8	1,880
	0.0	7.1	2.9	3.6	1.5	
	2,479	32	202	184	133	
Yes	2,472.1	46.3	183.9	205.5	122.2	3,030
	0.0	4.4	1.8	2.2	1.0	
Total	4,006	75	298	333	198	4910

Note. Pearson chi2(3) = 24.3200 P<0.001
First line in each internal (non-total) cell=observed counts; second line is expected counts, third line is each categories contribution to the overall chi^2 score

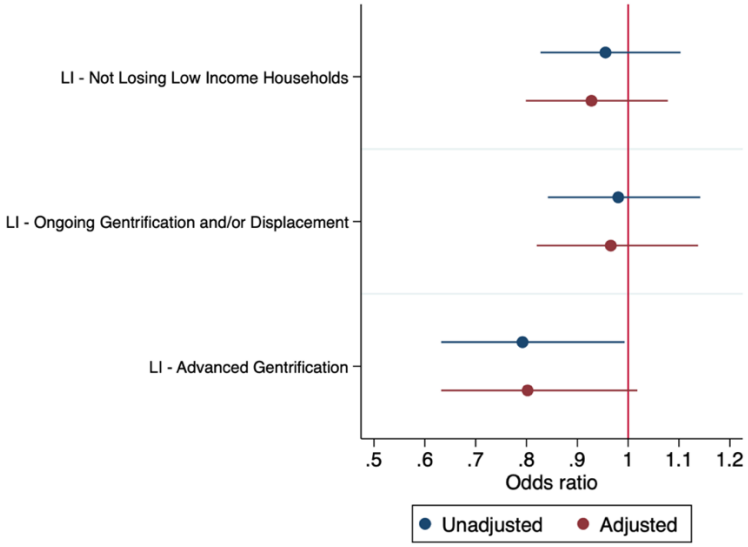
FIGURES

Figure 5.2.
Black preterm birth rate by census tract, San Francisco Bay Area, SOMI, 2013-2015, N=4,910



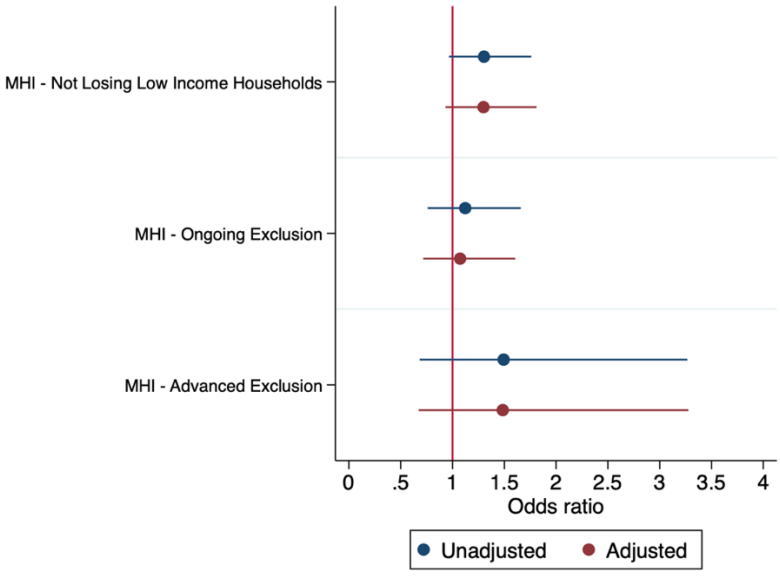
Note. Map created by author using Tableau. Lightest color blue represents tracts with no preterm births. Gray census tracts had no births to Black women in the sample.

Figure 5.3.
Unadjusted and adjusted odds ratios of preterm birth as a function of Neighborhood Displacement Typology, low-income tracts, SOMI, 2013-2017, N=13,994



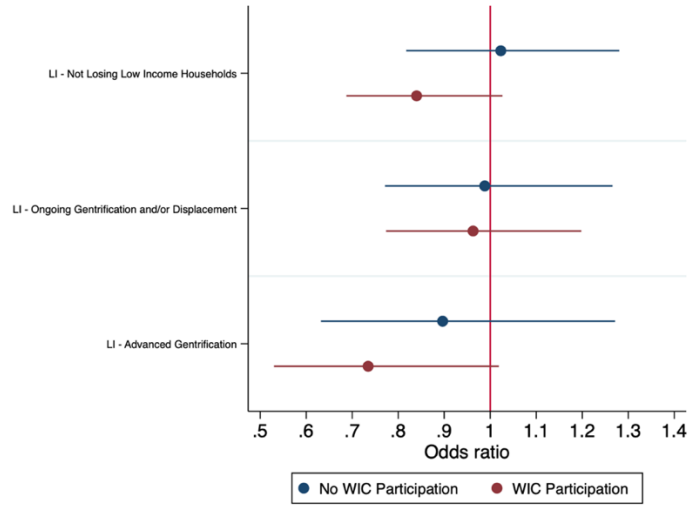
Note. Reference neighborhood is low-income (LI) at risk of gentrification.
Adjusted model controls for, age, birthplace, education, WIC, insurance type, smoking, and per capital county health expenditures

