Variation in a Mid-Atlantic State's Opioid Response Services by Race, Age, Gender, and Place-Based Economic Indicators

Tibebe A. Assefa
Bowie State University
LaTanya Brown-Robertson
Howard University
Nega Lakew
Bowie State University
Ellen Meara
Harvard University
George Onoh
Bowie State University
Azene Zenebe
Bowie State University

Focal and Program Areas: Trends in Disability, Disparities by Race and Ethnicities

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Abstract: As opioid overdose mortality and morbidity continue to rise in recent years, many states have pursued State Opioid Response (SOR) programs to facilitate access to opioid use disorder treatment. This study characterizes access to care and variation in federally funded SOR programs operating in a state in the Mid-Atlantic region since 2014. This state has experienced high and rising opioid-involved overdose deaths, especially among its Black residents. Using data from 53 jurisdiction-level service providers combined with information on demographic, economic, and social characteristics within a 10-mile radius of the SOR service providers, our research explores the equity of opioid treatment, referral services, and discharge in this Mid-Atlantic State's SOR programs. From October 2020 through May 2022, our study area's jurisdiction-level SOR providers served 8,659 adult clients. Among the rate of service received (per 100,000 population) adult men received more service, at 260, compared with adult women, at 110. The rate of service receipt of Black adults (240) was higher than White adults (186). Black SOR service users were prevalent at ages when Social Security Disability Insurance benefits are most common; 49 percent of Black adults served were aged 45 to 64, in contrast with 21 percent of White adults served. Furthermore, the results from the analysis of the services to clients at the SOR communities' level (within 10 miles of a SOR service provider) show no significant difference in the association between the number of referrals, clients, or MOUD (medication for opioid use disorder) starts, and the poverty level and education level. In addition, the clients from communities with more Black residents were more likely to take up services. The findings also reveal many clients referred, enrolled, or starting MOUD in the SOR program are from the lowest Economic Vulnerability Index (EVI) communities with fewer clients coming from the high EVI communities. In conclusion, access to treatment and recovery services among our study area are relatively equitable across the White and Black race groups; SOR service providers were an important point of access for MOUD with OUD (opioid use disorder) treatment needs living in majority Black communities. There are still great opportunities for outreach in those more economically vulnerable communities. Since rates of opioid-involved overdose deaths continue to grow fastest among Black residents in our study area, future research should examine whether opioid treatment correlates with a decline in opioid-involved deaths and if there is any difference in the quality of SOR provider services delivered by race as well as by type of program.

1. Introduction

The opioid crisis began in the late 1990s, mainly among non-Hispanic White individuals in suburban and rural areas in relation to prescription opioid use and misuse. In the mid-2000s, opioid overdose deaths began to affect all populations. In recent years, opioid-related overdose deaths have been concentrated in large metropolitan areas, particularly among minority groups (Lippold & Ali, 2020), and heroin or illegally manufactured synthetic opioids, like fentanyl, contribute to most of these deaths. Minority groups face significant obstacles in opioid use disorder (OUD) treatment due to limited access to qualified healthcare providers (Santoro & Santoro, 2018).

For many communities, opioid-involved deaths remain high. Certain states experience higher opioid overdoses at a rate which, far exceeds the national rate of 20.7 deaths per 100,000 (NIDA, 2020). Among the same communities the Black opioid related death rate increased, while the White death rate declined (NIDA, 2020 and KFF, 2021). For the Mid-Atlantic State in our study the State Opioid Response (SOR) program, funded under the Substance Abuse and Mental Health Services Administration (SAMHSA), aims to address the statewide need for enhanced prevention, intervention, and support services for people with OUDs. In 2014, The State-sponsored SOR program was launched to enhance services prevention and treatment of OUDs. Such services include screening and enrolling referred individuals for eligibility for services, referral to treatment, increased access to medications for OUD, and related services. Individuals with OUD with a stimulant use disorder diagnosis or both are screened; the MAT services upon program enrollment include treatment with Methadone, Suboxone/Buprenorphine, and Naltrexone (Vivitrol).

A recent study focusing on the Mid-Atlantic state found that White opioid-involved death rates have declined while Black opioid-involved death rates are increasing (KFF, 2021). However, OUD-related deaths remain high, and in 2018, synthetic opioids (i.e., illicit fentanyl) were involved

in 90 percent of this Mid-Atlantic state's opioid-involved deaths (NIDA 2020). Fentanyl is far more lethal than opioids like heroin or commonly prescribed opioids like hydrocodone or oxycodone.

