Black Flight? The Emergence of Crack Cocaine and Black Suburbanization*

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Abstract

Although Black people historically faced barriers to residing in the suburbs, Black suburbanization doubled from the 1970s to 2010s. Research highlights the role of positive shocks for such a rapid increase. This study provides an alternative theory and investigates Black suburbanization in the wake of a race- and location-specific negative shock. It exploits the outbreak of the crack epidemic, which affected inner-city Black people in the mid-1980s and early-1990s. The crack epidemic triggered positive externalities—race-specific coordination—that facilitated Black flight to the suburbs in the long run. The findings from a triple-differences design indicate that crack exposure increased the likelihood of Black people residing in the suburbs. Whether Black people moved to the suburbs in response to crack exposure depended not only on their socioeconomic status but also on the suburbanization of other Black people and social cohesion among inner-city Black migrants to the suburb. The effects of crack exposure are cumulative and persistent. Black suburbanization continues to be higher in crack-affected areas than in non-crack-affected areas two decades after the advent of crack cocaine. Crack exposure accounts for nearly 1 million Black people being suburbanized.

Keywords: crack epidemic; quasi-experiment; inner-city; suburbanization; residential inequality

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1 Introduction

The residential landscape of the United States (U.S.) continues to stratify opportunities across racial groups, from labor market outcomes to exposure to violence and the criminal justice system (Chetty et al., 2014; Light and Thomas, 2019; Manduca and Sampson, 2019). Racially stratified opportunities in turn (re)produce racial differences in residential attainment (Faber, 2020; Massoglia et al., 2013). Indeed, suburbanization shaped racial geography in the second half of the 20th century. Government initiatives such as the New Deal and the G.I. Bill stimulated “White flight” to the suburbs and forced Black people to remain in the inner-city, creating urban Black ghettos surrounded by White suburbs (Rothstein, 2017). In the 21st century, the suburbs have become more diverse, and a monolithic view of suburbia might not be as relevant today (Lacy, 2016). Nonetheless, suburbanization rates continue to vary by ethnic/racial group: Whites are the most suburbanized group, followed by Asians and Hispanics, with Blacks being the least suburbanized in any given decade (Massey and Tannen, 2018; Timberlake et al., 2011).¹

Extant perspectives emphasize that disadvantages—lack of socioeconomic resources (Massey and Denton, 1985), as well as prejudice and discrimination against racial minorities (Logan, 1978)—hinder residential attainment of minority groups. However, Black people are the fastest-growing suburbanized group, and Black suburbanization increased by 100% from 1970 to 2010 (Massey and Tannen, 2018; Timberlake et al., 2011).² “[T]he old path of [W]hite flight to the suburbs is now followed by Hispanics, Asians, and, to a *greater degree than ever before*, [B]lacks—all aspiring to achieve the suburban American Dream” (p.149 Frey, 2018) (emphasis added by the author). As explanations for the rapid increase in Black suburbanization, scholars identify positive shocks such as affirmative action, the emergence of the Black middle-class, improvements in intra-urban transportation, and job suburbanization, some of which are destination-oriented shocks that take place in the suburbs (e.g., Frey, 2018; Lacy, 2016; Quillian, 1999; Wilson, 1987).

This study proposes an alternative theory of the rapid increase in Black suburbanization. It focuses not on destination-oriented positive shocks, but instead on *origin-oriented negative shocks*.

¹Suburbs refer to the physical space beyond a central city’s boundaries; however, this space is still within the metropolitan area (Lacy, 2016). Suburbanization rates are generally defined as the share of the population that does not reside in central cities in a particular metropolitan area.

²In fact, in the first decade of the 21st century, for the first time, the majority of racial/ethnic minority populations reside in the suburbs in the 100 largest metropolitan areas (Frey, 2018).

A theory must explain why Black people would not move to the suburbs in the absence of these negative shocks, given that a plethora of research highlights that Black people are trapped in the inner-city and face barriers in fleeing to the suburbs in the presence of origin-oriented negative factors such as crime and residential segregation (e.g., [Bell, 2020](#); [Liska and Bellair, 1995](#); [Logan and Stults, 1999](#); [Morenoff and Sampson, 1997](#); [Massey and Denton, 1993](#)). Building on insights from threshold models ([Granovetter, 1978](#); [Schelling, 1971](#)) and cumulative causation of migration ([Massey and Zenteno, 1999](#)), this study provides a conceptual framework that accommodates the interdependencies of Black individuals' behaviors in both origin and destination location. In this framework, a race- and location-specific negative shock triggers positive externalities—race-specific coordination—that facilitate Black flight to the suburbs in the long run.

To test this idea, this study focuses on an unusually violent and race-specific drug epidemic: the outbreak of the crack epidemic in major U.S. inner-cities in the mid-1980s and early-1990s. The crack epidemic played a role in shaping the racial landscape in the U.S. by generating an unprecedented amount of lethal violence in predominantly Black neighborhoods ([Blumstein, 1995](#); [Fryer et al., 2013](#)). While drug dealing and its associated violence were concentrated mostly in inner-city neighborhoods, the epidemic was, on average, absent in the suburbs ([Agar, 2003](#); [Grogger and Willis, 2000](#)). Therefore, the epidemic was a negative shock to amenities in the inner-city.

How did the crack epidemic shape Black suburbanization in the long run? Following the idea of historical persistence in economics and political science ([Acharya and Sen, forthcoming](#)), I argue that the crack epidemic served as a critical juncture for Black suburbanization, and it led to the path dependence of Black suburbanization. As channels, I consider the following two processes of race-specific coordination. First, in the absence of the crack epidemic, remaining in the inner-city was an option for inner-city Black people; however, the crack epidemic likely shifted collective expectations among inner-city Black people about relocation to the suburbs. That is, one Black person's response to the crack epidemic, with respect to residing in the suburbs, likely depended on how other Black people were responding to the crack epidemic. Second, remaining in the inner-city or leaving for the suburbs would depend not only on the characteristics of the original locations but also those of the destinations. To take this into account, I argue that social cohesion among inner-city Black migrants to the suburb reduced the cost of suburban migration and helped inner-city Black people prepare to flee the inner-city to the suburbs in the wake of the crack epidemic.

With a positive feedback mechanism that makes the migration process “self-perpetuating,” Black suburbanization then cumulatively increased in crack-affected areas relative to non-crack-affected areas over time. This positive feedback mechanism can explain why the crack epidemic, which took place in historical time, can have persistent effects that amplify over time.

To evaluate this theory, I exploit the unique features of the crack epidemic, namely, Black people facing crack exposure while White people did not, as well as temporal and geographical variation in the emergence of crack cocaine, which abruptly intensified between the mid-1980s and early-1990s.³ Leveraging these sources of variation generates a triple-differences design that I apply to the repeated cross-sectional data of the 1980, 1990, 2000, and 2010 Integrated Public Use Microdata Series (IPUMS) sample periods. I identify the emergence of crack cocaine at the metropolitan statistical area (MSA) level based on the index of crack cocaine created by Fryer, Heaton, Levitt, and Murphy (FHLM) (2013). To address concerns that the emergence of crack exposure might have happened at the same time as other temporal local changes such as changes in racial preferences, population compositions, and urban landscape, my preferred specification includes MSA-by-decade fixed effects, which control for any arbitrary MSA-specific time-varying confounders. Thus, identifying variation effectively comes from between racial groups within the MSA in a given decade.

The findings indicate that crack exposure increased the likelihood of Black people residing in the suburbs. Crack exposure accounts for 43-48% of the increase in Black suburbanization during the study period, and it is responsible for nearly 1 million Black people being suburbanized. Consistent with the race-specific coordination channels, whether Black people moved to the suburbs in response to crack exposure depended on the suburbanization of other Black people and social cohesion among inner-city Black migrants to the suburb. Even though the crack epidemic ended long ago (U.S. General Accounting Office, 1991; Moore and Pacula, 2021), the effects of crack exposure are cumulative and persistent. Black suburbanization continues to be higher in crack-affected areas than in non-crack-affected areas two decades after the advent of crack cocaine. Lastly, the barriers Black people faced to escaping crack exposure and residing in the suburbs depended on their socioeconomic resources. The results survive a variety of robustness checks.

³I use the terms “crack exposure” and “crack epidemic” interchangeably. However, in general, “crack exposure” in this paper refers to it in the empirical sense, while “crack epidemic” refers to the overall phenomenon.

This study provides new insights into the residential consequences of crime, residential inequality, and racial inequality more broadly. While research indicates that crime traps Black people in high-crime areas and pushes White people out of these areas (e.g., [Hipp, 2011](#); [Liska and Bellair, 1995](#); [Xie and McDowall, 2010](#)), the empirical evidence concerning racial variation in the effects of crime is not entirely conclusive ([South and Crowder, 1997](#); [South and Messner, 2000](#)). Consequently, the conditions under which the effects of crime yield different results are theoretically underdeveloped. This study draws on theoretical ideas that highlight the interdependencies of behaviors ([Granovetter, 1978](#); [Schelling, 1971](#); [Massey and Zenteno, 1999](#)) to understand the residential choices of a disadvantaged group in the presence of a group-specific crime shock. Additionally, this study addresses an unexplored implication of [Wilson's \(1987\)](#) thesis that non-poor Black people leaving the inner-city for the suburbs was the cause of concentrated poverty in the inner-city in the 1970s and 1980s. Did earlier Black flight to the suburbs help inner-city Black people prepare to flee the inner-city to the suburbs in the wake of the crack epidemic? Earlier social cohesion among inner-city Black migrants to the suburbs helped inner-city Black people flee the inner-city to the suburbs following the crack epidemic; however, working-class and poor Black people were nonetheless trapped in crack-affected inner-cities. These results broaden our understanding of the residential attainment of middle-class Black people and their separation from poor Black people who are exposed to urban disadvantage ([Lacy, 2007](#); [Pattillo-McCoy, 1999](#); [Sharkey, 2014](#); [Wilson, 1987](#)). Lastly, that a race-specific drug epidemic cumulatively shapes racial inequality in residential domains in the long run hints at the temporal embeddedness of social interactions. By highlighting historical persistence, this study complements recent sociological research that examines the temporal and geographical variation in crime-related events and law enforcement to understand racial inequality ([Desmond et al., 2016](#); [Legewie, 2016](#); [Legewie and Fagan, 2018](#); [Mobasseri, 2019](#)).

2 Racial Differences in Suburbanization

Two perspectives explain racial differences in suburbanization. The spatial assimilation perspective posits that the spatial distribution of residential patterns mirrors differences in socioeconomic resources and status ([Massey and Mullan, 1984](#); [Massey and Denton, 1985](#)). Racial minorities have, on average, less human capital and lower income and occupational status than Whites, and thus

racial minorities face constraints in their residential choices. As members of minority groups gain socioeconomic status and resources, they can translate them into residential attainment. Research generally suggests that, compared to other groups, Black people are less able to translate their socioeconomic resources into residential attainment (Alba et al., 1999; Alba and Logan, 1993). To better explain Black suburbanization, the place stratification perspective emphasizes continued discrimination against racial minorities (Alba and Logan, 1993; Logan, 1978). Racial differences in suburbanization reflect a hierarchy in group membership, where Black people tend to face the most unfavorable residential terms. Members of the dominant majority group, White people, use resources to maintain social distance from members of disadvantaged groups. Research generally concludes that the overall patterns of Black suburbanization are consistent with the place stratification perspective (Charles, 2003).

These perspectives explain the difficulties Black people face residing in the suburbs; Black people are the least suburbanized racial/ethnic group in any given decade (Timberlake et al., 2011; Massey and Tannen, 2018). However, as indicated in Figure 1, Black suburbanization doubled from 1970 to 2010, and the gap in White–Black suburbanization decreased by about 20% during the same period. Additionally, the quality of suburban neighborhoods where middle- and upper-income Black people reside has improved (Lacy, 2007; Sharkey, 2014). To explain these trends, research considers positive shocks such as affirmative action, the emergence of the Black middle-class, improvements in intra-urban transportation, and the relocation of jobs and amenities to the suburbs (Frey, 2018; Lacy, 2016; Quillian, 1999; Wilson, 1987). Some of these are destination-oriented shocks that occur in the suburbs, which serve as pull factors. However, less is known about the conditions under which Black people move to the suburbs in the wake of origin-oriented negative shocks that occur in the inner-city. A plethora of research indicates that Black people are trapped in the presence of negative shocks in the inner-city, where they face barriers in relocating to the suburbs (e.g., Bell, 2020; Liska and Bellair, 1995; Logan and Stults, 1999; Morenoff and Sampson, 1997; Massey and Denton, 1993). The current study attempts to fill this void.

Figure 1: Trends in Black and White Suburbanization Over Time

Note: **Panel A:** Proportions of Black Suburbanization (blue solid line) and of White Suburbanization (red dashed line) Over Time. **Panel B:** Differences between Proportions of Black Suburbanization and of White Suburbanization Over Time. **Observation Unit:** MSA-by-Year. **Data Source:** Longitudinal Tract Data Base (LTDB).

Lastly, it is important to note that the social significance of suburbanization has evolved over time. For example, as cities began to transform in the 21st century, wealthy people have started to move to the city. In the suburbs, poverty has grown ([Kneebone and Garr, 2010](#)). As a result, the traditional view of suburbia held in the second half of the 20th century—achieving the suburban American Dream—has become more nuanced ([Lacy, 2016](#)). While understanding the evolution of the social meaning of suburbanization over time is beyond the scope of this study, any arbitrary shocks specific to race, metropolitan areas, and time periods with regard to changes in suburbanization are effectively taken into account in my research design to identify the effects of crack exposure.

3 Crack Epidemic and Black Flight to the Suburbs

This section develops the link between the crack epidemic and Black flight to the suburbs. To do so, I first provide (i) the background information about the crack epidemic necessary to understand my research design (for a more comprehensive review, I refer interested readers to [Agar \(2003\)](#)).

Then, I provide (ii) a conceptual framework of the link.

3.1 Crack Cocaine in U.S. Cities and Effects on Black Communities

Crack cocaine is a smokable version of powder cocaine; it is easily manufactured by dissolving powder cocaine in water, mixing it with baking soda, and letting it cool. However, unlike powder cocaine, which is more likely to be used among the affluent and purchased in large amounts, crack cocaine is inexpensive (ranging between \$5-10 per gram) and sold in small units (e.g., [Venkatesh and Levitt, 2000](#)). The features of crack cocaine attracted poor individuals in the inner-city in the mid-1980s. In short, crack cocaine was a technological innovation of the mid-1980s.

In the 1970s, cocaine smuggled from Colombia to the U.S. was distributed by Cubans in Miami, Colombians in New York, and freelance White entrepreneurs. During this time, cocaine was used by middle-class and upper-class Whites; therefore, it had a perceived association with high-class status and was believed to be a safe and non-addictive party drug. These beliefs and perceptions soon boosted its popularity. However, in the early 1980s, Whites began to suffer from adverse reactions to cocaine; accordingly, the popularity of powder cocaine was on the decline.