Figure 5.4.
Unadjusted and adjusted odds ratios of preterm birth as a function of Neighborhood Displacement Typology, moderate/ high-income tracts, SOMI, 2013-2017, N=4,333



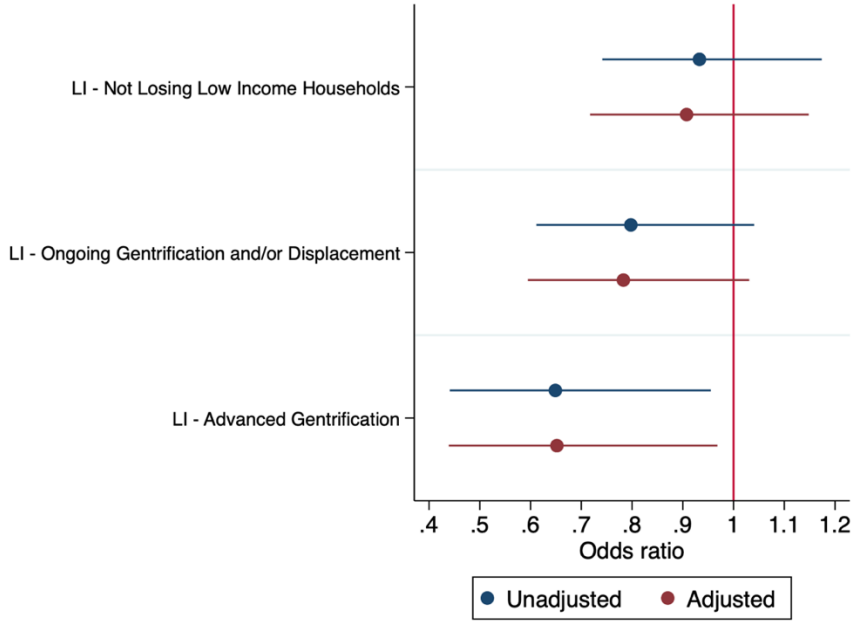
Note. Reference neighborhood is Moderate/high income (MHI) at risk of exclusion.
Adjusted model controls for age, birthplace, education, WIC, insurance type, smoking, and per capital county health expenditures

Figure 5.5.
Adjusted odds ratios of preterm birth as a function of Neighborhood Displacement Typology stratified by WIC participation, SOMI, 2013-2017, N=13,994



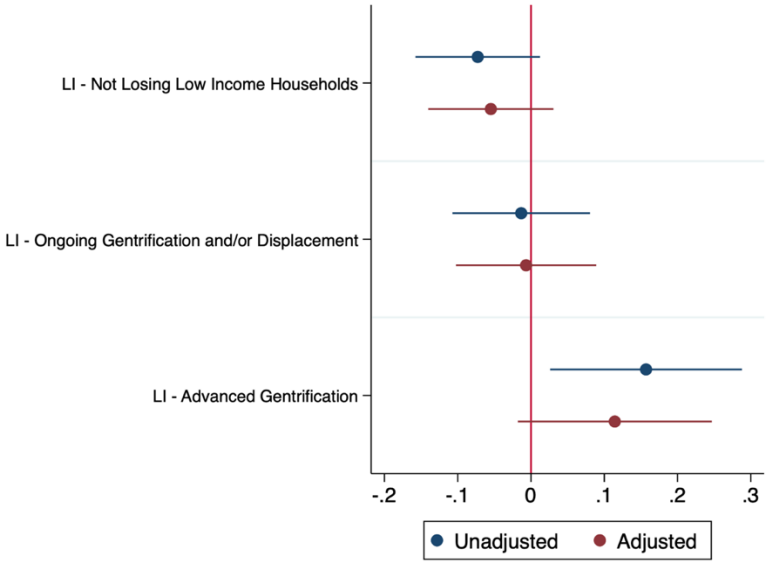
Note. Reference neighborhood is low-income (LI) at risk of gentrification.
Models control for, age, birthplace, education, insurance type, smoking, and per capital county health expenditures

Figure 5.6.
Sensitivity analysis, unadjusted and adjusted odds ratios of preterm birth as a function of Neighborhood Displacement Typology, nulliparous sample, N=5,766