In addition, while our study area's overdose trend follows national trends, researchers have found that this area has the highest rate of opioid overdose deaths among non-Hispanic Black adults (SAMHSA, 2020). Further, research shows that synthetic opioids are affecting the opioid death rates of Black populations more than other populations, which could require modifications to the treatment of OUD among Black adults with OUD (SAMHSA, 2020).

To curb opioid overdose deaths, this Mid-Atlantic state, for our study of the SOR program, strives to take a comprehensive approach to achieve the following goals: prevent overdose fatalities by supporting a range of programs, including screening, referral to treatment, walk-in services, and recovery support; increased early identification of substance use through education and training of school personnel; expanding access to recovery services through peer support and recovery housing; enhancing public and provider awareness of causes of and resources available for opioid use disorder; and enhancing the availability of medication for opioid use disorders (MOUD), walk-in crisis centers, crisis beds and safe stations for individuals with OUD.

To understand how Black and White populations in our study area have accessed SOR program services, we combined a comprehensive literature review to understand what is known regarding racial differences in OUD treatment and changes in opioid-involved overdose with analyses of administrative and survey data on SOR program clients linked to contextual economic and social indicators from the American Community Survey. While comprehensive standardized program models are essential strategies for addressing the opioid crisis, treatment needs vary. Thus the treatment response should vary to address ethnic and racial differences among adults who need OUD treatment (SAMHSA, 2020). Therefore, this research explores whether there are disparities in the Mid- Atlantic study area's SOR service treatment by race, sex, ethnicity, economic, and other social factors, where overdose trends diverge by race.

This paper is organized into four sections. Section 2 reviews relevant literature on opioid use disorder (OUD) and opioid-involved deaths, focusing on variation across states and by race. Section 3 describes our data and methodology. Section 4 presents the results, followed by a discussion in Section 5. Finally, Section 6 presents the conclusion and future research.

2. Literature Review

Before focusing on our study area's SOR program, we review the prevailing related literature on opioid-involved deaths by race and opioid use and deaths among the SSDI population. We reviewed studies of racial differences in overdose and opioid use disorder treatment in the social science and clinical literature that covers US national data, regional, and specific target populations such as Veterans and SSDI, focusing on the last five years to shed light on the current literature.

Pyra et al. (2022) analyzed a nationally representative cross-sectional random sample of 1,161 U.S. respondents who completed the AmeriSpeak survey between October 22 and October 26, 2020. The survey consisted of fifty items. Pyra et al. (2022) analyzed how political affiliation, racial attitudes, and opioid stigma influence public support for public health responses to address opioid use disorder (OUD). Attitudes around race play an essential role in public support for public health responses to the opioid epidemic. Prya et al. found that race-conservative attitude, as well as Republican affiliation, were associated with lower support for (1) Medicaid expansion, (2) increased government spending to address the OUD epidemic, or (3) expanding naloxone availability. The stigma around OUD was also associated with decreased support for Medicaid expansion, naloxone availability, and government spending to address OUD. Pyra et al. also found racial and ethnic differences in support for naloxone distribution; Black participants displayed lower support for Medicaid expansion, increased government spending on OUD, and naloxone availability compared with non-Hispanic White support. Such differences suggest that one source of differences in treatment capacity or approach across racial and ethnic groups is the support for these.

Santoro and Santoro (2018) conducted a literature review evaluating racial disparities in opioid use, opioid use disorders, and opioid use treatment in the U.S. Racial disparities in the prescription of opioid-containing compounds are dramatic, with non-white individuals receiving prescription opioid medication at half the rate of white individuals. Historical and cognitive biases and limited access to medical care may have limited exposure to prescription opioids among racial and ethnic minorities. Physician bias, media portrayal of OUD, and governmental regulations form multi-factorial roots of racial inequality in response to the opioid epidemic. An example of such government regulation is President Ronald Reagan signed the 1986 Anti-Drug Abuse Act. In 1988, the Omnibus Anti-Drug Abuse Act expanded the law to allow harsher criminalization of crack cocaine users, disproportionately affecting Black populations, while the many White individuals using other forms of cocaine received no significant sanction for their substance use.