The decline in the demand for cocaine among affluent Whites made it difficult to profit from powder cocaine. The target of the drug was thus shifted from the affluent to the poor. Gangs and posses used different marketing strategies to facilitate the flow of the drug from producers in Colombia to users in impoverished Black communities.

An increase in crack market competition and innovative marketing strategies allowed the spread of crack cocaine to many U.S. cities. The drug was rapidly introduced in different locations at different times during the mid-1980s and early-1990s. The locations of trade ranged from street corners, public spaces (e.g., parks and arcades), to open-air drug markets where drug dealers and buyers had no previous contact ([Venkatesh and Levitt, 2000](#)). Importantly, while crack cocaine spread from city to city, crack cocaine markets were located primarily in the inner-city rather than the suburbs ([Fagan and Chin, 1990](#); [Johnson et al., 1990](#)).

The arrival of crack cocaine led to violence ([Grogger and Willis, 2000](#)), especially among young Black males. The homicide rate among young Black males tripled from 32 per 100,000 in 1984 to 111.8 in 1991, and their homicide rate was nearly ten times higher than that of their White counterparts ([Blumstein, 1995](#)). [Fryer et al. \(2013\)](#) find that crack can account for 55%–155%

of the increase in young Black male homicides, while this relationship is not significant for White homicides. [Evans et al. \(2022\)](#) compare Black homicide rates of young cohorts relative to old cohorts in an event-study design, finding that the effects of crack exposure on Black homicide persisted for nearly 20 years after its emergence. Given the higher rates of violence, crack dealing and use among Black people than their White counterparts, under the Anti-Drug Abuse Act of 1986, which resulted in a 100:1 crack–powder-cocaine disparity in mandatory-minimum sentencing, the incarceration of Black people increased substantially, exacerbating racial disparities in the prison system ([Blumstein, 2015](#); [Evans et al., 2016](#)).⁴

When crack cocaine was introduced in the inner-city, the urban landscape decayed in predominantly Black neighborhoods ([Anderson, 2000](#)). As manifest in crack-addicted homeless individuals ([Jencks, 1995](#)) and cocaine-addicted sex workers who exchanged sex for crack cocaine in crack houses (e.g., [Maher and Curtis, 1992](#); [Inciardi, 1995](#)), the crack epidemic generated much social disorder in the inner-city. During the crack era, negative racial stereotypes linking inner-city Black people and criminalization were triggered and reinforced ([Alexander, 2012](#); [Agar, 2003](#)).

However, the crack cocaine epidemic, in terms of prevalence of use, declined rapidly ([Moore and Pacula, 2021](#)). According to [U.S. General Accounting Office \(1991\)](#), the number of people who used cocaine in the previous year decreased by 50% between 1985 and 1990 (12 million in 1985 and 6.2 million in 1990), based on data from the National Household Survey on Drug Abuse.

Overall, the nature of the crack epidemic—(i) an unexpected or unpredictable external shock due to technological innovation, (ii) temporal and geographical variation in the emergence of crack cocaine, as well as (iii) Black people facing crack exposure while White people did not—generate a quasi-experimental variation. Consistent with this idea, [Appendix A2](#) indicates that pre-crack structural conditions at the MSA level are not correlated with the emergence of crack cocaine across MSAs. This background motivates the current research design, as detailed in [Section 4.2](#).

“So, in the end, was crack an African-American drug, or not?... [T]he major impact of the 1980s crack epidemic fell on ‘truly disadvantaged’ African-American communities, as described by Wilson” ([Agar, 2003](#), p.25).

⁴Research finds other adverse socioeconomic consequences for Black people, such as a decline in educational attainment ([Evans et al., 2016](#)) and adverse birth outcomes ([Fryer et al., 2013](#)).

3.2 Conceptual Framework

How did the crack epidemic shape the residential choices of Black people in the long run? The conventional wisdom holds that following the crack epidemic, even affluent Black people were more exposed to violence than working-class White people (Bell, 2020) due to residential segregation (Logan and Stults, 1999; Morenoff and Sampson, 1997). Thus, even Black people with abundant socioeconomic resources were likely to be trapped in the inner-city. Consistent with this idea, research using individual-, neighborhood-, and city-level data consistently indicates that crime traps Black people in crime-ridden areas while it pushes White people out of them, which includes White flight to the suburbs (e.g., Cullen and Levitt, 1999; Curci and Masera, 2022; Hipp, 2011; Liska and Bellair, 1995; Liska et al., 1998; Frey, 1979; Marshall, 1979; Morenoff and Sampson, 1997; Xie and McDowall, 2010). One study finds opposite results from this strand of research. South and Crowder (1997) find that violent crime rates are associated with city-to-suburb mobility among Black people but not among White people in a sample drawn from the Panel Study of Income Dynamics from 1979 to 1985. However, the researchers indicate that this result was unexpected and could not be easily explained theoretically.

This study proposes a conceptual framework to better understand the residential consequences for Black people by focusing on a race- and location-specific crime shock, namely, the crack epidemic. While previous research has (implicitly) assumed that individuals exposed to crime independently make their decisions related to a residential location, the proposed framework emphasizes the interdependencies of individuals' behaviors. According to this framework, the crack epidemic was a negative shock to inner-city amenities and induced positive externalities—race-specific coordination—that facilitated Black flight to the suburbs in the long run.

Crack Epidemic as a Push Factor: Exposure to the crack epidemic, which was disproportionately confined to predominantly Black neighborhoods in the inner-city, increased the risk and uncertainty in the lives of Black residents in inner-city neighborhoods. Consequently, neighborhood dissatisfaction among Black residents likely increased, and their intention to relocate to a safer area such as the suburbs likely increased in crack-affected inner-city neighborhoods.

A few accounts hint at the role of crack cocaine in shaping Black suburbanization. Wiese (2005) draws on historical newspapers and qualitative documents to argue that the most compelling factor

leading to middle-class Black suburbanization during the 1980s and 1990s was increased violence in cities. Additionally, a Chicago Tribune survey indicates that in Chicago, where the crack epidemic hit heavily, about 60,000 residents moved out of the city in the early 1990s, and nearly 80% of those who left the inner-city reported a desire for a safer place to live as a crucial reason ([Readon, 1993](#)).⁵

Given the severity and unusually violent nature of the crack epidemic, the epidemic was likely a negative shock to amenities in the inner-city. Thus, the cost of remaining in the inner-city increased for Black people. Before the crack epidemic, remaining in the city was an option for inner-city Black people, but this was no longer the case thereafter. The crack epidemic therefore acted as a push factor for Black people to relocate to the suburbs.

Suburbanization of Other Black People as a Push Factor: Given persistent barriers to residing in the suburbs for Black people, elevated risks may not be sufficient to explain Black suburbanization. How was the crack epidemic different? Given the crack epidemic being a race-specific shock, the epidemic likely shifted collective expectations about relocation to the suburbs. That is, a Black person's decision to reside in the suburbs depended on the suburbanization of other Black people. To develop this idea, I draw on insights from threshold/tipping models, where an individual's migration decision depends on the migration decisions of other people in his/her reference group ([Clark, 1991](#); [Bruch and Mare, 2006](#); [Granovetter, 1978](#); [Schelling, 1971](#)). The decision to leave one's neighborhood depends on a tipping point, where a sufficient proportion of the members of the same racial group have already moved or members of a different racial group moved in (the latter possibility is likely absent given the race-specific nature of the crack epidemic).

This line of reasoning indicates that the response to the crack epidemic was not only about an individual Black person's decision to reside in the suburbs, but also about the decision of other Black people to reside in the suburbs. The proportions of other Black people's decisions to relocate may have allowed for frequent communication and information exchange about relocation and may have signaled the possibility of creating Black suburban communities, all of which likely reduced the cost of migration to the suburbs. Taken together, I argue that the complementarity of the crack

⁵In the Chicago metropolitan area in the early 1990s, the likelihood of urban residents becoming victims of violence was nine times higher than that of suburban residents. The same newspaper article describes one family's move from a predominantly Black neighborhood to a suburb when drug dealers began operating outside their house in Woodlawn, a predominantly Black neighborhood.

epidemic and the suburbanization of other Black people as two push factors increased the likelihood of a Black person residing in the suburbs. One testable implication is that *crack exposure increased the likelihood of suburban residence for Black people in crack-affected areas with high levels of the suburbanization of other Black people due to crack exposure.*

Social Cohesion among Inner-city Black Migrants to the Suburb as a Pull Factor:

Remaining in the inner-city or leaving for the suburbs depends on the characteristics of both the original location and the destination. The cumulative causation perspective accounts for the roles of push and pull factors in the origin and destination areas. It highlights how the links between origins and destinations provided by community members facilitate migration flows (Massey, 1990). Migration from an origin to a specific destination induces more migration because origin–destination connection decreases the cost of migration, including search cost, information acquisition, and preparation. Potential migrants draw on information and resources provided by earlier migrants; these people migrate, further network ties accumulate, and then more people migrate. This positive feedback mechanism makes the migration processes “self-perpetuating” (Massey and Zenteno, 1999). Internal migration episodes such as the Great Migration demonstrate the importance of relying on social capital (e.g., Tilly, 1968; Eichenlaub et al., 2010; Tolnay, 2003; Sharkey, 2015).

I propose that the process of cumulative causation carries over to the context of the crack epidemic, along with one implication of the study by Wilson (1987). Wilson argues that the fact that (non-poor) Black people left for the suburbs, leaving poor Black people in the inner-city behind, was a cause of concentrated poverty in the 1970s and 1980s. Did earlier Black flight to the suburbs help other Black people leave the inner-city in the wake of the crack epidemic? In crack-affected areas with high social cohesion among inner-city Black migrants to the suburb, the origin–destination connection likely decreased the cost of migration and helped inner-city Black people prepare to flee the inner-city to the suburbs. In the “self-perpetuating” process, Black suburbanization then cumulatively increased in crack-affected areas. By contrast, in the absence of such cohesion, though inner-city Black residents’ intention to relocate increased, inner-city Black people would have little access to the suburbs, which likely trapped them in crack-affected inner-cities. Taken together, I argue that the complementarity of crack exposure as a push factor and social cohesion among inner-city Black migrants to the suburb as a pull factor facilitated Black flight to the suburbs. The

testable implications from this discussion are twofold. First, *crack exposure increased the likelihood of suburban residence for Black people in areas with high social cohesion among inner-city Black migrants to the suburb*. Second, *Black suburbanization cumulatively increased in crack-affected areas relative to non-crack-affected areas in the decades following the emergence of crack cocaine*.

Individual-Level Resources as Constraints: In addition to these two race-specific coordination processes, I aim to identify the various barriers Black people faced in escaping the crack epidemic and residing in the suburbs. The barriers likely depend on individual-level socioeconomic resources, based on the notion that residential inequality is better understood as resulting from the interaction between race and class (e.g., [Charles, 2003](#); [Iceland et al., 2005](#); [Wilson, 1978](#)).

While research on the relationship between crime and residential outcomes overlooks the differences in residential outcomes by class within a racial group, a different strand of literature discusses the interactive effects of race and class to escape crime exposure. [Wilson \(1978\)](#) argues that race and class play an intertwined role in an individual’s ability to escape high-crime neighborhoods. Similarly, [Quillian \(1999\)](#) conjectures that one reason that non-poor Blacks moved into predominantly White neighborhoods at a fast pace from 1970 to 1990 was their desire to avoid high rates of crime. This discussion implies that Black people affected by the crack epidemic but with relatively fewer constraints were likely able to flee the inner-city to the suburbs. One testable implication is that *the effects of crack exposure on the likelihood of suburban residence are driven by middle-class and non-poor Black people*.

Remarks: I offer the following two remarks. First, this study is not intended to evaluate or challenge other existing theories of residential attainment. Instead, it proposes crack exposure as a new cause of Black suburbanization over time, with race-specific coordination serving as a channel. Therefore, the study is not concerned with, for instance, the overall determinants of Black suburbanization before and after the crack epidemic. Second, the proposed framework and corresponding analysis are based on the assumption that Black people, on average, have better living conditions in the suburbs than in the inner-city (e.g., [Charles, 2003](#)). This assumption allows for the possibility that Black people in the suburbs may not be immune to crack-related problems entirely, given that suburbs in which Black people reside tend to be more disadvantageous than

suburbs in which their White counterparts reside (Alba et al., 1994; Pattillo-McCoy, 1999).

4 Data and Research Design

4.1 Data

For the main analysis, I use data from two sources: the index of crack cocaine constructed by Fryer et al. (2013) and individual-level samples from the census data compiled by IPUMS (n.d.). I merge these two datasets at the MSA level. I focus on MSAs that are consistently available across census years in the IPUMS data as well as all the measures used in this study. Thus, the number of MSAs across census years, measures, and analyses is balanced, and is 65. MSAs are an appropriate geographical unit for two reasons. First, my interest lies in an individual’s residential location, and the two locations—a city or suburb—are nested within the MSA. Second, prior studies use MSAs as a geographical unit to capture crack exposure (Evans et al., 2016, 2022).

MSA-Level Data

Crack Exposure Indicator: FHLM (2013) construct an index of crack cocaine based on multiple proxy measures.⁶ The index is available for 144 cities from 1980 to 2000. For this study, I first aggregate the city-by-year-level FHLM index to the MSA-by-year-level. Figure 2 shows the trends in crack intensity over time based on the FHLM index. It provides two pieces of information. First, it indicates that the index’s value is virtually zero in 1980, which is consistent with research suggesting that crack cocaine was almost unheard of in the early 1980s (Agar, 2003). Second, the figure shows the rapid change in crack intensity over time. These two pieces of information indicate that the emergence of crack cocaine was unexpected, and the 1980 census year can be considered

⁶Because the FHLM index captures multiple dimensions of crack cocaine, it is more comprehensive than crack measures based on single indicators such as cocaine-related arrests or deaths. The FHLM index is constructed from a factor analysis of the following proxy measures of crack cocaine. (i) Cocaine-related arrest rates, namely, the percentage of all arrests for possession or distribution of opium/cocaine and their derivatives, minimum of 100 arrests based on the Federal Bureau of Investigation (FBI) Uniform Crime Reports (UCR). (ii) Death rates, namely, the number of all cocaine-related deaths per capita based on the National Center for Health Statistics (NCHS) Mortality Detail Files. (iii) Bust rates, namely, the number of busts involving cocaine, minimum of 15 busts, based on the Drug Enforcement Administration (DEA) System to Retrieve Information from Drug Evidence (STRIDE). (iv) ER visits, namely, the number of cocaine-related emergency department visits per 100,000 population based on data from the Drug Abuse Warning Network (DAWN). Finally, (v) the frequency of crack cocaine mentions in newspapers, namely, the number of articles drawn from 341 U.S. periodicals containing a city name, “crack,” and “cocaine” divided by the number of articles containing the city name and “crime,” a minimum of 30 crime articles using Lexis-Nexis data.

as the pre-crack period.