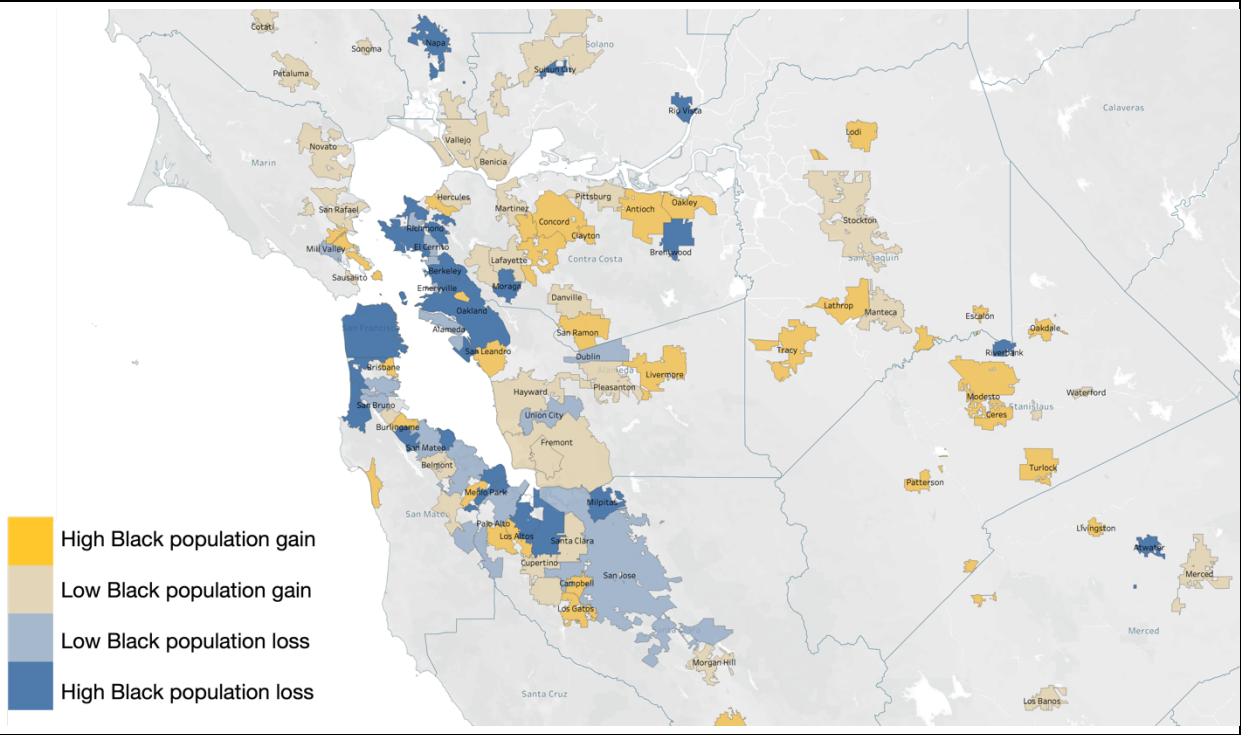
Note. Reference neighborhood is low-income tract (LI) at risk of gentrification
Adjusted model controls for, age, birthplace, education, WIC, insurance type, smoking, and per capital county health expenditures

Figure 5.7.
Sensitivity analysis, unadjusted and adjusted coefficient of weeks' gestation as a function of Neighborhood Displacement Typology, N= 13,994



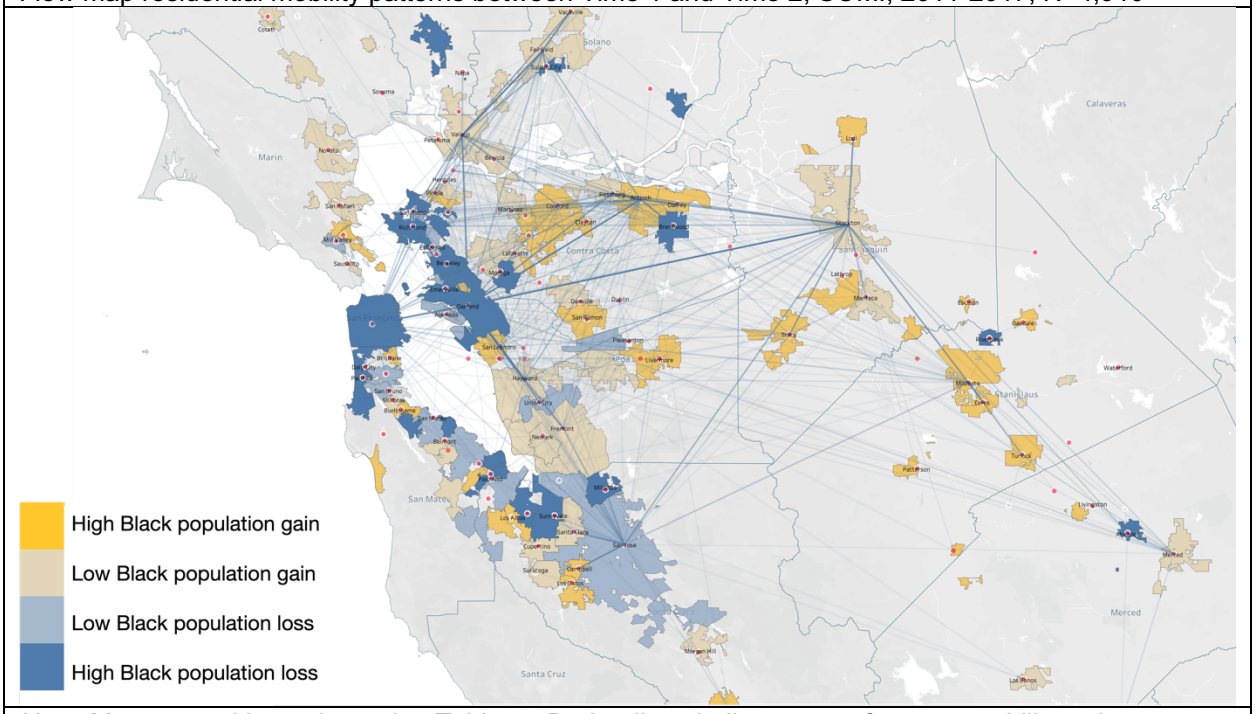
Note. Reference neighborhood is low-income tract (LI) at risk of gentrification
Adjusted model controls for, age, birthplace, education, WIC, insurance type, smoking, and per capital county health expenditures