African American and American Indian populations are dying from drug overdose deaths in Minnesota at greater rates than White individuals. In a Minnesota Department of Health study, DeLaquil (2020) characterized racial differences in drug overdose death rates from 2002 to 2019 in Minnesota. In 2019, African Americans living in Minnesota were almost two times more likely to die of a drug overdose than white Minnesotans. In 2019, American Indians living in Minnesota were seven times more likely to die of a drug overdose than white Minnesotans. Drug overdose mortality rates trended upward for all races (African America, American Indians, and White), and racial inequality in death rates increased from 2010 to 2019. In Minnesota, for White, African American, and American Indian adults, opioids are the leading cause of drug overdose death. Furthermore, over the past 15 years, there have been increases in overdose deaths in all drug categories.

Essien et al. (2020) assessed the association of race and ethnicity with prescribing opioids and medications for opioid use disorder (MOUDs) after a non–fatal opioid overdose. The participants in the study were patients prescribed ≥1 opioid from July 1, 2010, to September 30, 2015, who experienced a non-fatal opioid overdose in the Veterans Health Administration (VA).

The authors conducted difference-in-difference analyses using multivariable regression to assess whether the change in opioid prescribing from before to after an overdose event differed by race and ethnicity. Essien et al. also used multivariable regression to test whether MOUD prescribing differed by race and ethnicity after overdose. They concluded that in a national cohort of patients with non-fatal opioid overdose treated in the VA health system, there were no racial or ethnic differences in opioid prescribing following overdose. Although, in this study, Black and Hispanic patients were more likely than White patients to receive MOUD 30 days after overdose, less than 4% of patients in any group received such therapy.

Larochelle et al. (2021) conducted research as part of the HEALing Communities Study, which aims to significantly reduce opioid-related overdose deaths by helping communities implement evidence-based practices to treat OUD and reduce other harms associated with opioid use in New York, Massachusetts, Kentucky, and Ohio. This study, the most prominent addiction implementation study conducted to date, was part of the National Institute on Drug Abuse and Substance Abuse and Mental Health Services Administration Helping to End Addiction Long-term Initiative. The authors collected data from death certificates for 2018 and 2019 across 67 communities with a population of more than 8.3 million people in the four states participating in the HEALing Communities Study. The researchers calculated rates and trends of opioid overdose deaths for each state and then further analyzed trends by race and ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, other). Overall, the investigators observed no change in the opioid overdose death rate in these states from 2018 (38.3 deaths per 100,000 people) to 2019 (39.5 deaths per 100,000 people). However, the researchers observed a 38% overall increase in the opioid overdose death rate for non-Hispanic Black individuals from 2018 to 2019 across these four states. There were no changes overall among the other racial and ethnic groups. The size of the increase in overdose among non-Hispanic Black individuals varied by state; the highest was in Kentucky (a 46% increase) and Ohio (a 45% increase). The study did not observe a significant increase among

non-Hispanic Black individuals in Massachusetts. While opioid overdose death rates were unchanged for non-Hispanic Black individuals in New York, there was an 18% decline among non-Hispanic White individuals, suggesting that non-Hispanic Black individuals have not benefitted equally from prevention and treatment efforts.

Alexander et al. (2018) investigated trends in Black and White Opioid Mortality in the United States from 1979 to 2015 using multiple causes of death data. They calculated age-standardized mortality rates involving opioids, by race and opioid type, for the U.S. resident population. Alexander et al. also analyzed trends in mortality rates using join point regression. Their results indicate that Black and White populations underwent three successive waves. In the first wave, from 1979 to the mid-1990s, the epidemic affected both populations and was driven by heroin. In the second wave, from the mid-1990s to 2010, the increase in opioid mortality was caused by natural/semi-synthetic opioids (e.g., codeine, morphine, hydrocodone, or oxycodone) among White populations, while there was no increase in mortality for Black populations. In the current wave, increases in opioid-involved mortality for both people have been driven by heroin and synthetic opioids (e.g., fentanyl and its analogues). Heroin rates are increasing at 31% per year for White individuals and 34% for Black individuals. Concurrently, mortality involving synthetic opioids is growing at 79% and 107% annually for White and Black people, respectively. They concluded that since 1979, the nature of the opioid epidemic has shifted from heroin to prescription opioids for the White population to increasing heroin and synthetic opioid deaths for both Black and White people.