Figure 2: The Rapid Change in Crack Intensity

Original Source:: [Fryer et al. \(2013\)](#)

To construct a treatment indicator of crack exposure, I use breaks in trends (i.e., a threshold) in the FHLM index.⁷ I estimate the intercept of an ordinary least squares (OLS) regression of the FHLM index, which provides a predicted mean of the FHLM index (1.132) with the 95% confidence intervals (lower bound: 1.064, and upper bound: 1.200). The intercept coefficient, along with the lower and upper bounds of the confidence intervals, serves as a mean shift. I use this intercept coefficient as a threshold value to assign when and where crack emerged. However, exceeding the threshold for just one year can be idiosyncratic, and it is possible that an MSA experienced this threshold one year and reverted to values below the threshold in subsequent years (Appendix A1 depicts two MSAs for illustration). To avoid this possibility, I take the first three-year average of crack intensity once an MSA exceeds the threshold. If the three-year average is above the lower bound of the confidence intervals, then that MSA is considered crack-affected, and otherwise not-crack-affected. Figure 3 provides the geographical distribution of crack exposure across MSAs,

⁷Other studies define the emergence of crack cocaine similarly using other measures, such as cocaine-related arrests ([Cork, 1999](#)), cocaine-induced deaths ([Evans et al., 2016, 2022](#)), ER visits, and police chief surveys ([Grogger and Willis, 2000](#)).

where the blue circle indicates crack-affected MSAs and the red cross indicates non-crack-affected MSAs. Importantly, whether and when an MSA experienced crack exposure varies. Appendix Table A1 provides the full list of 65 MSAs and the arrival year of crack cocaine. Appendix Figure A2 validates the criterion of treatment assignment. Furthermore, Appendix Table A4 examines the robustness of the main results using ten alternative treatment assignment criteria.

Figure 3: Geographical Distribution of Crack Exposure

Note: Hawaii is excluded for the sake of space.

Suburbanization of Other Black People: To examine whether the likelihood of residing in the suburbs for Black people in response to crack exposure depended on the suburbanization of other Black people, I use the aggregate measure of Black suburbanization at the MSA level. That is, the proportion of Black people who reside in the suburbs within the MSA. To avoid (i) simultaneity bias, (ii) post-treatment bias (Angrist and Pischke, 2008; Elwert and Winship, 2014), and (iii) reflection problems (Manski, 1995), I use the predicted measure of Black suburbanization for crack-affected MSAs, in the spirit of Arellano and Bond (1991). I obtain the predicted Black suburbanization from regressing the mean of Black suburbanization in the post-crack period on Black suburbanization in the pre-crack period, conditional on state fixed effects. For non-crack-affected MSAs, I compute

the baseline decade of Black suburbanization at the MSA level. Appendix Figure A3 provides the distribution and summary statistics of this variable.

Social Cohesion among Inner-city Black Migrants to the Suburbs: To examine whether the likelihood of Black people residing in the suburbs in response to crack exposure depended on social cohesion among inner-city Black migrants to the suburb, I use the Herfindahl-Hirschman Index (HHI) as a proxy for social cohesion. This approach is in the spirit of [Stuart and Taylor \(2021\)](#), who examine the crime consequences of social cohesion among Black southern migrants during the Great Migration, using the HHI.⁸ To avoid post-treatment bias, I use the 1980 IPUMS data, which records respondents' residential location in the census year (the place of destination) as well as his/her residence five years prior to the 1980 census year (the place of origin). Ideally, one would like to define HHI as $cohesion_o = \sum_d (N_{d,o}/N_o)^2$, where $N_{d,o}$ is the number of Black people that moved to destination suburb d from origin city o , and N_o is the number of Black people from origin city o . However, while the geographical identifier is available for both MSAs and central cities, the identifier for a specific suburb within the MSA is not available in the IPUMS data. Instead, I use destination MSA j as a proxy for a destination suburb, resulting in $cohesion_o = \sum_j (N_{j,o}/N_o)^2$. Because I limit the sample to Black people who originally resided in a central city five years before the census year and resided in a suburb in the census year, the destination MSA j always reflects a suburb.⁹ The index calculated at the origin city $cohesion_o$ is then aggregated to the MSA level $cohesion_m$. It measures the shares of migrant flows of inner-city Black people to a shared suburb in MSA m : that is, social cohesion among inner-city Black people who migrated to the same suburb.¹⁰ The higher value of the index means higher concentration among inner-city Black migrants to the suburb, indicating higher social cohesion. Appendix Figure A3 provides the distribution and summary statistics of this variable.

⁸Aside from social cohesion, the HHI is a common measure to capture racial/ethnic diversity (e.g., [Graif, 2018](#); [Legewie and Schaeffer, 2016](#)).

⁹The focus on this sample is only to construct the social cohesion measure. For the main analysis, I focus on respondents who live in an MSA at the census year.

¹⁰This is a proxy measure for social cohesion, not observed ties between inner-city and suburban Black people.

Individual-level Data

Sample/Periods: I focus on respondents who are not institutionalized, are born between the 1920s and 1970s (this ensures no change in sample compositions across census years), are aged between 15 and 65 (i.e., active working-age), and reside in a city or suburb within the MSA.¹¹ I use data from the 1980, 1990, 2000, and 2010 IPUMS for two reasons. First, the 1970 IPUMS does not include MSAs as a geographical unit or does not record respondents' residential location. Second, the 1960 IPUMS records respondents' residential location, but the 1960 census year is before the civil rights movement, which is not directly comparable to 1980 and its successive decades, especially when the outcome of interest is directly related to the civil rights movement.

Suburban Residence: The IPUMS records whether the respondent resides within an MSA and, among those in the MSA, whether he/she resides within or outside of a central/principal city in the census year. In the Census data, areas outside of a central/principal city refer to the suburbs. From this measure, I create the outcome variable, suburban residence, which equals 1 if the respondent resides in a suburb (i.e., outside of a central/principal city) and 0 if he/she resides in a city (i.e., within a central/principal city).¹² Table 1 provides the summary statistics: the mean is 0.339 for Black and 0.714 for White respondents.

Initial Residential Location: The 1980, 1990, and 2000 IPUMS data record whether the respondent resides in a city or suburb within the MSA 5 years before the census year. With this measure, one of the specifications accounts for the respondent's initial residential location to examine whether Black respondents who initially resided in a city moved to a suburb in response to crack exposure. Table 1 provides the summary statistics. The mean for initial urban residence is 0.755 for Black respondents and 0.347 for White respondents.

Race Indicator: I create mutually exclusive categories of non-Hispanic White and non-Hispanic Black. The race indicator equals 1 if the respondent is Black and 0 if he/she is White. Of the

¹¹Difference-in-differences(DD)-related designs with repeated cross-sectional data assume no change in sample compositions. A concern in the current context is that respondents born in certain birth cohorts do not appear in the earliest or latest census year. The focus on cohorts that appear in all census years (i.e., respondents born between the 1920s and 1970s) mitigates this concern.

¹²One caveat is that the suburban residence measure does not capture different types of suburbs; and the measure here likely captures the average suburb within the MSA.

respondents, 17% are Black, while 83% are White. I focus on Black and White respondents, rather than Black, White, and Hispanic ones, because the focus of this study is to understand Black suburbanization. Appendix Table A8 examines the robustness of the results to the inclusion of Hispanic respondents.

Predetermined Individual-Level Covariates: I include the predetermined individual-level demographic characteristics of sex, foreign-born, 10-year birth cohort, and the number of generations in the respondent’s household. I do not include other individual-level covariates that (i) are likely affected by racial categories or (ii) crack exposure is likely to affect to avoid post-treatment bias. With this caveat in mind, however, Appendix Table A6 examines the robustness to the inclusion of other individual-level covariates.

Socioeconomic Status Indicator: To examine the heterogeneous effects of crack exposure by socioeconomic status, I separately use five socioeconomic measures: (i) poverty status, (ii) household income, (iii) education, (iv) employment status, and (v) occupation. For each measure, I create mutually exclusive indicators, and I label each (a) as middle-class (or non-poor) and each (b) as working-class (or poor). For poverty status, I classify (i-a) households above the poverty threshold as non-poor, and (i-b) households below the poverty threshold as poor. For household income, following Lacy’s (2007) classification, (ii-a) I use households earning more than \$30,000 as a cutoff to categorize them as middle-class, and (ii-b) those earning less than or equal to \$30,000 as working-class.¹³ I categorize education as (iii-a) respondents with a college degree or more, and (iii-b) those with a high school diploma or less as working-class. I categorize employment status as (iv-a) employed respondents and (iv-b) unemployed respondents. Lastly, I categorize occupation as (v-a) respondents with managerial, professional, or technical occupations; and (v-b) those with sales and administrative, service, or farming, precision, and operator occupations.

¹³Following Lacy (2007) and Sharkey (2014), I define these groups using dollars as of 2000 and adjust for dollars in other years with the Consumer Price Index.

Table 1: Summary Statistics of the Outcome Variable, Socioeconomic Variables, and Predetermined Individual-Level Covariates

	Black (17.06%)		White (82.94%)	
	Mean	Std.Dev.	Mean	Std.Dev.
Outcome Variable:				
Suburban Residence	0.339	0.473	0.714	0.451
Initial Residential Location*:				
Initial Urban Residence	0.755	0.429	0.347	0.476
Predetermined Individual-Level Covariates:				
Male	0.437	0.496	0.490	0.499
Foreign-Born	0.094	0.292	0.065	0.245
Household Generation, 1st (ref)	0.287	0.452	0.391	0.488
Household Generation, 2nd	0.579	0.493	0.568	0.496
Household Generation, 3rd	0.132	0.339	0.042	0.196
Birth Year 1920-1929 (ref)	0.056	0.229	0.081	0.273
Birth Year 1930-1939	0.094	0.219	0.108	0.311
Birth Year 1940-1949	0.173	0.378	0.198	0.399
Birth Year 1950-1959	0.276	0.447	0.289	0.448
Birth Year 1960-1969	0.251	0.433	0.219	0.414
Birth Year 1970-1979	0.150	0.357	0.112	0.316
Socioeconomic-Related Variables:				
Household above Poverty Threshold	0.797	0.402	0.940	0.236
Household Income > \$30,000	0.496	0.499	0.669	0.471
College Graduates and Above	0.380	0.485	0.525	0.499
Employment**	0.880	0.324	0.950	0.217
Middle-Class Occupation***	0.130	0.336	0.286	0.452

Notes: **Sample:** Respondents who are not institutionalized, are born between the 1920s and 1970s, are aged between 15 and 65, and reside in a city or suburb within the MSA. **Sample periods:** 1980, 1990, 2000, 2010 census years. **Observations:** 1,572,567. *** Note for initial residential location.** **Sample periods:** 1980, 1990, and 2000 census years. **Observations:** 641,821. **** Note for employment.** **Observations:** 1,195,206 (due to NA). ***** Note for occupation.** **Observations:** 1,122,541 (those who are employed).

4.2 Identification Strategy

Triple-Differences Design: A naive comparison between MSAs with and without crack exposure may be misleading and fail to understand residential consequences because these areas are likely to differ at unobservable levels. For instance, the crack epidemic was a race-related issue, and the underlying racial tension across MSAs may explain crack exposure and racial geography. I identify the effects of crack exposure by exploiting the following unique features of the crack epidemic.¹⁴ First, the emergence of crack cocaine varied by place and time, as indicated in Table A1. Second, the crack epidemic had disproportionate effects on Black people, while it had negligible effects on White counterparts, as discussed in Section 3.1; accordingly, I conceptualize crack exposure as a race-specific treatment rather than as treatment effect heterogeneity by racial

¹⁴In urban studies, researchers often examine the association between variables by decade. For the current inquiry, analysis by decade does not equate to a triple-differences strategy. For those who are interested in the effects of crack exposure by decade, I do so in an event-study analysis, where I examine the dynamic effects of crack exposure in the decades leading to and following crack exposure exploiting the triple-differences variation.

group (see Appendix A.2 for this discussion). Leveraging these sources of variation generates a triple-differences design (or Difference-in-Differences-Differences, DDD). I compare the suburban residence for Blacks in crack-affected MSAs (i) over decades with the following control groups: (ii) Whites in crack-affected MSAs and (iii-iv) Blacks and Whites in non-crack-affected MSAs. I estimate the following triple-differences specifications:

$$suburb_{i,r,c,m,t} = \gamma_{r,m} + \delta_{r,t} + \lambda_{r,c} + \mu_{c,m} + \alpha_0 \mathbb{1}_{m,t}^{crack} + \alpha_1 (\mathbb{1}_{m,t}^{crack} \times \mathbb{1}_r^{blk}) + v\mathbf{X}_i + \epsilon_{i,r,c,m,t}, \quad (1)$$

$$suburb_{i,r,c,m,t} = \tilde{\gamma}_{r,m} + \tilde{\delta}_{r,t} + \tilde{\lambda}_{r,c} + \tilde{\mu}_{c,m} + \tilde{\phi}_{m,t} + \tilde{\alpha}_1 (\mathbb{1}_{m,t}^{crack} \times \mathbb{1}_r^{blk}) + \tilde{v}\mathbf{X}_i + \tilde{\epsilon}_{i,r,c,m,t}, \quad (2)$$

where $suburb_{i,r,c,m,t}$ is suburban residence for respondent i who belongs to racial group r and cohort c in MSA m in decade t . $\mathbf{X}_i$ represents the predetermined individual-level covariates. $\gamma_{r,m}(\tilde{\gamma}_{r,m})$ is the MSA-by-race fixed effects. This controls for unobserved time-invariant differences across metropolitan areas that vary by racial group. For instance, underlying unobserved racial tension across MSAs may explain both the likelihood of Black people residing in the suburbs and crack exposure. MSA-by-race fixed effects effectively control for such unobserved heterogeneity. $\delta_{r,t}(\tilde{\delta}_{r,t})$ represents the race-by-decade fixed effects. This controls for arbitrary differences in the likelihood of suburban residence across racial groups that change over time. For instance, Black suburbanization increased at a faster rate than did White suburbanization during the sample periods of this study. Race-by-decade fixed effects effectively control for these differential trends across racial groups over time. $\lambda_{r,c}(\tilde{\lambda}_{r,c})$ represents the cohort-by-race fixed effects. This controls for arbitrary birth cohort differences across racial groups. For instance, racial attitudes vary by birth cohorts (Firebaugh and Davis, 1988), which may also explain the likelihood of suburban residence for Black people. $\mu_{c,m}(\tilde{\mu}_{c,m})$ indicates the cohort-by-MSA fixed effects. This allows for cohort effects to vary across MSAs. For instance, it controls for potential racial attitudes across cohorts that may vary by MSA.

With $\gamma_{r,m}$ and $\delta_{r,t}$, I refer to equation 1 as a standard triple-differences specification. Equation 2 introduces further flexibility by controlling for MSA-by-decade fixed effects, $\tilde{\phi}_{m,t}$. Henceforth, I refer to equation 2 as a flexible triple-differences specification. MSA-by-decade fixed effects effectively control for unobserved differences across MSAs from decade to decade (i.e., differential trends across MSAs over time). Hence, any arbitrary shocks specific to an MSA in a given decade such as changes in racial attitude, urban landscape, policing practices, and other economic and

social changes in MSA m in decade t are perfectly absorbed by MSA-by-decade fixed effects. This is the most conservative specification with the current data configuration.