Figure 5.8
Census place-level change in Black population, NCDB, 1990-2010



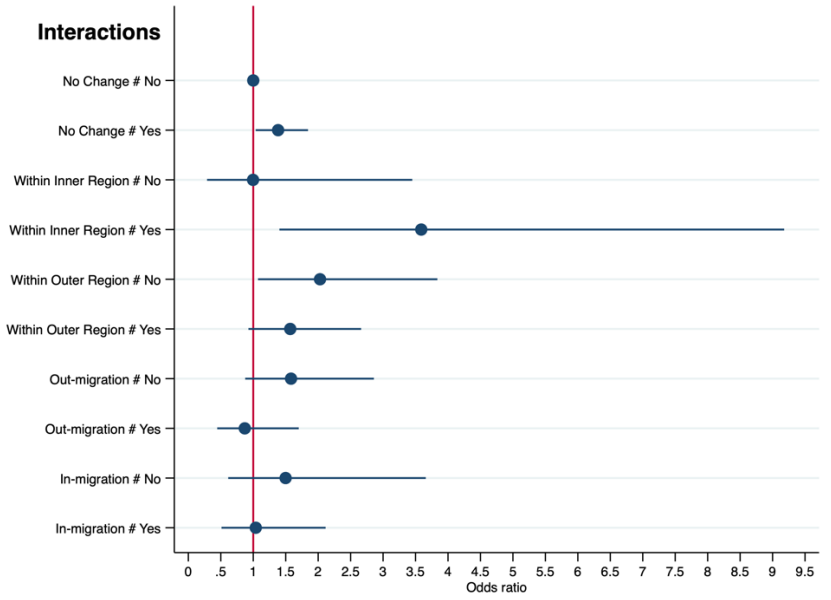
Note. Map created by author using Tableau

Figure 5.9.
Flow map residential mobility patterns between Time 1 and Time 2, SOMI, 2011-2017, N=4,910



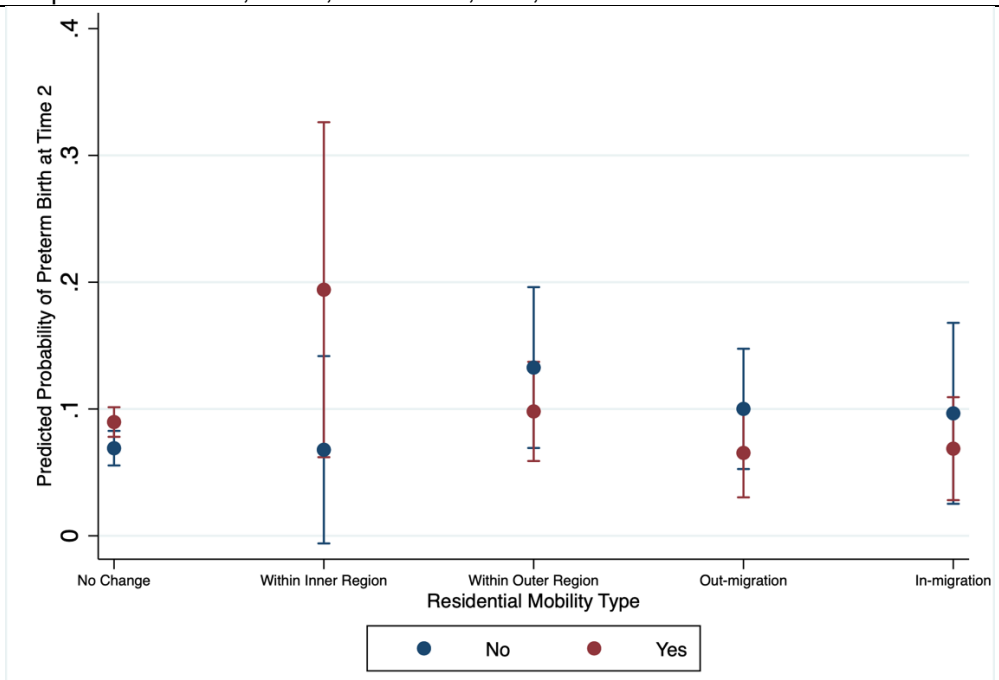
Note. Map created by author using Tableau. Darker lines indicate more frequent mobility trajectory.