Lippold and Ali (2020) investigated the trends in opioid-involved overdose deaths across racial and ethnic groups in metropolitan and non-metropolitan areas. They used joinpoint regression, composed of several distinct linear phases over time divided by cut points, to examine the mortality trends from 1999 and 2017. The result shows that overdose death rates increased across metropolitan and nonmetropolitan areas for all racial and ethnic groups from 1999 to 2017. Nevertheless, the findings from this study indicate significant heterogeneity in the rates of opioid-involved overdose

deaths and their rates of increase for diverse populations. Death patterns in non-Hispanic White persons align with the increase in opioid-involved overdose death rates observed over the past two decades. Non-Hispanic Black and Hispanic adults in large metropolitan areas displayed minimal increases in overdose death rates between 1999 and 2012 but startling increases following the emergence of synthetic opioids into the illicit market around 2013 and 2014. These findings support the existence of sub-epidemics in the ongoing opioid overdose crisis and point toward the need for culturally tailored interventions to address opioid-involved deaths in diverse populations.

Krawczyk et al. (2017) used data from the National Treatment: Episode Database to compare the odds of opioid agonist treatment (OAT); they examined methadone or buprenorphine among Black, Hispanic, and White clients. They used mediation analysis methods to explore whether any racial or ethnic differences in OAT receipt were explained by variation in clinical need or other treatment, sociodemographic, or geographic characteristics. The odds of OAT receipt were significantly higher among Black and Hispanic clients than among White clients. Differences in clinical need accounted for a substantial portion of this difference. Differences persisted after accounting for other potential explanatory variables but were only evident for primary heroin users but did not persist for other opioid users. The receipt of OAT in treatment programs is low overall (28.7%), particularly among White heroin users. Differences in clinical need cannot fully explain differences in OAT receipt.

Hansen et al. (2020) aimed to understand how the brain disease model of addiction led to dramatic racial inequity in access to (legal) opioids and the treatment of OUD in response to what is viewed as a "White" crisis of opioid-involved deaths. Hansen et al. collected and analyzed data from several sources: a content analysis of U.S. biomedical as well as U.S. national popular media accounts of addiction neuroscience; a thematic analysis of their ethnographic interviews of fifty-seven US-based clinical researchers, neuroscientists, policymakers, and pharmaceutical executives who were recruited using respondent-driven sampling, in addition to seventy-seven buprenorphine

prescribers in New York City; and observations of twenty-four national addiction science and addiction treatment conferences. The authors argue that, in the U.S., "context-free" neuroscience made the social hierarchies of addiction and its consequences invisible to, and thus exacerbated by, decisions that shaped national policies on opioids (Leshner (1997) and McLellan et al. (2000)). The authors conclude that the brain disease model of addiction was selectively deployed among the White middle-class population; as a group, this population had long accessed narcotics and pharmaceutical treatments for narcotics disorders from medical clinics rather than from illegal sources subject to law enforcement. In this paper, Hansen et al. attempt to answer why the life expectancy of almost all nonwhite racial groups in the United States is rising while the life expectancy of middle-aged White adults has been falling since the mid-1990s (Case and Deaton 2015). The answer is partly due to opioid overdose: from the mid-1990s onward, opioid overdose mortality rose sharply among White adults, primarily because of prescription opioid painkillers. Hansen et al. argue that drugs can be designed with White racial identities and prescribing patterns, which ample evidence supports given higher rates of prescription opioid medication used for pain in White non-Hispanic populations compared with other racial and ethnic groups in the 1990s and 2000s. Paradoxically, and in a departure from much of the research on race and pharmaceuticals (Hatch, 2016; Kahn 2008, 2012), Hansen et al. conclude that the White identity of pharmaceutical opioids is crucial to understanding the falling life expectancy of White adults during the contemporary US opioid crisis.