The variable of interest is the interaction term of $\mathbb{1}_{m,t}^{crack}$ and $\mathbb{1}_r^{blk}$. The former is an indicator of crack exposure that varies by MSA m and decade t , and the latter is an indicator for Black. Accordingly, the coefficient of interest is α_1 in equation 1 and $\tilde{\alpha}_1$ in equation 2. The coefficient on $\mathbb{1}_{m,t}^{crack}$ in equation 1, α_0 , captures time-varying confounding effects specific to crack-affected MSAs as well as the effects of crack exposure among White people. Econometrically, these two effects are not distinguishable; however, given that the crack epidemic had negligible effects on White people, I assume that the effects of crack exposure among them are zero. Because equation 2 includes $\tilde{\phi}_{m,t}$, the main term $\mathbb{1}_{m,t}^{crack}$ is a perfect collinear. With $\tilde{\phi}_{m,t}$, a comparison between Black and White comes solely from the variation in the same MSA and period. Lastly, $\epsilon_{i,m,c,r,t}(\tilde{\epsilon}_{i,m,c,r,t})$ is an error term. The standard errors are clustered at the MSA level to account for interdependence in the observations for individuals exposed to crack.

Event-Study Design: Before explaining an event-study design, I offer the following remark. The majority of MSAs experienced crack exposure in the 1980s, and the treatment indicator equals 1 after the 1990 census year. Because indirectly examining the parallel trends assumption—one crucial identification assumption in Difference-in-Differences(DD)-related designs (i.e., DD and DDD)—requires at least two pre-treatment periods, with the current IPUMS sample periods, there is only one pre-treatment period for these MSAs, limiting the ability to fully examine pre-trends for all treated MSAs. Therefore, for an event-study analysis, I turn to MSA-level suburbanization measures from 1970 to 2010, using the Longitudinal Tract Data Base (LTDB) (Logan et al., 2014). Appendix A.3 provides an explanation of the measurement construction. Appendix Figure A7 provides the result of an event-study analysis with only MSAs that experienced crack exposure in the 1990s using the IPUMS data.

With lag (i.e., decades after crack exposure) and lead (i.e., decades before crack exposure) treatment indicators, the event-study design estimates dynamic treatment effects over time, which allows me to examine the long-term effects of crack exposure. To implement an event-study with a triple-differences variation and conduct the analysis at the MSA level, the data structure requires the stacking of different groups. I stack the data into a panel structure by race and state, such that

the unit of observation is at race r , MSA m , and census year t . That is, race-by-MSA-by-decade. I estimate the following event-study specification:

$$suburb_{r,m,t} = \check{\gamma}_{r,m} + \check{\delta}_{r,t} + \check{\phi}_{m,t} + \sum_{-2}^2 \omega_{\tau} (\mathbb{1}_{m,t}^{\tau} \times \mathbb{1}_r^{blk}) + \check{\epsilon}_{r,m,t}. \quad (3)$$

I normalize the timing of observation, such that time t is measured with respect to the decade of crack exposure in MSA m . $\mathbb{1}_{m,t}^{\tau}$ is the treatment indicator: $\mathbb{1}_{m,t}^{\tau} = 1$ if the difference between dates t and t_m is either (i) equal to τ , (ii) greater than or equal to 2, or (iii) less than or equal to -2 , where t_m is the decade of crack exposure in MSA m . ω_{τ} are the coefficients of interest, with normalization $\omega_{-1} = 0$; the coefficients are interpreted as a comparison to one decade prior to crack exposure in MSA m . Identification requires that the coefficient on the lead crack indicator ω_{-2} should be indistinguishable from zero. Once crack emerges, the coefficients on the contemporaneous and lag treatment indicators $\omega_0, \omega_{+1}, \omega_{+2}$ should be large in magnitude. $\check{\gamma}_{r,m}, \check{\delta}_{r,t}, \check{\phi}_{m,t}$ are MSA-by-race fixed effects, race-by-decade fixed effects, and MSA-by-decade fixed effects, respectively. The standard errors are clustered at the MSA level.

Estimand, Identification Assumption, and Estimator:

- **Estimand:** The triple-differences design captures the average treatment effect on the treated (ATT). In specifications 1 and 2, where I do not account for which respondents initially resided in a city, the treatment effects are the intention-to-treat (ITT), capturing the effects of crack exposure on the entire population of Blacks relative to Whites within crack-affected MSAs. In one specification, where I account for the respondent's initial residential location, I am primarily interested in capturing the effects of crack exposure for Black people who initially resided in a city relative to Whites as a whole within crack-affected MSAs. By contrast, there should be null effects of crack exposure for Black people who initially resided in a suburb, because they would have no incentive to move to the city, given crack exposure in the inner-city. Importantly, this assumption is consistent with research indicating that although the suburbs in which Black people reside tend to be exposed to disadvantages including crime, their living conditions are still better in the suburbs than in the inner-city (Alba et al., 1994; Charles, 2003; Pattillo-McCoy, 1999). Because neither White people in a city nor those in a

suburb were likely to be exposed to crack, White people as a whole are used as a comparison group.

- **Whites as a Comparison Group for Blacks:** While previous studies use White people as a comparison group for Black people in DD-related designs (Albright et al., 2021; Aneja and Xu, 2022; Evans et al., 2016), the following two points may cast doubt on the validity of such a research design in that comparing Black and White people equates to comparing apples to oranges. First, Black and White people live in very different neighborhoods, such that there is little overlap in the distribution of neighborhood conditions (Peterson and Krivo, 2005). However, this point is precisely what makes the triple-differences design plausible. As extensively discussed in Section 3.1, the crack epidemic was disproportionately concentrated in Black neighborhoods, justifying crack exposure as a race-specific treatment. Second, Black suburbanization increased at a faster rate than White suburbanization during the study period. To this point, race-by-decade fixed effects effectively control for differential trends in suburbanization across the two groups over time. In addition, importantly, the triple-differences design does not require, for its identification, similar trends in Black and White suburbanization in the pre-crack period (see below).
- **Parallel Trends Assumption:** A crucial identification assumption in DD-related designs is the parallel trends assumption, which states that in the absence of treatment, the outcome trends would change at similar rates for the treatment and control groups. To indirectly test the assumption in the current triple-differences setting, *trends in Black–White suburbanization in crack-affected MSAs* need to be equivalent to *trends in Black–White suburbanization in non-crack-affected MSAs* in the pre-crack period.¹⁵ If the parallel trends assumption holds, then the coefficient on the decade leading up to crack exposure should (i.e., ω_{-2}) in equation 3 be small in magnitude and close to zero.
- **Matching:** Matching on an outcome variable in the pre-treatment period can further mitigate potential violation of the parallel trends assumption (e.g., Ryan et al., 2019). I use

¹⁵Note that while the triple-differences estimator is the difference between two difference-in-difference estimators, it does not require two parallel trends (i.e., parallel trends between crack-affected MSAs and non-crack-affected MSAs for Black and for White suburbanization, respectively) (Olden and Møen, 2022). In this sense, the triple-differences design requires a weaker assumption than a difference-in-difference design with heterogeneous effects.

the entropy balancing method proposed by [Hainmueller \(2012\)](#). This method weighs each control observation to achieve optimal balance to adjust differences in the sample moments. Intuitively, the entropy balancing method allows an identical covariate distribution between the treatment and control groups.¹⁶ For the main analysis with the IPUMS data, I match on differences between Black and White suburbanization rates at the MSA level in the 1980 census period.¹⁷ For the event-study analysis with race-by-MSA-by-decade level data, I match on differences between MSA-level Black suburbanization and White suburbanization rates from the 1970 to the 1980 census years. Appendix [B.2](#) provides sample moments before and after using the entropy balancing method. Appendix Table [A3](#) provides the robustness of the main analysis to alternative weighing/matching approaches.

- **Baseline Regional Characteristics:** While DD-related research designs do not require covariate balancing, covariate balance can further increase the validity of the research design. Appendix Table [A2](#) reports the results of the balance test, where I regress crack exposure on baseline structural characteristics measured in the pre-crack period. It is suggested that crack-affected MSAs and non-crack-affected MSAs are quite comparable in terms of observed covariates in the pre-crack period. The results are consistent with the idea that crack exposure was conditionally exogenous to structural conditions.
- **Estimator and Model:** With the balancing weights, I use the Weighted Least Squares (WLS) of Linear Probability Models (LPM). I use LPM over logit or probit models for the following reasons. First, logit models face the incidental parameter problem when fixed effects are included ([Wooldridge, 2002](#)). By contrast, an LPM is more flexible with regard to a high-dimensional set of fixed effects. Second, my interest lies in the treatment effects rather than predictions. Third, an LPM provides an easier interpretation of the coefficients than do logit or probit models.

¹⁶Because the entropy balancing method is a reweighing method, it uses the full sample and is not restricted to only matched units.

¹⁷Despite the outcome measure being at the individual level, I match on the MSA-level suburbanization measure because the IPUMS data are repeated cross-sectional data.

5 Results

5.1 Baseline Results

Table 2 provides the triple-differences estimates of the effects of crack exposure on suburban residence for Black people. Following the recommendation by [Keele et al. \(2019\)](#), I provide only the coefficients of interest. Columns (1-7) capture the ITT estimates of the effects of crack exposure on the entire population of Blacks relative to Whites within crack-affected MSAs. Column (1) includes only MSA and decade fixed effects, controlling for unobserved baseline differences across MSAs and average trends across decades. Column (2) replaces MSA fixed effects with MSA-by-race fixed effects, controlling for baseline unobserved differences across MSAs by racial group. Column (3) replaces decade fixed effects with decade-by-race fixed effects, controlling for differential trends by racial group over time, and it represents the standard triple-differences specification. Column (4) adds cohort-by-MSA and cohort-by-race fixed effects, controlling for differential trends across cohorts and MSAs and for differential trends across cohorts and racial groups. Column (5) adds MSA-by-decade fixed effects, controlling for any arbitrary shocks across MSAs over time (i.e., MSA-specific time-varying confounders), such as changes in segregation, population compositions, gentrification, and policing practices that occur at the MSA-level in a given decade. Column (6) represents the flexible triple-difference specification. Column (6) adds predetermined individual-level covariates. Column (7) incorporates sampling weights. Following [Morgan and Winship \(2015\)](#), I use the product of sampling weights and balancing weights as weights.

Across all specifications, the coefficient on the interaction term of crack exposure and Black is quite similar and large in magnitude. It is reassuring that the size of the coefficients does not vary much, even with a different set of high-dimensional fixed effects, suggesting that crack exposure does not confound these sets of demanding fixed effects and individual-level characteristics. This partially ensures the validity of the research design.

In terms of magnitude, the coefficients indicate an increase in suburban residence for Black people by 8.5-9.6 percentage points (p.p.), depending on the specification. Given the average Black suburbanization in the 1980 census year is 0.249, the coefficients imply an approximate 34-39% increase in Black suburbanization relative to the baseline mean. Given that Black suburbanization increased from 25% to 45%, or by 80% from the 1980s to the 2010s, the coefficients also imply

Table 2: Triple-Differences Estimates of Crack Exposure on Suburban Residence for Black

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dep.Var.: Suburban Residence							
Crack Exposure $\times$ Black	0.091*** (0.033)	0.095*** (0.023)	0.086*** (0.028)	0.090*** (0.030)	0.094** (0.037)	0.096** (0.037)	0.083** (0.039)	
Crack Exposure	-0.033 (0.031)	-0.035 (0.030)	-0.034 (0.031)	-0.036 (0.031)				
Crack Exposure $\times$ Black $\times$ City 5 yrs Before								0.027** (0.013)
Crack Exposure $\times$ Black $\times$ Suburb 5 yrs Before								0.003 (0.023)
Predetermined Individual-Level Covariates	no	no	no	no	no	yes	yes	yes
MSA Fixed Effects	yes	no	no	no	no	no	no	no
Decade Fixed Effects	yes	yes	no	no	no	no	no	no
MSA-by-Race Fixed Effects	no	yes	yes	yes	yes	yes	yes	yes
Decade-by-Race Fixed Effects	no	no	yes	yes	yes	yes	yes	yes
Cohort-by-MSA Fixed Effects	no	no	no	yes	yes	yes	yes	yes
Cohort-by-Race Fixed Effects	no	no	no	yes	yes	yes	yes	yes
Region-by-Decade Fixed Effects	no	no	no	no	no	no	no	no
MSA-by-Decade Fixed Effects	no	no	no	no	yes	yes	yes	yes
Initial Location-by-Race Fixed Effects	no	no	no	no	no	no	no	yes
Initial Location-by-MSA Fixed Effects	no	no	no	no	no	no	no	yes
Initial Location-by-Decade Fixed Effects	no	no	no	no	no	no	no	yes
Balancing Weight	yes	yes	yes	yes	yes	yes	yes	yes
Sampling Weight	no	no	no	no	no	no	yes	no
Mean of Dep.Var. for Black	0.249	0.249	0.249	0.249	0.249	0.249	0.249	0.07
Mean of Dep.Var. for Black Initially in City								0.878
Mean of Dep.Var. for Black Initially in Suburb								
Observations	1,572,567	1,572,567	1,572,567	1,572,567	1,572,567	1,572,567	1,572,567	641,821
R-squared	0.224	0.242	0.242	0.247	0.264	0.274	0.282	0.627
Sample Period	1980-2010	1980-2010	1980-2010	1980-2010	1980-2010	1980-2010	1980-2010	1980-2000

Notes: Significance at the 1%, 5%, and 10% levels indicated by ***, **, and *, respectively. Standard errors in parentheses are clustered at the MSA level. **Mean of Dep.Var. for Black:** the mean of suburban residence for Blacks in the 1980 census year. **Mean of Dep.Var. for Black Initially in City:** the mean of suburban residence for Blacks who initially resided in a city 5 years before the 1980 census year. **Mean of Dep.Var. for Black Initially in Suburb:** the mean of suburban residence for Blacks who resided in a suburb 5 years before the 1980 census year. **Additional Notes for Column (8):** (i) the result is based on the 1980, 1990, and 2000 IPUMS sample periods, which record whether a respondent resides in a city or suburb 5 years before the census year. (ii) the crack exposure indicator is merged with MSAs of origin, where the respondent initially resided. (iii) A set of MSA-related fixed effects based on the MSA of origin. (iv) Standard errors are clustered at the MSA of origin.

that crack exposure accounts for the overall increase in Black suburbanization by 43-49% during this period. Then, I quantify the estimates by calculating the number of Black people being suburbanized in an average crack-affected MSA. To do so, I take the estimate from Column (7), where the estimate is weighted by the product of sampling weights and balancing weights. The point estimate is 0.083, which corresponds to 0.33, or 33% ($0.33 = 0.083/0.249$). This means that because of crack exposure, 17,630 Black people resided in the suburbs in the average crack-affected MSA ($17,631 = 0.33 \times 53,427$, where 53,427 is the average number of Blacks in the suburbs in crack-affected MSAs as of the 1980 census year). Given the number of crack-affected MSAs is 46, the total number of Black people being suburbanized is 811,026 ($811,026 = 17,631 \times 46$).