Figure 5.10.
Adjusted odds ratios of preterm birth as a function of mobility type x WIC participation at Time 1 and covariates, SOMI, 2011-2017, N=4,910



Note. Model adjusted for preterm birth at Time 1, WIC at Time 2, infant sex, smoking, age at Time 2, education, and insurance type

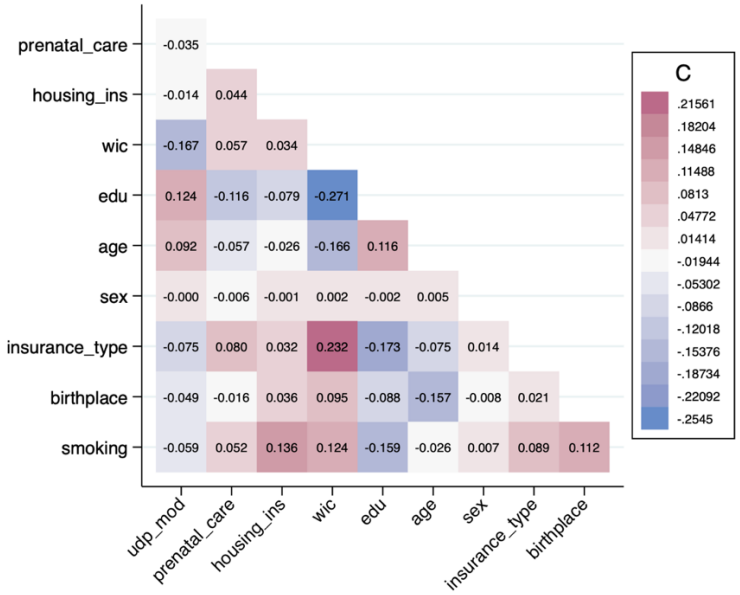
Figure 5.11.
Predictive probability of preterm birth at Time 2 as a function of mobility type x WIC participation at Time 1, SOMI, 2011-2017, N=4,910



Note. Model adjusted for preterm birth at Time 1, WIC at Time 2, infant sex, smoking, age at Time 2, education, and insurance type

Supplementary Figures

Figure S5.1.
Aim 1 predictor, mediators and covariates correlation matrix, SOMI, 2013-2017



Note. udp_mod= neighborhood displacement typology; housing_ins= housing insecurity; wic= WIC participation; edu= education; sex= infant sex

APPENDICES

Appendix A: 12-County San Francisco Bay Area Region

The county constitution of the Bay Area is “political and contested” (Samara, 2016). This project includes the 9 Bay Area counties that are designated by the Association of Bay Area Governments: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, and Sonoma. In addition, I include the following three counties: Merced, San Joaquin, and Stanislaus.

San Francisco Bay Area Region included in Analyses. Map created by author using Google Maps

Appendix B: Urban Displacement Project's Methodologies

The first methodology used was the Freeman (2005) method which has two parts. For a neighborhood to be considered *gentrifiable* it must be in the central city, have a lower median income than the rest of the metropolitan statistical area (MSA) and have greater proportion of its housing stock older than 20 years compared to the rest of the MSA. Then, to be considered *gentrifying,* a neighborhood must have an increase in educational attainment and housing prices greater than the average increase in the MSA.

Second, UDP used Bates' methodology which captures two important conceptual components of gentrification: market forces and population changes. Bates' measure considers tracts vulnerable to displacement if they have a greater proportion of renters, low-income households, people of color and/or people without college degrees. Tracts adjacent to gentrifying tracts are also considered vulnerable. Demographic changes associated with gentrification in this measure include increases in white residents, homeowners, and residents with college degrees. Finally, the measure considers housing appreciation greater than the city-wide average. Bates' measure includes a typology of early-, mid-, and late-stage gentrification.

Third, the UDP's Early Warning System draws from Maciag's methodology used for the 2013 Governing Magazine Gentrification Report. This measure is like Freeman's measure of gentrification. The methodologies differ in two distinct ways. First, Maciag's measure uses 40th percentile cut offs for household income and home values to determine whether tracts are gentrifiable. Second, the home value indicator used to determine whether a tract is considered gentrifying in Maciag's measure considers percent increases in the top third percentile while Freeman's measure uses increases above the median in a metro area (Freeman, 2005; Maciag, 2015).

