

Perspective

# Paradoxical Effects of Income and Income Inequality on Racial Health Disparities

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**Abstract:** The intersection of race and place in shaping health disparities presents complex dynamics, as evidenced by studies in cities like Detroit, Baltimore, and Philadelphia, where predominantly Black and economically disadvantaged populations experience high overall rates of health problems. Surprisingly, these cities do not exhibit the most pronounced racial disparities. In contrast, areas with a higher percentage of White residents, indicative of greater income inequality, show stark differences in health outcomes between Black and White populations. This disparity underscores how conditions diverge more sharply between Black and White individuals in wealthier urban areas. This phenomenon suggests a complex and sometimes counterintuitive relationship among race, place, income, and income inequality in shaping racial health disparities. These dynamics have significant policy implications. Addressing health disparities requires nuanced strategies that recognize the multiplicative effects of race and income inequality on health outcomes. Policies focusing on areas with a high disease burden, such as Detroit, Philadelphia, and Baltimore can effectively mitigate disparities both locally and more broadly. Conversely, interventions targeting regions with lower disease prevalence, but higher racial disparities must be approached carefully to avoid exacerbating inequalities. In conclusion, understanding and addressing the complex drivers of health disparities demand comprehensive approaches that acknowledge the intertwined influences of race, income, and place. By prioritizing interventions that address economic disparities alongside health initiatives, policymakers can foster more equitable health outcomes across diverse communities.

**Keywords:** Race, Health Disparities, Income Inequality, Racial Disparities, Social Determinants of Health

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## Introduction

This paper aims to explore the complex relationship between race, place, income, and income inequality in shaping health disparities, with an example from a published study by Noppert and colleagues focused on tuberculosis (TB) incidence in Detroit, Michigan. The paper revealed paradoxical results: while Detroit, a predominantly Black and economically disadvantaged area, has high overall rates of TB, the Black-White disparities

in TB were lower than in wealthier areas with fewer Black residents. This paper is structured into several key sections: First, we provide an introduction that contextualizes the paper within broader discussions on health disparities, race, and socioeconomic factors. Next, we delve into Detroit demographics, examining the sociodemographic characteristics of the city that contribute to the observed health outcomes. We then discuss the observed paradox of place and race in Detroit, highlighting the surprising findings of lower racial disparities in TB within Detroit compared to other regions. In their approach, we summarize the methodology used by Noppert and colleagues, including data sources, demographic categorizations, and statistical analyses. Following this, their findings section presents the results of the study, emphasizing the higher TB incidence in Detroit but smaller racial disparities compared to the rest of Michigan. The authors' explanations section outlines the two main hypotheses proposed by the authors to explain their findings: the impact of prolonged social disadvantage on immune function and increased exposure to TB due to poor living conditions. We then introduce another study with supporting results, discussing additional research that supports the paradoxical nature of racial health disparities in disadvantaged areas. Income inequality and racial disparities section explores how income and income inequality differentially affect health outcomes and contribute to racial health disparities. In rethinking the drivers of health disparities, we argue for a re-evaluation of traditional approaches to understanding and addressing health disparities, highlighting the need for nuanced strategies that consider the multiplicative effects of race, place, and income inequality. The policy implications section discusses potential interventions, focusing on areas with high crude rates of TB like Detroit and the benefits of concentrated efforts in such regions. Finally, the conclusion synthesizes the findings and discussions, emphasizing the importance of addressing both economic disparities and health outcomes to foster more equitable health across diverse communities.

### **Noppert and Colleagues Study**

A 2019 study published in the BMC Public Health titled "Understanding the intersection of race and place: the case of tuberculosis in Michigan" [1] provided counterintuitive yet illuminating results on racial health disparities in Detroit, Michigan. Given Detroit's sociodemographic conditions, one might have expected to find the most significant racial disparities in Detroit. After all, Detroit is a predominantly Black and economically disadvantaged area. Surprisingly, the study revealed the opposite. Although the highest crude (and overall) infection rate was found in Detroit, the Black-White disparities in tuberculosis (TB) were lowest in Detroit. In contrast, racial disparities in TB were highest in regions with fewer Black populations, which are areas with greater income inequality given the enormous income gap between Black and White people in predominantly White areas [1]. This finding challenges the conventional narrative of cumulative disadvantage due to race and place on racial disparities [2]. Their results underscore the complex interplay between race, place, and socioeconomic factors in health outcomes. The authors proposed two hypotheses to explain their observation. In this opinion piece, we explain the context, methods, and hypotheses. Then, we propose another potential mechanism for this paradoxical observation. Next, we discuss the policy implications of these findings. In the end, we provide our conclusion on the challenges of decomposing the effects of income inequality from income as interrelated causes of racial health disparities.