The following two points are noteworthy. First, from Columns (2) to (3), where I replace decade fixed effects with decade-by-race fixed effects, the size of the coefficients on the interaction term of

crack exposure and Black slightly decreases. This is likely because Black suburbanization increased at a faster rate than White suburbanization during the study period. Second, from Columns (3-5) to (6-7), where I include MSA-by-decade fixed effects, the size of the coefficients increases slightly. This is likely because MSA-specific time-varying confounders for crack exposure are likely to be negative factors, while the MSA-specific time-varying confounders for Black suburbanization are likely to be positive factors.

The coefficients on crack exposure are negative but small in magnitude and not statistically significant. These coefficients capture time-varying confounders for crack-affected MSAs, as well as crack effects for White people. These two effects are not distinguishable empirically, but they can be interpreted under two different scenarios. First, if we assume zero effects of crack exposure for Whites under the triple-differences design, conditional on relevant fixed effects, the observed negative estimates capture time-varying confounders for crack-affected MSAs; and these confounders are negligible. Second, suppose that we relax the assumption in the triple-differences design and assume crack effects for White people. Then, we would expect positive effects of crack exposure for White people, given that crime generally induces White flight to the suburbs. At the same time, there could be time-varying confounders in crack-affected MSAs, which are negatively correlated with suburbanization. Under this scenario, if the negative confounders dominate the positive effects of crack effects for White people, then the coefficients are negative but not statistically significant. In the latter scenario with positive effects of crack exposure for White people, a different research design is considered: rather than the triple-differences design, differences-in-differences with heterogeneous effects by racial group, where the effects of crack exposure for Black people are computed as the sum of the coefficient on crack exposure and the coefficient on the interaction term of crack exposure and Black. Because crack effects for White people are expected to be positive in this scenario, the triple-differences estimates then would serve as a lower bound.

Lastly, Column (8) accounts for the respondent's initial residential location. I include two interaction terms along with a relevant set of fixed effects: (i) the interaction of the treatment indicator, the race indicator, and a city indicator that equals 1 if the respondent initially resided in a city, and (ii) the interaction of the treatment indicator, the race indicator, and a suburb indicator that equals 1 if the respondent initially resided in a suburb.¹⁸ This specification allows me to

¹⁸I estimate the following specification: $suburb_{i,l,r,c,o,t} = \gamma_{r,o} + \delta_{r,t} + \lambda_{r,c} + \mu_{c,o} + \phi_{o,t} + \zeta_{l,r} + \eta_{l,o} + \nu_{l,t} +$

examine whether Black people who initially resided in a city moved to a suburb in response to crack exposure. Because crack exposure was on average absent in the suburbs, there should be null effects of crack exposure for Black people who initially resided in a suburb, serving as a placebo test. Column (8) reports exactly this pattern. Crack exposure increased suburban residence for Black people who initially resided in a city by 2.7 p.p. The coefficient implies a 39% increase given that the mean of suburban residence for this group in the 1980 census year is 0.070. By contrast, the coefficient on the interaction term of crack exposure, Black, and suburb 5 years before is not statistically significant and is small in magnitude. Overall, the null effects of crack exposure for Black people who initially resided in a suburb, but the positive and large effects for Black people who initially resided in a city lend further credibility to the argument that crack exposure pushed Black people out of the inner-city to the suburbs.

5.2 Channels

Suburbanization of Other Black People: This section attempts to provide insight into the first proposed channel: a Black person’s decision to reside in the suburbs in response to crack exposure depended on the suburbanization of other Black people. Figure 4 illustrates the heterogeneous effects of crack exposure according to the suburbanization of other Black people in two ways. First, the solid line and dashed band indicate the marginal effect of crack exposure with the 95% confidence intervals when using the suburbanization of other Black people as a continuous variable. Second, the three dots with solid lines indicate the binned estimates as in [Hainmueller et al. \(2019\)](#); the marginal effect of crack exposure evaluated at low, medium, and high levels of suburbanization of other Black people, respectively.¹⁹ Note that the baseline differences in the suburbanization of other Black people across MSAs are absorbed by relevant MSA fixed effects. Furthermore, MSA-by-decade fixed effects absorb possible time-varying effects of the suburbanization of other Black

$\omega_1 (\mathbb{1}_{o,t}^{crack} \times \mathbb{1}_r^{blk} \times \mathbb{1}_l^{base\ suburb}) + \omega_2 (\mathbb{1}_{o,t}^{crack} \times \mathbb{1}_r^{blk} \times \mathbb{1}_l^{base\ city}) + v\mathbf{X}_i + \epsilon_{i,r,c,o,t}$, where o is the origin of the MSA, where the respondent resided 5 years before the census year, $\mathbb{1}_l^{base\ city}$ equals 1 if the respondent resided in a city, $\mathbb{1}_l^{base\ suburb}$ equals 1 if the respondent resided in a suburb, $\zeta_{i,r}$ is the initial location-by-race fixed effects, $\eta_{i,o}$ is the initial location-by-MSA fixed effects, and $\nu_{l,t}$ is the initial location-by-decade fixed effects.

¹⁹With Z_m being the moderator of interest, I estimate the following: (i) $y_{i,r,c,m,t} = \gamma_{r,m} + \delta_{r,t} + \lambda_{r,c} + \mu_{c,m} + \phi_{m,t} + \beta_1 (\mathbb{1}_{m,t}^{crack} \times \mathbb{1}_r^{black}) + \beta_2 (\mathbb{1}_{m,t}^{crack} \times \mathbb{1}_r^{black} \times Z_m) + v\mathbf{X}_i + \epsilon_{i,r,c,m,t}$. β_1 captures the effects of crack exposure on Blacks in MSAs with a zero value of Z , and β_2 captures the degree to which the effects of crack vary by Z . (ii) $y_{i,r,c,m,t} = \gamma_{r,m} + \delta_{r,t} + \lambda_{r,c} + \mu_{c,m} + \phi_{m,t} + \omega_1 (\mathbb{1}_{m,t}^{crack} \times \mathbb{1}_r^{black} \times \mathbb{1}_m^{low\ Z}) + \omega_2 (\mathbb{1}_{m,t}^{crack} \times \mathbb{1}_r^{black} \times \mathbb{1}_m^{med\ Z}) + \omega_3 (\mathbb{1}_{m,t}^{crack} \times \mathbb{1}_r^{black} \times \mathbb{1}_m^{high\ Z}) + v\mathbf{X}_i + \epsilon_{i,r,c,m,t}$. ω_1 , ω_2 , and ω_3 capture the effects of crack exposure for MSAs with low, medium, and high values of Z , respectively.

people on the likelihood of suburban residence. Thus, the results are based on the most flexible and demanding specification in the current data configuration.

The results indicate that the effects of crack exposure on the likelihood of Black people residing in the suburbs depend on the suburbanization of other Black people. The effects are small in magnitude and are not statistically significant for MSAs with lower levels of suburbanization of other Black people. The effects become large and statistically significant with an increase in the suburbanization of other Blacks. Taken together, for MSAs with a lower level of suburbanization of other Black people, crack exposure did not induce Black people to reside in the suburbs, but for MSAs above high levels of suburbanization of other Black people, crack exposure motivated Black people to reside in the suburbs in the post-crack period.

Figure 4: Marginal Effects of Crack Exposure: Suburbanization of Other Black People

Note: The solid line and dashed band: the marginal effect of crack exposure with the 95% confidence intervals when the predicted Black suburbanization is used as a continuous variable. **Three dots with solid lines:** binned estimates; the marginal effect of crack exposure evaluated at low, medium, and high levels of predicted Black suburbanization. **Moderator:** Suburbanization of other Black people = predicted Black suburbanization, which is obtained by regressing the mean of Black suburbanization in the post-crack period on Black suburbanization in the pre-crack period, conditional on state fixed effects. For non-crack-affected MSAs, the baseline decade of Black suburbanization is computed. **Specification:** MSA-by-race fixed effects; decade-by-race fixed effects; cohort-by-MSA fixed effects; cohort-by-race fixed effects; MSA-by-decade fixed effects; predetermined individual-level covariates. **Estimator:** WLS with balancing weights.

Social Cohesion among Inner-city Black Migrants to the Suburb: This section provides insight into the second channel: a Black person’s decision to reside in the suburbs in response to crack exposure depended on social cohesion among inner-city Black migrants to the suburbs. Consistent with the analysis above, baseline differences in social connectedness across MSAs and time-varying effects of social cohesion are absorbed by relevant fixed effects. Figure 5 illustrates the heterogeneous effects of crack exposure by social cohesion. The effects of crack exposure on the likelihood of Black people residing in the suburbs are small in magnitude and are not statistically significant for MSAs with lower levels of social cohesion. The effects become large with higher social cohesion. For MSAs with high social cohesion in the pre-crack period, crack exposure motivated Black people to reside in the suburbs in the post-crack period.

Figure 5: Marginal Effects of Crack Exposure: Social Cohesion among Inner-City Black Migrants to the Suburbs

Note: The solid line and dashed band: the marginal effect of crack exposure with the 95% confidence intervals when the HHI is used as a continuous variable. **Three dots with solid lines:** binned estimates; the marginal effect of crack exposure evaluated at low, medium, and high HHI. **Moderator:** Social cohesion among inner-city Blacks to the suburbs = the HHI of migrant flows of inner-city Black people to a shared suburb at the MSA level in the 1980 census year. **Specification:** MSA-by-race fixed effects; decade-by-race fixed effects; cohort-by-MSA fixed effects; cohort-by-race fixed effects; MSA-by-decade fixed effects; predetermined individual-level covariates. **Estimator:** WLS with balancing weights.

Heterogeneous Constraints by Socioeconomic Status: This section examines the heterogeneous effects of crack exposure by socioeconomic status to investigate how Blacks faced barriers in suburban residence depending on their socioeconomic status. I separately examine five socioeconomic status measures: (i) poverty status, (ii) household income, (iii) education, (iv) employment status, and (v) occupation. I note here that an individual’s socioeconomic status is not randomly assigned, and crack exposure may have affected some of these socioeconomic measures, which in turn induce post-treatment bias. Thus, it is important to keep in mind that the results for the heterogeneous effects by socioeconomic status here are only suggestive. With this caveat in mind, Appendix Table A9 provides an indirect test for the violation of post-treatment bias, and the result suggests that post-treatment bias is less of a concern.

Figure 6 plots point estimates with 95% confidence intervals. For each class measure, I run a sub-sample analysis. The coefficients are statistically significant for middle-class and non-poor Black people, but not statistically significant for working-class and poor Black people. The size of the coefficients for middle-class and non-poor Black people is similar to the main results reported in Table 2. The only exception is a statistically significant result for working-class occupation. Taken together, the results suggest that the effects of crack exposure on the likelihood of suburban residence are driven by middle-class and non-poor Black people.

Figure 6: Heterogeneous Effects: Socioeconomic Status

Note: Dots with black lines: point estimates with 95% confidence intervals. **Sample:** each result is based on the relevant sub-sample. **SES measures:** **Poverty status:** (i-a) households above the poverty threshold defined as non-poor, and (i-b) households below the poverty threshold as poor. **HH (household) income:** (ii-a) households earning more than \$30,000 defined as middle-class, and (ii-b) those earning less than or equal to \$30,000 as working-class. **Education:** (iii-a) respondents with a college degree or more, and (iii-b) those with a high school diploma or less. **Employment status:** (iv-a) employed respondents, and (iv-b) unemployed respondents. **Occupation:** (v-a) respondents with managerial, professional, or technical occupations as middle-class, and (v-b) those with sales and administrative, service, or farming, precision, and operators occupations as working-class. **Specification:** MSA-by-race fixed effects; decade-by-race fixed effects; cohort-by-MSA fixed effects; cohort-by-race fixed effects; MSA-by-decade fixed effects; predetermined individual-level covariates. **Estimator:** WLS with balancing weights.

5.3 Long-Term Effects of Crack Exposure on Black Suburbanization

Lastly, this section investigates the long-term effects of crack exposure on Black suburbanization. Unlike previous analyses, where I use individual-level data, I use race-by-MSA-by-decade-level data. Figure 7 provides point estimates with 95% confidence intervals. First, the coefficient on the two-decade lead crack indicator (i.e., 2 decades before crack exposure) is indistinguishable from zero and virtually zero. Thus, prior to crack exposure, the trends in suburbanization are similar in crack-affected MSAs relative to non-crack-affected MSAs. Second, the coefficients on the contemporaneous (i.e., decade of crack exposure), one-decade lag (i.e., one decade after crack

exposure), and two-decade lag (i.e., two decades after crack exposure) indicators are positive, large in magnitude, and statistically significant. Thus, once crack emerged, Black suburbanization cumulatively increased more in crack-affected MSAs relative to non-crack-affected MSAs, and this effect persisted two decades later. To formally test whether the effects of crack exposure are cumulative, I run a joint-significance F -test with the null hypothesis that all the coefficients on the contemporaneous and lag crack indicators are equal. If the null hypothesis is rejected, the treatment effects are not constant over time. The p-value from the joint-significance test is 0.004, indicating that the effects of crack exposure are cumulative over time.

Although I admit that the following point is only suggestive and informal, the result that Black suburbanization cumulatively increased in crack-affected MSAs over the two subsequent decades is consistent with the perspective that crack exposure generated a positive feedback mechanism, making the migration process “self-perpetuating.” That is, crack exposure initially induced Black migrants to move to the suburbs, network ties then accumulated, and then more Black migrants moved to the suburbs. In contrast, suppose that crack exposure only induced initial Black migration to the suburbs, and Black migrants stayed in the suburbs in the decades following the emergence of crack cocaine. If this was the case, we would observe that the effects of crack exposure would be constant over time, rather than the cumulative and amplified effect that we observe.

Note, however, that the recent DD literature indicates that the two-way fixed effects estimator may suffer from bias in the presence of treatment effect heterogeneity ([Goodman-Bacon, 2021](#)). To probe into this possibility, [Appendix B.11](#) uses two newly developed estimators that are robust to treatment effect heterogeneity over time, and [Figure A6](#) shows that the results are robust to both [Sun and Abraham’s \(2021\)](#) estimator and [Callaway and Sant’Anna’s \(2021\)](#) estimator.

Figure 7: Event-Study Analysis: Long-Term Effects

Note: Event-study estimates and the 95% confidence intervals. **Unit of Observation:** Race-by-MSA-by-Decade. **Number of Observations:** 650. **Specification:** MSA-by-race fixed effects; decade-by-race fixed effects; MSA-by-decade fixed effects. **Estimator:** WLS with balancing weights. **P-value of Joint Significance Test of Lag Crack Coefficients:** 0.004.

6 Robustness Checks and Other Empirical Results

I conduct a series of robustness checks for the main analysis, analyses for channels, and event-study analysis. Furthermore, I conduct additional analyses to provide suggestive evidence for residential attainment for Black people by looking at the types of suburbs in which Black people resided in response to crack exposure, as well as the effects of crack exposure on the suburbanization of poverty for Black people over time. These results are summarized in Table 3 and are detailed in relevant Appendix sections.