In a related publication characterizing racial and ethnic differences in overdose death, the Substance Abuse and Mental Health Services Administration (SAMHSA, 2020) reported that synthetic opioids affect opioid death rates among non-Hispanic Black populations more than others. Synthetic opioids accounted for nearly 70 percent of opioid-related overdose deaths and 43 percent of non-Hispanic Blacks' total drug overdose deaths in 2017 (CDC, 2019). The same report states that death rates involving synthetic opioids increased by 818 percent and were the highest for non-

Hispanic Black persons compared to all other racial and ethnic groups. Regarding prescription opioids, it has been proposed that Black/African Americans may be insulated from the fast-raising rate of opioid misuse and overdose deaths due to a lack of access to these medications. The lack of access to prescription opioids is rooted in misperceptions and biases in the healthcare system, including the undervaluing of Black/African American self-reporting of pain and stereotyping by providers (SAMHSA, 2020). According to the Kaiser Family Foundation (2018) opioid–related overdose death rates by state in 2018 were highest in the Mid-Atlantic and Midwest regions. West Virginia (WV) and Maryland (MD) appear in the top five states with the highest opioid–related overdose death rate by state among the non-Hispanic Black population. Maryland has the highest number of opioid–related overdose deaths among non-Hispanic Black adults and outpaces the second-highest state, Illinois, by over 100 deaths.

Regarding Social Security Disability Insurance (SSDI) or Supplemental Security Income recipients' use of opioids, there is limited evidence. Wu et al. (2021) examined the prevalence of opioid use in a sample of initial-level SSDI applicants using data from the Social Security Administration's Structured Data Repository, Disability Analysis File, and Numerical Identification from 2007 through 2017. Their findings indicate that over 30 percent of SSDI applicants reported using one or more opioids. In related studies using administrative data from 2007 through 2017 to examine prescription fills of Medicare beneficiaries under age 65, a group composed almost entirely of SSDI recipients, about half of the beneficiaries filled an opioid prescription each year. In these studies, a slightly higher proportion of White versus Black beneficiaries filled a prescription for opioids each year, filled prescriptions consistent with a long-term opioid receipt each year, and filled prescriptions yielding a higher dose (milligrams of morphine equivalents per year) (Morden et al., 2014; Meara et al., 2016; Morden et al. 2021). In Morden et al. 2021, a higher opioid dose among White versus Black beneficiaries was present within 90% of 310 health systems delivering the plurality of primary care to the Black and White beneficiaries studied. This finding suggests that

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differences do not arise because different health systems serve Black and White beneficiaries with, for example, different prescribing norms.

Opioid use varies by age and demographic characteristics. SSDI applicants ages 40 – 49 were the most likely age group to report opioid use, women were three to four percentage points more likely to report opioid use than men, and people with some college education (but no college degree) were the most likely education group to report opioid use. The authors reported that opioid use varies significantly by geographic location. Applicants from Rhode Island, Massachusetts, and Washington, DC, reported a lower-than-average rate of opioid use throughout the study period. On the other hand, applicants from Delaware, Nevada, and Michigan consistently reported the highest rates of opioid use. Finally, Wu et al. (2021) reported positive associations, but not causation, between 1) reported opioid use and SSDI awards and 2) reported opioid use, SSDI award rates, and death rates.

In contrast, the study by Maestas et al. (2021) finds that the prevalence of opioid use among SSDI applicants declined from 33% in 2013 to 24% in 2018. The authors estimated the prevalence of opioid use among SSDI applicants at the time of application. Using SSDI administrative data, they identified applicants who were taking prescription opioids by using a novel natural language processing algorithm to identify opioid analgesics in free text medication entry fields on the application. While there is a decline in opioid use, the share of applicants reporting musculoskeletal impairments, which are commonly associated with chronic pain, was unchanged during this period. Opioid use was especially prevalent among applicants with musculoskeletal and back impairments (45% and 50%, respectively). Between 2013 and 2018, applications reporting opioid use declined across sexes, all age groups, and education levels. The share of applicants reporting opioid use also declined across all regions in the US, though there was substantial variation in the magnitude of the decline, with the largest declines seen in part of the Midwest and southeastern U.S. Finally, Maestas

et al. found that both levels and changes in the rates of SSDI applications overall, as well as applicant's reporting opioid use, were positively associated with local opioid prescribing rates.