Appendix C: Interview Guide

WELCOME

RIC**:** First, thank you all for agreeing to share your experiences with me in this interview. Today I'm asking that you share your experiences of living and giving birth in the Bay. I'm interested in your experiences with housing, health care, and community support and anything else you want to share. This interview is voluntary, and you can stop it at any time. You can also pass on any question you do not feel comfortable answering. First, I'll give a short introduction to me and my work then we can jump into questions. Are you okay with me starting the recording?

>>>>>> START RECORDING

INTRODUCTION

RIC: I came to this topic because I'm from Harlem, NY and I've seen how my community has changed over the past 15 years and how it has affected people including my own family. I've been living in LA for 8 years and the same things are happening in LA. But I became interested in the Bay because of just how expensive it has become. Being a mother myself, I'm interested in learning how black parents navigate the neighborhood changes and the expensive housing market before, during, and after pregnancy.

CORE QUESITONS

General

1. First can you tell me about where you grew up?
    a. What was the neighborhood like?
    b. Where did you go to school?
    c. How long did you live in that neighborhood?

2. How did you come to live where you live now?
    a. What went into the decision to live where you live now?
    b. Where did you live just before moving into your current home?

3. Can you describe what your time has been like living in [city]?

4. Since you've lived in the Bay, what are some of the changes you've seen?
    a. How is it different from your childhood?
    b. Some people I've talked to have said their interactions with police have been different. Other people haven't noticed a difference. How's that been for you?

5. What made you move to [city]?
    a. Can you talk about your decision to move?
    b. How did you choose this neighborhood over others that you were considering?
    c. What other factors went into that decision?

6. How does living in [city] compare to where you moved from?
    a. How do the people compare?
    b. How do the services different?
    c. How does the transportation compare?

Housing

1. Next, we want to get a better understanding of your experiences with housing in the Bay Area.
2. We know that housing is very expensive in the Bay, but we don't often hear about how people deal with expensive housing.
    a. What is your housing situation right now?
    b. Who lives in the home with you?
    c. Are you renting/do you own?
    d. How much of your budget are you spending on housing?
    e. What strategies do you use to deal with housing costs?

3. Can you describe a time when you felt forced to move from your home?
    a. How did that impact you and your family?
    b. What did you do?
    c. How did you improve your housing situation?

4. What was your housing situation during your most recent pregnancy?
    a. In what ways did that affect you?
    b. How did you improve your housing situation?

5. Talk to me about your housing situation before and after the move.

Social Support and Engagement

1. Can you describe your village or support system?
    a. What do they help you with?
    b. What do you help them with?
    c. How close are they to you geographically?
2. What organizations, support groups, if any, are you a part of?
    a. How do these organizations/groups influence you?
    b. What made this organization/group successful?
3. During your most recent pregnancy, what type of support did you have?

Social and Health Services

1. Can you tell me about your most recent birth experience?
2. What was the process like trying to find a doctor in [city]?
    a. Did you seek out a Black doctor?
3. What would improve health care in your city?

Transportation

1. Next, I'd like to learn more about your experiences with transportation and commuting.
2. What is your commute to and from work like?
    a. Has that changed during COVID? What about other errands? About what time do you wake up to get ready for the day? Do you ever use public transportation?
    b. talk about how that commute time impacts your day? What about your time with your family? What about your time for taking care of yourself?
    c. Some people say that the Bay Area suburbs need access to better jobs so that people don't have to commute for so long, what do you think?

Final Question

1. With X minutes left, are there other issues that you wanted to shed light on?

a. Can you think of anything else that might be important to the health of Black mothers?

Demographics

1. How old are you?
2. What do you do for work?
3. Do you rent or own?
4. How many children do you have? What are their ages?
5. What is your annual household income?

WRAP UP

1. Thank you for your time. Your knowledge and insights are very valuable. Once again, we wanted to assure you that everything you shared here will remain anonymous, including the video recording and transcript of today's conversation. I will edit or delete any identifying information. Thank you very much for your participation. I appreciate your time!
2. If you know of any other Black people who have given birth in the Bay and who might be interested in participating, please send them my information.

>>>>> END RECORDING

Appendix D: Interview Implementation Checklist

BEFORE INTERVIEWS

Screening

1. Complete screening survey via phone, text, or email to determine eligibility

Scheduling

1. Send participant invitation with attached consent form (use IRB approved/stamped form)
    a. Follow-up email if no response
2. For participants that cannot participate due to scheduling
    a. Ask if it is ok to contact for future focus groups or participation with project
    b. Record their contact information/organization contact info
    c. Ask if they have any recommendations for other participants
    d. Follow up with recommendations
3. Interested participants
    a. Schedule participant for 1-on-1 interview
    b. Send outlook email with Zoom info

Pre focus group meeting

1. Review consent form
    a. Ask participant to keep a copy of consent form for their records
    b. Explain that there is no need for a signature on the form.
2. Review incentive amount and Amazon details, due to COVID we are experiencing delays of up to 3 months for incentive delivery
3. Ask if there are any questions regarding the consent form or focus group process
    a. Answer questions
4. Provide PI contact information/IRB contact information in case of any concerns
    a. Encourage participants to email coordinator if there are any additional questions after pre-session meeting
5. Review norms community norms
    a. The focus group will be recorded, so please allow for only one person to speak at a time.
    b. Use the name and pronouns listed on participant's screens when referencing others.
    c. If you need to respond to a call, please do so quietly and rejoin us as quickly as you can.
    d. Please be mindful of background noise and adjust your audio settings accordingly.
    e. There are no wrong answers, only differing points of view.
    f. Please talk to each other. You don't need to agree with others, but you must listen respectfully as others share their views.
    g. Please remember to keep confidential the information shared during the sessions.