Table 3: Summary of Robustness Checks and Other Empirical Results

	Results	Appendix
Main Analysis:		
Alternative weighting/matching approaches	✓	B.3
Alternative treatment assignment criteria	✓ +	B.4
Including MSA-level covariates with the standard triple-differences specification	✓	B.5
Including additional individual-level covariates	✓	B.6
OLS estimator	✓	B.7
Including Hispanic people	✓	B.8
Heterogeneous Analysis:		
Test for violation of post-treatment bias for SES measures	✓	B.9
MSA-level moderators with the standard triple-differences specification	✓	B.10
Alternative measure/sample for MSA-level moderators	✓	B.10
Event-Study Analysis:		
Sun and Abraham's (2021) estimator	✓	B.11
Callaway and Sant'Anna's (2021) estimator	✓	B.11
Analysis with IPUMS data	✓	B.12
Results on Residential Attainment:		
Quality of suburbs	Sorting in high quality suburbs	B.13
Suburbanization of poverty for Black people	Downward trend in the decade of crack's emergence ++	B.14

Notes: +: Out of 20 models (10 alternative treatment assignment criteria, including continuous treatment variables, for both the standard and flexible triple-differences specifications), 2 models fail to detect significant effects. ++: the coefficient on the contemporaneous crack indicator (i.e., the decade of crack's emergence) indicates a downward trend, but it is not statistically significant at conventional levels.

7 Discussion and Conclusion

I study Black suburbanization in the wake of the crack epidemic, which affected inner-city Black people in the mid-1980s and early-1990s. I argue that the crack epidemic was a negative shock to amenities in the inner-city and induced race-specific coordination, facilitating Black flight to the suburbs in the long run. Triple-differences estimates indicate that crack exposure increased the likelihood of suburban residence for Black people. Crack exposure accounts for 43-48% of the increase in Black suburbanization during the study period, and it is responsible for nearly 1 million Black people being suburbanized. The effects of crack exposure depended on the suburbanization of other Black people and social cohesion among inner-city Black migrants to the suburbs, and were driven by middle-class and non-poor Black people. Although the epidemic of crack cocaine subsided long ago, the effects of crack exposure on Black suburbanization are cumulative and persistent. Black suburbanization continues to be cumulatively higher in crack-affected MSAs than non-crack-affected MSAs two decades after the emergence of crack cocaine.

This study advances research on the crime and residential choice nexus, residential inequality, and more broadly racial inequality. While most studies find that crime pushes White people out of

crime-ridden areas, including White flight to the suburbs (e.g., [Curci and Masera, 2022](#); [Cullen and Levitt, 1999](#); [Hipp, 2011](#); [Liska and Bellair, 1995](#); [Xie and McDowall, 2010](#)), the empirical evidence on racial variation in the effects of crime is not entirely conclusive ([South and Crowder, 1997](#); [South and Messner, 2000](#)). Consequently, the conditions under which crime effects lead to different results are theoretically underdeveloped. This study provides a conceptual framework and empirical evidence: the crack epidemic triggers two processes of race-specific coordination and explains Black suburbanization in the long run. More generally, to understand the residential attainment of a disadvantaged group in the presence of a negative group-specific shock, this study demonstrates the usefulness of perspectives in which the interdependencies of individual behaviors affect an individual's residential choices ([Bruch and Mare, 2006](#); [Schelling, 1971](#); [Massey and Zenteno, 1999](#)).

Extant studies on the association between crime and residential outcomes overlook the heterogeneous effects of crime exposure on residential outcomes by class within a racial group, although one strand of research does discuss the relevance of such heterogeneous effects ([Wilson, 1978, 1987](#); [Quillian, 1999](#)). The results of this study indicate that the effects of crack exposure on the likelihood of residing in the suburbs are driven by middle-class and non-poor Black people. The findings suggest that crack exposure decreased Black–White differences in suburbanization, but increased differences by socioeconomic status within Black people, highlighting the role of the crack epidemic in shaping both racial inequality as well as class inequality among Black people.

The results of this study address some unexplored implications of [Wilson's \(1987\)](#) thesis. On the one hand, earlier social cohesion among inner-city Black migrants to the suburbs helped inner-city Black people flee the inner-city to the suburbs following the crack epidemic. On the other hand, middle-class and non-poor Black people could escape the crack epidemic and reside in the suburbs, while working-class and poor Black people could not. Taken together, earlier Black flight to the suburbs helped other Black people leave the inner-city in the wake of the crack epidemic; however, working-class and poor Black people were nonetheless trapped in crack-affected inner-cities. The results of this study provide new insights into the residential attainment of middle-class Black people as well as their separation from poor Black people exposed to urban disadvantage ([Lacy, 2007](#); [Pattillo, 2005](#); [Sharkey, 2014](#); [Wilson, 1987](#)).

More broadly, this study contributes to sociological research on racial inequality in two important ways. First, growing sociological research examines temporal and geographical variation in

crime-related events and law enforcement to understand racial inequality (Desmond et al., 2016; Legewie and Fagan, 2018; Legewie, 2016; Mobasseri, 2019). Second, although sociology has long been interested in the persistence of racial inequality (e.g., DiPrete and Eirich, 2006; Sampson and Morenoff, 2006; Tilly, 1968), less attention has been paid to how historical shocks play a role in shaping inequality in the long-run in the sociological literature. Here, I draw on research on historical persistence in economics and political science that highlights two mechanisms: a critical disjuncture and path dependence to explain the persistent effects of historical shocks (Acharya and Sen, forthcoming). This study underscores the importance of expanding the conceptual scope of crime-related events to consider race-specific crime shocks and a temporal perspective to understand long-term consequences on racial inequality. More broadly, it indicates the importance for sociologists to look into history to better understand the current state of racial inequality.

Taken together, this study identifies a set of processes by which Black people reside in suburbs in response to crack exposure. Future research should assess the external validity of the proposed mechanisms of the residential attainment of a disadvantaged group by examining other group- and location-specific negative shocks.

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APPENDIX

A Appendix: Treatment/Measurement Construction

A.1 Construction of Crack Treatment Indicator, List of MSAs, and Arrival Year of Crack Cocaine

To construct a treatment indicator of crack exposure, I estimate the intercept of an OLS regression of the FHLM index at the MSA-by-year level. This provides a predicted mean of the FHLM index (1.132) with the 95% confidence intervals (lower bound: 1.064, and upper bound: 1.200). This intercept coefficient serves as a mean shift, and I use it as a threshold to assign when and where crack emerged. The predicted mean is consistent with the break in the FHLM index trends, as Figure 2 shows. However, exceeding the threshold for one year can be idiosyncratic, and it is possible that an MSA experienced this threshold one year and reverted to values below the threshold in subsequent years. To avoid this possibility, I take the first three-year average of crack intensity once an MSA exceeds the threshold. If the three-year average is above the lower bound of the confidence intervals (1.064), then that MSA is considered crack-affected, and otherwise not-crack-affected. I define the year that an MSA exceeds the threshold as the year of crack cocaine arrival. Table A1 provides the list of MSAs and crack cocaine arrival year.

Importantly, whether and when an MSA experienced crack exposure varies. Figure A1 depicts two MSAs for illustration: one MSA assigned as crack-affected in the mid-1980s and another MSA as non-crack-affected. In Philadelphia, Pennsylvania, the crack index hit the threshold in 1986, and then experienced higher intensity in subsequent years. By contrast, under the current set up, Ann Arbor, Michigan is considered non-crack-affected. The crack index consistently takes low values. The only year that exceeds the threshold is 1998, where the years before and after also take low values. It is therefore reasonable to consider 1988 idiosyncratic.

Figure A2 provides the distribution of crack intensity across MSAs to validate the criterion of treatment assignment. The y-axis shows the number of MSAs and the x-axis shows crack intensity across MSAs. Crack intensity is calculated as the three-year average for crack-affected MSAs and the average from 1980 to 2000 for non-crack-affected MSAs. The red dashed line indicates the predicted mean (i.e., threshold value) of the FHLM index. The figure shows relatively few MSAs around the threshold value. This means that manipulating a threshold by a small amount does not result in a change in treatment and comparison compositions, validating the criterion of treatment assignment.

Table A1: List of MSAs and Crack Cocaine Arrival Year

MSA	Arrival Year	MSA	Arrival Year
Akron, OH	0	Minneapolis-St. Paul, MN	1986
Albuquerque, NM	1988	Mobile, AL	1989
Ann Arbor, MI	0	New Orleans, LA	1987
Atlanta, GA	1987	New York, NY-Northeastern NJ	1986
Austin, TX	1995	Oklahoma City, OK	1987
Baltimore, MD	1988	Omaha, NE/IA	1988
Baton Rouge, LA	0	Orlando, FL	1986
Boston, MA	1985	Peoria, IL	0
Bridgeport, CT	1986	Philadelphia, PA/NJ	1986
Buffalo-Niagara Falls, NY	1987	Phoenix, AZ	1986
Chattanooga, TN/GA	0	Pittsburgh-Beaver Valley, PA	1990
Chicago-Gary-Lake, IL	1988	Portland-Vancouver, OR	1987
Cincinnati, OH/KY/IN	1989	Providence-Fall River-Pawtucket, MA/RI	1986
Dallas-Fort Worth, TX	1988	Raleigh-Durham, NC	1990
Dayton-Springfield, OH	0	Riverside-San Bernardino, CA	1986
Des Moines, IA	1986	Rochester, NY	0
Detroit, MI	1986	Sacramento, CA	1987
Erie, PA	0	St. Louis, MO/IL	1988
Evansville, IN/KY	0	San Antonio, TX	1988
Flint, MI	0	San Diego, CA	1986
Fort Lauderdale-Hollywood-Pompano Beach, FL	1986	San Francisco-Oakland-Vallejo, CA	1986
Fort Wayne, IN	1989	San Jose, CA	1986
Fresno, CA	1988	Shreveport, LA	0
Grand Rapids, MI	1989	Spokane, WA	1988
Greensboro-Winston Salem-High Point, NC	0	Stockton, CA	1987
Honolulu, HI	1990	Syracuse, NY	0
Houston-Brazoria, TX	1991	Tampa-St. Petersburg-Clearwater, FL	1986
Kansas City, MO/KS	1987	Toledo, OH/MI	0
Knoxville, TN	0	Tucson, AZ	1988
Los Angeles-Long Beach, CA	1986	Tulsa, OK	0
Louisville, KY/IN	0	Washington, DC/MD/VA	1990
Memphis, TN/AR/MS	0	Wichita, KS	0
Milwaukee, WI	1987		

Figure A1: Illustration of Treatment Assignment

Note: **Panel A:** Philadelphia, PA = Crack-affected MSA, Arrival Year = 1986. **Panel B:** Ann Arbor, MI = Non-crack-affected MSA

Figure A2: Validation of Treatment Assignment Criterion

Note: Red dashed line: the predicted mean (i.e., threshold value) of the FHLM index. **y-axis:** the number of MSAs. **x-axis:** crack intensity, where it is the three-year average for crack-affected MSAs, and the average from 1980 to 2000 for non-crack-affected MSAs.

A.2 Conceptualization of Crack Exposure as Treatment

As extensively discussed in Section 3.1, the crack epidemic was an inner-city problem that disproportionately affected Black communities and had little impact on White communities. This background provides an implication for how to conceptualize crack exposure as a treatment: (i) treatment effect heterogeneity by racial group or (ii) a race-specific treatment. The former assumes that both Black and White people were similarly exposed to crack, but each group responded differently. By contrast, the latter assumes that only Black people faced crack exposure and responded accordingly. To see the difference, let me first illustrate the former. Consider previous studies on the association between crime and residential outcomes, which generally report greater associations for White than for Black people. These studies focus exclusively on non-race-specific crime; both Black and White people are exposed to crime, but they respond to crime differently. By contrast, the crack epidemic is a race-specific crime shock, which allows me to conceptualize crack exposure as a race-specific treatment. The unique feature of the crack epidemic motivates the choice of estimand and identification strategy (Lundberg et al., 2021).

A.3 Suburbanization Measures with the LTDB

I use the LTDB to normalize tract boundaries from previous census data to 2010 tract boundaries ([Logan et al., 2014](#)). Therefore, the changes in tract boundaries from one census decade to another do not affect the comparisons over time. The LTDB also includes the central city indicator, which differentiates whether the census tract is located in a central city or suburb within an MSA. I then define Black suburbanization as the share of Black people who live in suburbs relative to the overall number of Black people in the MSA. White suburbanization is defined in the same manner.

B Appendix: Robustness Checks and Other Results

B.1 Balance Test

This section provides the result of a balance test. Although D(D)D designs do not require covariate balance for identification, Table A2 shows, along with the summary statistics of covariates, the result of the balance test, where I regress crack exposure on a number of baseline characteristics measured in the 1980 census year. First, because I use the triple-differences design, most covariates here are the differences between Blacks' socioeconomic characteristics and Whites' characteristics. This includes suburbanization, commuting means (proportions of those who use private motor vehicles), concentrated disadvantage, and so forth. The Black–White differences in socioeconomic characteristics are generally similar for crack-affected and non-crack-affected MSAs. Second, I include the suburbanization of other Blacks, social connectedness of inner-city Blacks with suburban Blacks, concentrated disadvantage in suburbs, and economic advantage in suburbs. I do not find these characteristics are systematically correlated with crack exposure. Third, I include the log of violent crime rates (per 100,000 inhabitants) and Black–White residential segregation measured by dissimilarity index. Again, these characteristics are not correlated with crack exposure. Fourth, I include the size of the population. Overall, the result suggest that the emergence of crack cocaine was not driven by particular demographic or socioeconomic conditions. In my regression analyses, I use the MSA-by-decade fixed effects to account for these factors. Appendix B.5 presents additional results that directly control for interactions of these factors with the decade fixed effects in the standard triple-differences specification.

Table A2: Regional Characteristics in the Pre-Crack Period and Covariate Balancing

	Crack Exposure	Mean [St.Dev.]
B-W Differences in Population	-0.079 (0.491)	-0.669 [0.182]
B-W Differences in High School Graduates or Less	-0.705 (1.728)	0.106 [0.052]
B-W Differences in Working-Class (Household Income)	-1.460 (1.559)	0.137 [0.054]
B-W Differences in Working-Class (Occupation)	6.134* (3.235)	0.080 [0.028]
B-W Differences in Unemployment Rates	-0.894 (1.110)	0.175 [0.101]
B-W Differences in Concentrated Disadvantage	0.054 (0.078)	0.033 [1.696]
B-W Differences in Commuting Means (Prop. of Private Motor Vehicle)	-0.927 (0.971)	-0.106 [0.070]
B-W Differences in Suburban Employment Rates	-0.972 (0.627)	-0.181 [0.125]
B-W Dissimilarity Index	-0.782 (0.709)	0.689 [0.111]
Prop. of Foreign Born People	1.402 (1.887)	0.061 [0.048]
log of Population	0.135 (0.110)	13.152 [0.863]
log of Violent Crime Rates	0.049 (0.099)	5.582 [0.680]
Concentrated Disadvantage in Suburbs	0.010 (0.081)	0.000 [1.485]
Economic Advantage in Suburbs	0.021 (0.070)	0.000 [1.730]
Social Connectedness of Inner-City Blacks with Ties to Suburban Blacks	0.048 (0.274)	0.569 [0.245]
Black Suburbanization Rates	0.231 (0.499)	0.248 [0.162]
Constant	-1.105 (1.497)	
R-squared	0.413	
Observations	65	

Notes: Significance at the 1%, 5%, and 10% levels indicated by ***, **, and *, respectively. () indicates robust standard errors, and [] indicates standard deviations. All variables are measured at the MSA level in the 1980 census year. **Social connectedness of inner-city Blacks with suburban blacks:** measured by Herfindahl-Hirschman Index.