### **Detroit Demographics**

According to the US Census [3], Detroit is predominantly Black (81%) and is characterized by higher rates of social disadvantage across several metrics: a higher proportion of individuals with less than high school education, higher unemployment

rates, lower per capita income, and a higher proportion of the population living in poverty, particularly among those under 18 years old and across racial/ethnic groups. However, Detroit has another distinctive feature: low-income inequality. This means that most of the residence are either poor or staying on the same range of income, regardless of racial group, even White people in Detroit are also not wealthy [3], which helps explain the paradoxical observation in the study.

### **The Observed Paradox of Place and Race in Detroit**

Detroit, one of the poorest areas in Michigan, is characterized by a high prevalence of TB among its residents. Given that approximately 80% of Detroit's population is Black, one might assume that racial disparities in TB would be most pronounced in this urban center [1]. However, Detroit has another distinctive feature: low-income inequality. This means that most of the residents are either poor or in the same income range; even White people in Detroit are not wealthy [3], which helps explain the paradoxical observation in the study.

### **Their Approach**

In the study by Noppert and colleagues [1], the outcome was TB incidence. The demographic and clinical characteristics of TB cases were obtained from de-identified data using the Michigan Department of Health and Human Services (MDHHS) "Report of a Verified Case of TB" form, developed by the CDC. Race/ethnicity was categorized as Non-Hispanic Black, Non-Hispanic White, Asian, and Hispanic, while gender and nativity were dichotomized as male or female, and U.S.-born or foreign-born, respectively. Data were analyzed from three jurisdictions: the state of Michigan (excluding Wayne County and Detroit City), Wayne County (excluding Detroit City), and Detroit City. Population demographics were sourced from the American Community Survey 2012. Michigan had a population of about 8 million, primarily Non-Hispanic White (82%), followed by Non-Hispanic Black (8%), Hispanic (2%), and Asian (5%). Wayne County had 1.1 million people, 76% Non-Hispanic White, 13% Non-Hispanic Black, 4% Hispanic, and 4% Asian. Detroit City had about 700,000 residents, 8.2% Non-Hispanic White, 81% Non-Hispanic Black, 7.5% Hispanic, and 1.1% Asian. Treatment jurisdiction was determined by the address at the time of diagnosis, using treatment location for those with unstable housing situations. Cases were categorized based on treatment locations: Detroit City Health Department (29% of cases), Wayne County Health Department (13% of cases), and all other locations classified as Michigan cases (58% of cases). Statistical analyses employed multivariable negative binomial regression models to examine TB incidence by location, race, nativity, and gender. These models were chosen due to their appropriateness for over-dispersed count data and allowed for the estimation of incidence rate ratios (IRRs) with 95% confidence intervals (CIs). The log of the total population, derived from the Integrated Public Use Microdata Series (IPUMS) and American Community Surveys, was used as an offset term in the regression model. Interaction terms were included to test for differences in TB incidence across locations, with models stratified by location to highlight socio-demographic risk differences for TB in Detroit and Wayne County compared to the rest of Michigan [1].

### **Their Findings**

In the study by Noppert and colleagues [1], residents of Detroit experienced a 58% greater TB incidence than those of Wayne County or the state of Michigan. Blacks in Detroit had a 2.01 times greater TB incidence than Whites, while this inequality was 8.72 times greater in the state of Michigan. Thus, the Black-White TB gap was less pronounced in Detroit than in the state of Michigan [1].

### **Authors' Explanations**

The authors proposed two main hypotheses to explain the observed racial and geographic disparities in TB incidence in Detroit compared to the rest of Michigan [1]. The first hypothesis posited that the higher rates of social disadvantage in Detroit lead to compromised immunity through prolonged exposure to psychosocial stress and increased prevalence of co-morbid conditions. Prolonged social disadvantage results in chronic stress, which in turn causes physiological wear and tear, especially on the immune system, leading to increased inflammation and decreased immune function. Detroit's population has a higher prevalence of diabetes, obesity, and hypertension, all of which negatively impact immune function and may make individuals more vulnerable to TB. The second hypothesis suggested that social disadvantage in Detroit indirectly increases TB risk through heightened exposure to the pathogen causing TB, *Mycobacterium tuberculosis* (MTB). This pathway involves poor housing conditions, limited access to healthcare, lack of material resources, and poor neighborhood environments, all consequences of high social disadvantage. This hypothesis aligns with the fundamental cause theory, which explains that social conditions create environments conducive to disease spread and progression [12].