DURING INTERVIEWS

1. Review verbal consent ensuring confidentiality
2. Introductions
3. Core Questions

AFTER INTERVIEWS

1. Complete memo
    a. Document emergent themes,
    b. Compare to previous interview respondent
    c. Document aspects of interview that were not recording on the audio
    d. Write down questions
2. Send thank you email
3. Send incentive
    a. Double check contact information
    b. Track incentive delivery
4. **Upload recordings and other files to secure UCLA box account**
    a. Name and date recording
        i. Adhere to existing format
5. Send recording to transcription service

Appendix E: Focus Group Informed Consent Letter

University of California, Los Angeles

RESEARCH INFORMATION SHEET

Gentrification, Residential Mobility and Preterm Birth Among Black Women: A Mixed Methods Examination of Racial Resegregation in Northern California

INTRODUCTION

Rebekah Israel Cross, MA and Chandra L. Ford, PhD, MPH, MLIS from the Department of Community Health Sciences at the University of California, Los Angeles are conducting a research study. This study is being funded by the Robert Wood Johnson Foundation's Health Policy Research Scholars Program and the UCLA Center For the Study of Women. You were selected as a possible participant in this study because you are a Black birthing parent living in the San Francisco Bay Area. Your participation in this research study is voluntary.

WHAT SHOULD I KNOW ABOUT A RESEARCH STUDY?

Someone will explain this research study to you.
Whether or not you take part is up to you.
You can choose not to take part.
You can agree to take part and later change your mind.
Your decision will not be held against you.
You can ask all the questions you want before you decide.

WHY IS THIS RESEARCH BEING DONE?

The purpose of this interview is to understand the experiences of Black mothers and birthing parents who have been impacted by gentrification, displacement, or suburban relocation in the Bay Area. The information learned in this interview will be used to explain how these processes impact maternal and infant health.

HOW LONG WILL THE RESEARCH LAST AND WHAT WILL I NEED TO DO?

Participation will take a total of about *60 minutes.*

If you volunteer to participate in this study, we will ask you to do the following:

Answer questions about your experiences living and giving birth in the Bay Area during racial and economic changes. Questions will touch on housing affordability, access to quality care, transportation and family supprt.
Interviews will take place on Zoom due to COVID restrictions

ARE THERE ANY RISKS IF I PARTICIPATE?

Risks may include triggering conversations about birthing experiences. If you need to step away from the conversation or stop participating altogether, you are free to do that.

ARE THERE ANY BENEFITS IF I PARTICIPATE?

You will not directly benefit from the study.

The results of the research may highlight specific community needs.

What other choices do I have if I choose not to participate?

Your alternative to participating in this research study is to not participate.

HOW WILL INFORMATION ABOUT ME AND MY PARTICIPATION BE KEPT CONFIDENTIAL?

We will do their best to make sure that your private information is kept confidential. Information about you will be handled as confidentially as possible but participating in research may involve a loss of privacy and the potential for a breach in confidentiality. Study data will be physically and electronically secured. As with any use of electronic means to store data, there is a risk of breach of data security.

Use of personal information that can identify you:
No personal identifiers will be collected

How information about you will be stored:
The information you provided will be stored in a secure online account (box.com).

People and agencies that will have access to your information:

The research team (Rebekah Israel Cross and TaNefer Camara), authorized UCLA personnel, and the study sponsor (Chandra L. Ford) may have access to study data and records to monitor the study. Research records provided to authorized, non-UCLA personnel will not contain identifiable information about you. Publications and/or presentations that result from this study will not identify you by name.

Employees of the University may have access to identifiable information as part of routine processing of your information, such as lab work or processing payment. However, University employees are bound by strict rules of confidentiality.

How long information from the study will be kept:
Your information will be kept for approximately 5 years.

USE OF DATA FOR FUTURE RESEARCH

Your data, including de-identified data may be kept for use in future research.

WILL I BE PAID FOR MY PARTICIPATION?

You will receive $50 in the form of electronic (Venmo or CashApp) transfer for participating in this study.

WHO CAN I CONTACT IF I HAVE QUESTIONS ABOUT THIS STUDY?

The research team:
If you have any questions, comments, or concerns about the research, you can talk to the one of the researchers. Please contact: Rebekah Israel Cross or TaNefer Camara, by email: ucla.blackhealth@gmail.com, or phone/text: (323) 364-1866.