B.2 Sample Moments before and after the Entropy Balancing Method

For the main analysis with the IPUMS data, I match on differences between Black and White suburbanization rates at the MSA level in the 1980 census period. Despite the outcome measure being at the individual level, I match on the MSA-level suburbanization measure because the IPUMS data are repeated cross-sectional data. The sample mean of Black–White differences in suburbanization in crack-affected MSAs is -0.387, and the mean in non-crack-affected MSAs, after balancing, is -0.389 (before balancing, it is -0.433). For the event study analysis with race-by-MSA-by-decade level data, I match on differences between MSA-level Black and White suburbanization rates from the 1970 to the 1980 census years. The sample mean of Black–White differences in suburbanization from the 1970 to 1980 census years in crack-affected MSAs is -0.018, and the mean in non-crack-affected MSAs after balancing is -0.019 (before balancing, it is -0.065).

B.3 Alternative Weighting/Matching Approaches

The main analysis uses the entropy balancing method (Hainmueller, 2012) to ensure identical distributions of the MSA-level differences in Black–White suburbanization in the pre-crack period in crack-affected MSAs and non-crack-affected MSAs. This section examines the robustness of the main result to alternative weighting/matching approaches. First, I use coarsened exact matching (CEM), a kind of exact matching that matches each crack-affected MSA with a non-crack-affected MSA by non-nonparametrically coarsening the pre-treatment covariates (Iacus et al., 2012). Consistent with the main result, I match on differences between Black and White suburbanization in the 1980 census year. The resulting number of matched MSAs is 61. Second, I use inverse probability treatment weighting (IPTW). I first calculate a propensity score as a conditional probability of crack exposure via a logistic regression model with the differences between Black and White suburbanization in the 1980 census year as a covariate and then generate the IPTW for crack exposure. Table A3 provides the estimation results. The first two columns represent the standard triple-differences specification, and the second two columns represent the flexible triple-differences specification. The results are qualitatively similar to the main result.

Table A3: Alternative Weighting/Matching Method

	(1)	(2)	(3)	(4)
	Dep.Var.: Suburban Residence			
Crack Exposure $\times$ Black	0.068*** (0.025)	0.080*** (0.027)	0.067*** (0.025)	0.078*** (0.027)
Crack Exposure	-0.040 (0.031)		-0.044 (0.029)	
MSA-by-Decade Fixed Effects	no	yes	no	yes
Matching/Weighting Method	CEM	CEM	IPTW	IPTW
R-squared	0.268	0.282	0.252	0.266
Observations	1,449,267	1,449,267	1,572,567	1,572,567

Notes: Significance at the 1%, 5%, and 10% levels indicated by ***, **, and *, respectively. Standard errors in parentheses are clustered at the MSA level. **Specification:** **Columns (1)-(3):** MSA-by-race fixed effects; decade-by-race fixed effects; cohort-by-MSA fixed effects; cohort-by-race fixed effects; predetermined individual-level covariates. **Columns (2)-(4):** Columns (1)-(3) + MSA-by-decade fixed effects. **Matching/Weighting:** **CEM:** coarsened exact matching. **IPTW:** inverse probability treatment weighting.

B.4 Alternative Treatment Assignment Criteria

As explained in Appendix A.1, in the main analysis, I define crack exposure as follows: (i) if an MSA exceeds the predicted mean (i.e., the threshold value) of the FHLM crack index, I calculate the three-year average crack intensity once the MSA exceeds the threshold. (ii) If the three-year average is above the lower bound of the threshold, then I assign the MSA as crack-affected, and non-crack-affected otherwise. (iii) I define the first year that the MSA exceeds the threshold as year of crack cocaine arrival. This section examines the robustness of the main result to alternative measures of crack exposure in ten different ways.

Table A4 presents the results using the standard specification in PANEL A and the results using flexible triple-differences specification in PANEL B. Column (1) defines the arrival year of crack exposure in a similar way as the main analysis, but I take the five-year average instead of the three-year average. Column (2) defines it if (i) an MSA exceeds the mean of the FHLM crack index, (ii) the MSA consistently experiences similar intensity (the lower bound of the threshold, but no restriction on the upper bound) in the subsequent three years. Column (3) defines it similarly to Column (2), but it is defined if the MSA consistently experiences similar intensity in the subsequent five years instead of the subsequent three years. Column (4) defines it in a similar way as the main analysis, but if an MSA with the first three-year average of crack intensity is lower than the lower bound of the threshold, it receives another chance to be treated. That is, repeat the same procedure as the treatment assignment in the main analysis, and if the MSA meets the criterion in the second time, it is assigned as crack-affected. Column (5) defines it similarly to Column (4), but I take the five-year average instead of the three-year average. Column (6) defines the arrival year of crack exposure to minimize the root mean square error of the FHLM crack index. Column (7) defines it using a Bayesian change point model. Following Western and Kleykamp (2004), I specify prior distributions for the parameters, such that a non-informative prior is set to be 0.01, and non-informative priors for the mean and variance coefficients are set to be 0 and 10. I identify a change point for each MSA, but the caveat of this practice is that all MSAs, even for MSAs with very low crack intensity, are eventually assigned to the treatment group. To avoid this possibility, I construct the treatment dummy in the following way. First, I identify a change point at the national level; then I take crack intensity at that change point. Third, I assign an MSA as crack-affected if the MSA's crack intensity at its change point is above the crack intensity of the national level. Column (8) takes crack intensity based on the main criterion; that is, the first three-year average of crack intensity. Column (9) takes crack intensity based on Column (7). Column (10) also consider crack intensity by calculating the decade average of the FHLM crack index from 1980 to 2000. I exclude the 2010 census year from the analysis.

The results are generally consistent across the different treatment criteria. The coefficients in Columns (1-6) indicate an increase in suburban residence for Blacks by 6.7–9.6 p.p., depending on the treatment criteria. The size of the coefficients here is quite similar to the main result. In Columns (8-10), where I use the continuous treatment variables, in the standard triple-differences specification, the coefficients indicate, for MSAs with average crack intensity, an increase in suburban residence for Blacks by 4.5–9.2 p.p. (the coefficient multiplied by the average crack intensity). With the flexible triple-differences specification, however, the coefficients are not statistically significant in Columns (9-10). However, DD designs with a continuous treatment variable require a stronger assumption (Callaway et al., 2021), so the interpretation requires some caution.

Table A4: Alternative Treatment Assignment Criteria

PANEL A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Dep.Var.: Suburban Residence									
Crack Exposure $\times$ Black	0.092*** (0.030)	0.093*** (0.029)	0.089*** (0.029)	0.071** (0.034)	0.071** (0.032)	0.073** (0.029)	0.095*** (0.029)	0.036*** (0.013)	0.042** (0.017)	0.030** (0.014)
Crack Exposure	-0.038 (0.030)	-0.037 (0.028)	-0.041 (0.027)	-0.024 (0.027)	-0.025 (0.025)	-0.028 (0.023)	-0.015 (0.026)	-0.017 (0.011)	-0.005 (0.018)	-0.013 (0.010)
MSA-by-Decade Fixed Effects	no	no	no	no	no	no	no	no	no	no
R-squared	0.257	0.257	0.257	0.257	0.257	0.257	0.261	0.257	0.261	0.253
Mean of Crack Intensity	no	no	no	no	no	no	no	2.068	2.198	1.511
PANEL B	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Dep.Var.: Suburban Residence									
Crack Exposure $\times$ Black	0.096** (0.037)	0.092** (0.037)	0.090** (0.035)	0.071* (0.042)	0.070* (0.040)	0.069* (0.036)	0.067** (0.032)	0.033** (0.016)	0.027 (0.017)	0.022 (0.014)
MSA-by-Decade Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
R-squared	0.274	0.274	0.274	0.274	0.274	0.274	0.249	0.274	0.248	0.266
Mean of Crack Intensity	no	no	no	no	no	no	no	2.068	2.198	1.511

Notes: Significance at the 1%, 5%, and 10% levels indicated by ***, **, and *, respectively. Standard errors in parentheses are clustered at the MSA level. **Observations:** 1,572,567 in Columns (1-9); 1,232,725 in Column (10) **Specification:** **PANEL A:** MSA-by-race fixed effects; decade-by-race fixed effects; cohort-by-MSA fixed effects; cohort-by-race fixed effects; predetermined individual-level covariates. **PANEL B:** PANEL A + MSA-by-decade fixed effects. **Estimator:** WLS with balancing weights. **Treatment definition in Columns (1-10):** See the description above. **Mean of Crack Intensity:** the mean of crack intensity among crack-affected MSAs in the post-crack period.

B.5 MSA-Level Covariates

The main analysis includes MSA-by-decade fixed effects in the flexible triple-differences specification, which perfectly absorbs any time-varying MSA-level covariates. This section examines the robustness to the inclusion of MSA-level covariates in the standard triple-differences specification (without MSA-by-decade fixed effects). To avoid post-treatment bias, I measure the MSA-level covariates in the 1980 census year (those listed in Table A2), and then interact these covariates with the decade fixed effects. This specification controls for the effects of baseline MSA-level covariates over time without inducing post-treatment bias. Columns (1-2) in Table A5 present the results. Column (1) controls for Black–White differences in socioeconomic characteristics and the log of population. Column (2) controls for the log of the population, log of violent crime rates, and Black–White segregation. Furthermore, I examine the robustness of the results by including the interaction of an MSA-level covariate, decade fixed effects, and the race indicator. For computational efficiency, I focus on covariates most relevant to crack exposure and race: violent crime rates, Black–White segregation, and concentrated disadvantage. Again, these are measured in 1980. This specification controls for the effects of baseline MSA-level covariates on suburban residence over time across racial groups. Column (3) includes the interaction of the log of violent crime rates, decade fixed effects, and the race indicator; Column (4) includes the interaction of the Black–White dissimilarity index, decade fixed effects, and the race indicator; Column (5) includes the interaction of concentrated disadvantage, decade fixed effects, and the race indicator. Across all specifications, the results are qualitatively very similar.

Table A5: MSA-Level Covariates

	(1)	(2)	(3)	(4)	(5)
	Dep.Var.: Suburban Residence				
Crack Exposure $\times$ Black	0.098*** (0.028)	0.090*** (0.030)	0.102*** (0.035)	0.092*** (0.033)	0.110*** (0.030)
Crack Exposure	0.007 (0.032)	0.009 (0.032)	-0.036 (0.031)	-0.036 (0.028)	-0.026 (0.030)
B-W Differences in Covariates $\times$ Decade Fixed Effects	yes	yes	no	no	no
ln of Population $\times$ Decade Fixed Effects	yes	yes	no	no	no
ln of Violent Crime Rates $\times$ Decade Fixed Effects	no	yes	no	no	no
B-W Dissimilarity Index $\times$ Decade Fixed Effects	no	yes	no	no	no
ln of Violent Crime Rates $\times$ Decade Fixed Effects $\times$ Black	no	no	yes	no	no
B-W Dissimilarity Index $\times$ Decade Fixed Effects $\times$ Black	no	no	no	yes	no
Concentrated Disadvantage Index $\times$ Decade Fixed Effects $\times$ Black	no	no	no	no	yes
MSA-by-Decade Fixed Effects	no	no	no	no	no
R-squared	0.249	0.250	0.248	0.247	0.248

Notes: Significance at the 1%, 5%, and 10% levels indicated by ***, **, and *, respectively. Standard errors in parentheses are clustered at the MSA level. **Observations:** 1,572,567. **Specification:** MSA-by-race fixed effects; decade-by-race fixed effects; cohort-by-MSA fixed effects; cohort-by-race fixed effects; predetermined individual-level covariates. **Estimator:** WLS with balancing weights. **MSA-level covariates:** B-W differences in population, concentrated poverty, commuting means, suburban employment, college graduates, middle-class (household income), middle-class (occupation); Black–White dissimilarity index; log of violent crime rates; log of population.

B.6 Additional Individual-Level Covariates

The main analysis only includes predetermined individual-level covariates. Because many individual-level covariates such as poverty and marital status could also be affected by the crack epidemic, one concern is that the inclusion of these additional covariates could induce post-treatment bias. This section examines the robustness to the inclusion of these additional covariates, while acknowledging the tradeoff. In addition to predetermined covariates (i.e., gender, foreign-born, and household generations), the additional covariates are marital status, education level, poverty status, employment, occupation, and household income. I create additional indicators for missing values of these covariates to maintain the sample size. The analysis further examines the robustness to the inclusion of (i) full interaction terms of (both predetermined and additional) individual-level covariates and the race indicator and (ii) full interaction terms of individual-level covariates, the race indicator, and decade fixed effects. The inclusion of the interaction terms of the covariates and the race indicator allows me to control for the heterogeneous effects of the covariates by racial group, while the inclusion of the interaction terms of the covariates, the race indicator, and decade fixed effects further allow me to control for the heterogeneous effects of the covariates by racial group that change over time. Table A6 shows the results. Column (1) includes the interaction terms of predetermined individual-level covariates and the race indicator. Column (2) includes the interaction terms of predetermined individual-level covariates, the race, indicator, and decade fixed effects. Column (3) includes additional individual-level covariates. Column (4) includes the interaction terms of (predetermined and additional) individual-level covariates and the race indicator. Column (5) includes the interaction terms of (predetermined and additional) individual-level covariates, the race indicator, and decade fixed effects. The results are robust to the inclusion of additional individual covariates as well as the full interaction terms.

Table A6: Additional Individual-Level Covariates

	(1)	(2)	(3)	(4)	(5)
	Dep.Var.: Suburban Residence				
Crack Exposure $\times$ Black	0.093** (0.037)	0.092** (0.037)	0.096** (0.038)	0.093** (0.038)	0.091** (0.037)
Predetermined Individual-Level Covariates $\times$ Black	yes	no	no	yes	no
Predetermined Individual-Level Covariates $\times$ Black $\times$ Decade Fixed Effects	no	yes	no	no	yes
Additional Individual-Level Covariates	no	no	yes	no	no
Additional Individual-Level Covariates $\times$ Black	no	no	no	yes	no
Additional Individual-Level Covariates $\times$ Black $\times$ Decade Fixed Effects	no	no	no	no	yes
R-squared	0.276	0.276	0.285	0.287	0.288

Notes: Standard errors in parentheses are clustered at the MSA-level. Significance at the 1%, 5%, and 10% levels is indicated by ***, **, and *, respectively. **Observations:** 1,572,567. **Individual-level covariates:** **Predetermined covariates:** gender, foreign-born, 10-year birth cohort, and household generations. **Additional covariates:** marital status, education level, poverty status, employment, occupation, household income. **Missing values of covariates:** additional indicators for missing values are included as regressors.