### **Another Study with Supporting Results**

In a study comparing Black and White mortality rates across 16 different disadvantaged areas in the U.S., Geronimus et al. found the mortality inequality between advantaged and disadvantaged groups differed by geographic region. For example, while in most cases disadvantaged Blacks had more excess mortality than disadvantaged Whites, in Detroit White residents had mortality rates comparable to some Black populations studied [6].

### **Income Inequality and Racial Disparities**

Income inequality and income may have opposite effects on health outcomes, particularly on Black-White health disparities [9-11]. Income inequality measures how income is distributed across a population, with greater inequality indicating a more uneven distribution. In the U.S., income inequality is on the rise and surpasses that of other developed nations. Going further, economic inequality encompasses variations in the distribution of assets, wealth, and income among individuals or groups within a society. The Gini index, ranging from 0 (perfect equality) to 1 (perfect inequality), is commonly used to measure economic inequality. Research links higher income inequality to poorer health outcomes due to its impact on the social environment and individual behaviors. High economic inequality has been linked to a range of adverse health outcomes, including increased rates of chronic diseases, mental health disorders, and mortality. It fosters environments that heighten stress, reduce social cohesion, and increase barriers to healthcare access, contributing to health disparities among disadvantaged populations. Income inequality is a fundamental cause of disease because it shapes access to vital resources that enable individuals to avoid risks and adopt protective strategies. These resources include knowledge, money, power, prestige, and beneficial social connections, which are flexible, meaning their utility in preventing health problems can change as the socioeconomic context changes. These resources are also fundamental in the sense that they do not relate directly to health but shape access to material and social conditions that influence health [7, 8].

### **Rethinking the Drivers of Health Disparities**

The study's findings prompt a critical reevaluation of the complex interwoven web of causation such as race, income, income inequalities, and place in driving racial health disparities. As Noppert et al [1] show, these effects are not additive but multiplicative.

However, whether we should expect multiplicative or sub-additive effects of race and place on health disparities depends on income and income inequalities in the place. Traditional approaches often focus on areas with high concentrations of health problems, such as Detroit, assuming that disparities are most acute where the problem is most prevalent. However, this study illustrates that disparities can be more pronounced in areas where socioeconomic and racial inequalities are greatest, not necessarily where the disease burden is highest. This distinction is crucial for public health strategies aimed at reducing racial health disparities.

### **Policy Implications: Addressing the Place with the Highest Crude Rate**

The policy response to the issue of race and TB can be debated in multiple ways. To reach the maximum number of people with TB, it is essential to address areas with the highest crude rates, which in this case is Detroit. By investing in TB screening and treatment in Detroit, we tackle the problem where it is most concentrated. This approach is politically acceptable because it focuses on the sheer number of affected individuals, a significant proportion of whom are Black. Consequently, this strategy not only saves many Black lives but also contributes to reducing national and state-level disparities.

### **Benefits of Concentrated Intervention**

Focusing on Detroit offers several advantages. First, the high population density in Detroit lowers the cost of detection and treatment, as it reduces transportation costs and increases the efficiency of reaching affected individuals. Second, by addressing TB in Detroit, we can make a substantial impact on the overall health and life expectancy at both the national and state levels. This win-win situation allows for effective use of resources while achieving broader public health goals.

### **Alternative Perspectives on Policy Response**

Another perspective also exists. Those who aim to address inequality first might prefer interventions outside Detroit, targeting areas where the disease is less widespread, and the crude rate is lower. In these regions, screening would predominantly focus on Black and ethnic minority populations. However, such a policy may face significant challenges in terms of acceptability and could result in backlash due to its selective nature.

### **Conclusion**

There is some evidence suggesting that racial disparities may be lower, despite high overall health problems, in areas with predominantly low-income Black populations. This may be because White populations in these areas are also of low income, thus their situation is not very different from their Black counterparts. However, outside these areas and in predominantly White areas, income inequalities are higher, and Black and White people have very different conditions. It is in such conditions that Black-White health disparities may be greatest. If this hypothesis is correct, then income inequalities would be associated with better overall health but wider racial health disparities.

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