UCLA Office of the Human Research Protection Program (OHRPP):

If you have questions about your rights as a research subject, or you have concerns or suggestions and you want to talk to someone other than the researchers, you may contact the UCLA OHRPP by phone: (310) 206-2040; by email: participants@research.ucla.edu or by mail: Box 951406, Los Angeles, CA 90095-1406.

WHAT ARE MY RIGHTS IF I TAKE PART IN THIS STUDY?

You can choose whether or not you want to be in this study, and you may withdraw your consent and discontinue participation at any time.
Whatever decision you make, there will be no penalty to you, and no loss of benefits to which you were otherwise entitled.
You may refuse to answer any questions that you do not want to answer and still remain in the study.

You will be given a copy of this information to keep for your records.

Appendix F. The Roles and Expertise of Key Informant Interviewees

Key informant interview role, expertise, and interview date			
Name	Role	Expertise	Date
Alex Schafran	Lecturer, University of Leeds	Political economy of resegregation in the Bay Area; Author, *The Road to Resegregation: Northern California and the Failure of Politics*	2/22
Sharon Goldfarb	Perinatal Equity Initiative (PEI) Community Board member	Racial inequities in birth outcomes; CA state initiatives to reduce disparities	2/23
LeConte Dill	Associate Professor, Michigan State University	Community health and resegregation in the San Francisco Bay Area	3/22
Malo Hutson	Dean, University of Virginia School of Architecture	Displacement and Resistance in the San Francisco Bay Area Author, *The Urban Struggle for Economic, Environmental and Social Justice*	6/1
Anna Gruver	Maternal Child Health Director, Alameda County	Barriers and resources for Black maternal and child health in Alameda County	8/6
Natalie Berbick	Perinatal Equity Initiative (PEI) Coordinator, Contra Costa County	Implementation of PEI programs in Contra Costa County	10/4
Daphina Melbourne	Perinatal Equity Initiative (PEI) Coordinator, Alameda County	Implementation of PEI programs in Alameda County	10/6
Matt Vander Sluis	Policy Director, Bay Area Regional Health Inequalities Initiative	Public health policies and plans at the local, regional, and state level	10/26
Leah Matthews*	Physician	San Francisco policy initiatives to reduce racial inequities in birth outcomes	11/5
Angelique Anderson and Shandi Fuller	Solano Heals	Implementation of PEI programs in Solano County	12/15
* Pseudonym, participant asked to remain anonymous			

Appendix G: Documents

Documents used in document analysis by topic				
Topic	Title	Author(s)	Type / Source	Relevance
Maternal and Infant Health	Black Infants in the East Bay Are Experiencing Higher Negative Health Outcomes	Sarah Hoenicke, Sarah Cahlan and Drew Costley	Newspaper/ EastBay Express	Drivers of Black infant health outcomes in the East Bay
	California Black Infant Health Program	California Department of Public Health (updated 2020)	Program description	Describes California's state-wide program to address Black infant health through individual-level interventions
	SB-464 California Dignity in Pregnancy and Childbirth Act.	Holly Mitchell (2019)	Senate Bill Approved by Governor on October 07, 2019.	California law that seeks to reduce Black maternal and infant morbidity and mortality.
	Racial Equity Impact Analysis: Eliminating Lead Paint Hazards in Oakland & Alameda County	Marybelle N. Tobias	Government Report	Connects housing to toxic exposures in predominantly Black neighborhood in Oakland
Housing Insecurity and Displacement	Project Home: Soaring Home Prices, Systemic Discrimination Drive Resegregation In Bay Area Communities	Susie Steimle	Newspaper / CBS SF Bay Area	Housing insecurity as a core driver of resegregation
	Waves of displacement, resegregation affect Bay Area communities of color	Bay City News (2019)	Newspaper / Bay City News	Disproportionate impact of displacement on communities of color in the Bay Area.
	Black Californians' housing crisis, by the numbers	Matt Levin (2019)	Newspaper / CalMatters	Housing insecurity as a core driver and consequence of resegregation
	A new Great Migration: the disappearance of the black middle class	Mahlia Posey (2015)	Newspaper/ Richmond Confidential	Black out-migration in the Bay Area
	Bay Area gentrification	Kiley Russell (2019)		

	displacing communities of color			
Distribution of Power and Resources in Bay Area Suburbs	Regional Resegregation: Reflections on Race, Class, and Power in Bay Area Suburbs	Chris Smitt (2017)	Research Report / Urban Habitat	Allocation of health promoting resources in Bay Area suburbs
	Response to City and County of San Francisco Outmigration	San Francisco Task Force on African-American Outmigration (2009)	Government Report	Drivers of and solutions to reverse outmigration in San Francisco
	We Gon' Be Alright: Notes on Race and Resegregation	Jeff Change (2016)	Book / Picador Press	Links resegregation to police violence and racialized economic exploitation.

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