B.7 OLS Estimator

The main analysis uses WLS with the balancing weights. This section examines the robustness of the main results using the OLS estimator. Table A7 provides the results. The first column presents the estimate from the standard triple-differences specification, while the second column presents the estimate from the flexible triple-differences specification.

Table A7: OLS Estimator

	(1)	(2)
	Dep.Var.: Suburban Residence	
Crack Exposure $\times$ Black	0.063** (0.025)	0.075*** (0.026)
Crack Exposure	-0.041 (0.029)	
MSA-by-Decade Fixed Effects	no	yes
R-squared	0.253	0.276
Estimator	OLS	OLS

Notes: Standard errors in parentheses are clustered at the MSA level. Significance at the 1%, 5%, and 10% levels is indicated by ***, **, and *, respectively. **Observations:** 1,572,567. **Specification: Column (1):** MSA-by-race fixed effects; decade-by-race fixed effects; cohort-by-MSA fixed effects; cohort-by-race fixed effects; predetermined individual-level covariates. **Column (2):** Column (1) + MSA-by-decade fixed effects.

B.8 Inclusion of Hispanic People

The main analysis exclusively focuses on Blacks using Whites as a comparison group in the triple-differences design. This section examines the robustness to the inclusion of Hispanics. Table A8 presents the results. The balancing weights are based on Black–White differences in suburbanization as well as Hispanic–White differences in suburbanization. Column (1) presents the results without MSA-by-decade fixed effects and Column (2) presents the results with them. The coefficient on the interaction term of crack exposure and Hispanics is negative and indistinguishable from zero in Column (1). Once MSA-by-decade fixed effects are included in Column (2); however, the coefficient is positive and statistically significant. Thus, the results for Hispanic people are less robust. The results for Blacks remain qualitatively similar to the main result with the inclusion of Hispanic people in both specifications.

Table A8: Inclusion of Hispanic People in the Sample

	(1)	(2)
	Dep.Var.: Suburban Residence	
Crack Exposure $\times$ Black	0.089*** (0.030)	0.093** (0.037)
Crack Exposure $\times$ Hispanic	-0.023 (0.033)	0.072** (0.034)
Crack Exposure	-0.037 (0.031)	
MSA-by-Decade Fixed Effects	no	yes
R-squared	0.259	0.275
Observations	1,810,714	1,810,714

Notes: Standard errors in parentheses are clustered at the MSA level. Significance at the 1%, 5%, and 10% levels is indicated by ***, **, and *, respectively. **Observations:** 1,572,567. **Specification:** **Column (1):** MSA-by-race fixed effects; decade-by-race fixed effects; cohort-by-MSA fixed effects; cohort-by-race fixed effects; predetermined individual-level covariates. **Column (2):** Column (1) + MSA-by-decade fixed effects. **Estimator:** WLS with balancing weights based on Black–White differences in suburbanization and Hispanic–White differences in suburbanization.

B.9 Indirect Test for Violation of Post-Treatment Bias: Socioeconomic Status

Using five socioeconomic status measures: (i) poverty status, (ii) household income, (iii) education, (iv) employment status, and (v) occupation, I investigate how Blacks faced barriers in suburban residence depending on their socioeconomic status. One caveat is that crack exposure may have affected some of these socioeconomic measures. For instance, exposure to violence, including crack cocaine, reduces educational attainment (Evans et al., 2016; Harding, 2009). In such a case, conditioning on these socioeconomic measures in regression models may induce post-treatment bias. This section indirectly examines this possibility by regressing each socioeconomic indicator on the treatment variable in the standard and flexible triple-differences specifications. Table A9 shows the results; PANEL A presents the results from the standard triple-differences specification, and PANEL B presents the results from the flexible triple-differences specification. Except for Columns (2) and (5) in PANEL B, the coefficients are not statistically significant, suggesting that post-treatment bias is less of a concern, at least in the current research design. The reader may be concerned why I find different results from Evans et al. (2016), who find that crack exposure widens the gap in educational attainment between Black and White males. One potential reason lies in differences in the research design. Evans et al. (2016) exploit differences in MSAs, cohorts, and racial groups in crack exposure, while my design exploits differences in MSAs, decades, and racial groups.

Table A9: Testing Violation of Post-Treatment Bias: Socioeconomic Status

PANEL A	(1)	(2)	(3)	(4)	(5)
Dep.Var.	Non-Poor	HH Income More than \$30,000	College Graduate or More	Middle-Class Occupation	Employed
Crack Exposure $\times$ Black	-0.006 (0.018)	0.016 (0.021)	-0.008 (0.008)	0.001 (0.006)	-0.016 (0.010)
Crack Exposure	0.007 (0.004)	0.003 (0.016)	0.021 (0.008)	-0.007 (0.010)	0.010 (0.005)
MSA-by-Decade Fixed Effects	no	no	no	no	no
R-squared	0.055	0.243	0.101	0.073	0.030
PANEL B	(1)	(2)	(3)	(4)	(5)
Dep.Var.	Non-Poor	HH Income More than \$30,000	College Graduate or More	Middle-Class Occupation	Employed
Crack Exposure $\times$ Black	0.000 (0.017)	0.033* (0.018)	-0.001 (0.010)	0.011 (0.008)	-0.017* (0.009)
MSA-by-Decade Fixed Effects	yes	yes	yes	yes	yes
R-squared	0.056	0.246	0.102	0.075	0.032

Notes: Significance at the 1%, 5%, and 10% levels is indicated by ***, **, and *, respectively. Standard errors in parentheses are clustered at the MSA level. **Observations:** 1,572,567 in Columns (1-4); 1,195,206 in Column (5) **Specification:** **PANEL A:** MSA-by-race fixed effects; decade-by-race fixed effects; cohort-by-MSA fixed effects; cohort-by-race fixed effects; predetermined individual-level covariates. **PANEL B:** PANEL A + MSA-by-decade fixed effects. **Estimator:** OLS.

B.10 Distributions of MSA-Level Moderators/Alternative Specification/Robustness to Alternative Measure and Sample

Figure A3 provides the distributions and summary statistics of MSA-level moderators: the suburbanization of other Black people and social cohesion among inner-city Blacks to the suburbs. First, note that we observe an MSA with a value higher than 1. This is because the variable on the suburbanization of other Black people is a predicted variable, which is obtained by regressing Black suburbanization in the post-crack period on Black suburbanization in the pre-crack period, conditional on state fixed effects. I examine the robustness of the finding with this variable using an alternative measure in Figure A4. Instead of using the predicted measure, I use the measure of Black suburbanization in the 1980 census year. The left panel in Figure A4 shows the robustness to this alternative measurement. Second, note that there are 8 MSAs with the value of 1 for the variable on social cohesion among inner-city Black migrants to the suburbs. I examine the robustness of the finding with this variable excluding these MSAs in Figure A4. The right panel in Figure A4 shows the robustness to this alternative sample.

Figure A3: Distributions of MSA-Level Moderators

Panel A: Suburbanization of other Black people = predicted Black suburbanization, which is obtained by regressing the mean of Black suburbanization in the post-crack period on Black suburbanization in the pre-crack period, conditional on state fixed effects. For non-crack-affected MSAs, the baseline decade of Black suburbanization is computed.

Panel B: Social cohesion of inner-city Black migrants to the suburbs = the HHI of migrant flows of inner-city Black people to a shared suburb at the MSA level in the 1980 census year.

Figure A4: Marginal Effects of Crack Exposure: Robustness to Alternative Measure and Sample

Dots with black lines: point estimates with 95% confidence intervals. **Moderator in the left panel:** Suburbanization of other Black people = MSA-level Black suburbanization in the 1980 census year. **Moderator in the right panel:** Excluding MSAs with the value of 1 for the HHI measure. **Specification:** MSA-by-race fixed effects; decade-by-race fixed effects; cohort-by-MSA fixed effects; cohort-by-race fixed effects; MSA-by-decade fixed effects; predetermined individual-level covariates. **Estimator:** WLS with balancing weights.

Lastly, Figure A5 provides the results of heterogeneous analyses based on the standard triple-differences specification. Instead of MSA-by-decade fixed effects, I include the interaction terms of the moderator of interest and decade fixed effects. Generally, the results are consistent with the main results using the flexible triple-differences specification.

Figure A5: Marginal Effects of Crack Exposure with the Standard Triple-Differences Specification

Dots with black lines: point estimates with 95% confidence intervals. **Moderator in the left panel:** Suburbanization of other Black people = predicted Black suburbanization, which is obtained by regressing the mean of Black suburbanization in the post-crack period on Black suburbanization in the pre-crack period, conditional on state fixed effects. For non-crack-affected MSAs, the baseline decade of Black suburbanization is computed. **Moderator in the right panel:** Social cohesion of inner-city Black migrants to the suburbs = the HHI of migrant flows of inner-city Black people to a shared suburb at the MSA level in the 1980 census year. **Specification:** MSA-by-race fixed effects; decade-by-race fixed effects; cohort-by-MSA fixed effects; cohort-by-race fixed effects; predetermined individual-level covariates; moderator-by-decade fixed effects. **Estimator:** WLS with balancing weights.

B.11 Event-study Analysis with Race-by-MSA-by-Decade Data using Newly Developed Estimators

A recent development in the difference-in-difference (DD) literature reveals that treatment effects may be biased when treatment timing is staggered across units, and treatment effects are heterogeneous across units and over time (Goodman-Bacon, 2021). This section examines the robustness of the event-study result with race-by-MSA-by-decade data. I use two estimators recently developed by Sun and Abraham (2021) and Callaway and Sant'Anna (2021), respectively. Both estimators are robust to treatment effect heterogeneity. Figure A6 shows the results. Panel A presents the result from Sun and Abraham's (2021) estimator, and Panel B presents the result from Callaway and Sant'Anna's (2021) estimator. Both results are almost identical to the main result in Figure 7.

Figure A6: Event-Study Analysis with Estimators Robust to Treatment Effect Heterogeneity

Note: Event-study estimates and the 95% confidence intervals. **Unit of Observations:** Race-by-MSA-by-Decade **Numbers of Observations:** 650. **Specification:** MSA-by-race fixed effects; decade-by-race fixed effects; MSA-by-decade fixed effects.

B.12 Event-Study Analysis with IPUMS Data

Most MSAs experienced crack exposure in the 1980s. Because examining pre-trends in the outcome in an event-study framework requires at least two pre-treatment periods, the current sample periods from the IPUMS data do not allow me to fully examine the pre-trends for all crack-affected MSAs. Instead, this section examines the parallel trends assumption by focusing on MSAs with crack exposure in the 1990s in an event-study design with the IPUMS data.

Figure A7 provides point estimates with 95% confidence intervals based on this preliminary event-study analysis. First, the coefficient on the two-decade lead treatment indicator is very small in magnitude and indistinguishable from zero. That is, the trends in suburban residence between Blacks and Whites are similar in crack-affected and non-crack-affected MSAs in the pre-crack period. Second, the coefficients on the contemporaneous and one-decade lag treatment indicators are positive, large in magnitude, and statistically significant. Therefore, once crack emerged, Black suburban residence increased in crack-affected MSAs relative to non-crack-affected MSAs. These effects persisted one decade post crack exposure.

Figure A7: Event-Study Analysis: IPUMS Data

Note: Event-study estimates and the 95% confidence intervals. **Samples:** individuals who resided in MSAs that experienced crack exposure in the 1990s. **Observations:** 437,801. **Specification:** MSA-by-race fixed effects; decade-by-race fixed effects; cohort-by-MSA fixed effects; cohort-by-race fixed effects; MSA-by-decade fixed effects; predetermined individual-level covariates. **Estimator:** WLS with balancing weights.

B.13 Quality of Suburbs

Existing research indicates that the suburbs in which Blacks reside tend to be less affluent and poorer, although the living conditions are still better than in the inner-city (Alba et al., 1994; Charles, 2003; Pattillo-McCoy, 1999). If Blacks sorted themselves into poor suburbs as a result of crack exposure, then this would not be a sign of residential attainment. This section examines the heterogeneous effects of crack exposure by the quality of the suburbs within the MSA. First, following (Rastogi and Douds, 2020), I construct an index of economic advantage in suburbs at the MSA level from the proportion of college graduates and above, proportion of non-poor households, proportion of middle-class occupations, and median household income. This index is extracted from the first component of a principal component analysis. Second, I construct an index of concentrated disadvantage in suburbs at the MSA level from the proportions of female-headed households, unemployment rates, poverty rates, and proportions of individuals aged 18 years old. Again, this index is the first component of a principal component analysis. I use the 1980 census year to calculate these measures.

Figure ?? provides the results. The left panel shows the heterogeneous results by economic advantage in suburbs; and the right panel shows the heterogeneous effects by concentrated disadvantage in suburbs. The results indicate that the effects of crack exposure on the likelihood of suburban residence for Black people are greater for MSAs with initially higher economic advantage in suburbs. Similarly, they are also greater for MSAs with initially lower concentrated disadvantage in suburbs.

Figure A8: Marginal Effects of Crack Exposure: Quality of Suburbs

Dots with black lines: point estimates with 95% confidence intervals. **Moderator in left Panel:** concentrated disadvantage in suburbs at the MSA level in the 1980 census year. **Moderator in right Panel:** economic advantage in suburbs at the MSA level in the 1980 census year. **Specification:** MSA-by-race fixed effects; decade-by-race fixed effects; cohort-by-MSA fixed effects; cohort-by-race fixed effects; MSA-by-decade fixed effects; predetermined individual-level covariates. **Estimator:** WLS with balancing weights.

B.14 Suburbanization of Poverty

Suburbs in which Black people reside tend to be exposed to disadvantages compared to suburbs in which White counterparts reside (Alba et al., 1994; Pattillo-McCoy, 1999). If Black people who escaped crack-ridden inner-city neighborhoods continued to be exposed to poverty in the suburbs, this would not be a sign of residential attainment. This section examines the long-term consequences of crack exposure on the suburbanization of poverty for Black people. To do so, I replace the outcome in equation 3 with the suburbanization of poverty, which is defined as the proportion of those below the poverty threshold in suburbs relative to the overall number of people in suburbs within the MSA. I calculate the suburbanization of poverty rate for both Black and White people, and run an event-study regression with a triple-differences variation.

Figure A9 shows the results. The coefficients on the lead and lag crack indicators are virtually zero, but those on the contemporaneous crack indicator (i.e., the decade of crack's emergence) indicate a downward trend, although it is not statistically significant at conventional levels. In other words, crack-affected MSAs experienced downward trends in the suburbanization of poverty for Black people only in the decade of crack's emergence. This result is reasonable, given that those who escaped the crack epidemic were middle-class and non-poor Blacks.

Figure A9: Event-Study Analysis: Suburbanization of Poverty for Black People

Note: Event-study estimates and the 95% confidence intervals. **Unit of Observation:** Race-by-MSA-by-Decade. **Number of Observations:** 650. **Specification:** MSA-by-race fixed effects; decade-by-race fixed effects; MSA-by-decade fixed effects. **Estimator:** WLS with balancing weights.