Overall, the literature review exposes mixed findings regarding racial differences in access to treatment for OUD or the intent to address OUD in each community. However, there is a clear consensus in the literature that the opioid crisis, which initially started as a "White" crisis, is increasingly spreading to urban and minority areas. Furthermore, the literature agrees that policymakers have handled the opioid crisis since 2000 differently than before drug crises, like the 1980 crack cocaine epidemic, which primarily affected urban and inner-city minority populations. For the 1980s crack cocaine crisis, policy maker's response included long prison sentences and criminalization of the public health crisis. In contrast, for the recent opioid crisis, policymakers treat OUD as a chronic illness and allocate more funds to fight opioid use disorder. Our empirical research aims to shed light on the racial differences in the opioid crisis and the prevalence of opioid use in a study area of a State in the Mid-Atlantic region. This research aims to add to the evidence base for refining policy responses to the opioid crisis and its affected population groups.

3. Methodology and Data

The study employs a standard data science method used by Sarker (2021) to collect, curate, and integrate the data that come from different sources to characterize differences in OUD treatment and overdose by race, ethnicity, age, sex, and among individuals likely to be vulnerable to health consequences of OUD because they are homeless.

There are two levels of data and analysis performed in this paper: individual level and community level. At the individual level: This paper examines individual clients as the study population receiving State Opioid Response (SOR) services residing in a State within the Mid-Atlantic region. Specifically, the sample includes client referrals by providers and clients who opted into receiving the SOR services. At the community level, the paper explores the association between SOR service measures aggregated at the community level (defined below) and community-level

demographics, economic and educational measures (defined below). For this paper, the study population consists of all communities with census tracts within a 10-mile radius (concentric neighborhoods) of SOR providers that need SOR services in the State. The 53 service providers are located in 18 counties of the State and are designed and implemented to serve its residents. The sampled population is those communities who received SOR services.

3.1 Data Sources

Our empirical analysis uses two primary data sources: a State in the Mid-Atlantic region's SOR data and the American Community Survey conducted by the U.S. Census Bureau of Labor Statistics.

The State Opioid Response (SOR) Data

There are 53 jurisdiction-level service providers across the study area participating in the SOR programs providing treatment and recovery services to state residents whose progress report data was included in this study. A few service providers were excluded because corresponding data was unavailable from ACS due to address information. The 53 service providers report monthly data on overall counts of enrolled individuals receiving services, breaking out counts by different demographic characteristics and by service provider yielding total referral, screening, services while enrolled, and discharge services provided. Each of the 53 organizations that provide services under the State's SOR program submits monthly progress reports to one of the State's 18 SOR counties. Thus, each observation of SOR data represents a monthly count of clients receiving different services – treatment and recovery from a service provider. We use SOR data spanning October 1, 2020, to May 30, 2022, from all 53 Service Providers.

First, we focus on four SOR program outcomes of interest, also called SOR Measures. Based on SOR data as of May 30, 2022, we measure 1) **referrals**, the total number of unique individuals referred by self, family or friend, medical provider, or other referral sources to the State's SOR program, 2) **clients**, or the total number of unique individuals enrolled in services in the SOR program (a subset of referrals); 3) **MOUD starts**, or the total number of individuals receiving

medications for opioid use disorder (MOUD) through the State's SOR, including Suboxone/Buprenorphine, Methadone, or Naltrexone (Vivitrol), and 4) **MOUD referrals** following discharge or the total number of individuals referred to MOUD services following discharge or release.

Next, we describe the population served by each SOR service provider, characterizing the clients' overall race, age, ethnicity, and other characteristics in the SOR dataset. The individual characteristics used to describe recipients of SOR program service receipt are age (less than 18, 18-24, 25-44, 45-64, greater than 64); sex (female versus male); race (White, Black or African American, Hawaiian or Pacific Islander, Asian, American Indian or Alaska Native, more than one race, and Unknown); Ethnicity (Hispanic or Latino versus non-Hispanic or Latino); indicators for whether a client is currently homeless, pregnant or a veteran; and indicators for the jurisdiction or county of residence. In practice, many counts of SOR service receipts for the Asian, Hawaiian or Pacific Islander, American Indian, or Alaska Native populations will be suppressed due to small sample sizes.

American Community Survey (ACS)

To augment SOR data with additional information about the economic and social characteristics of communities surrounding SOR providers, we use publicly available Census tract-level data from the ACS, a household survey of population demographic and economic information. We gather the following variables from the 2020 ACS at the tract level: total population, population by race and ethnicity, annual unemployment rate, education (percentage of the 25 and older population for the selected each area that has a bachelor's degree or above), population below the poverty line (using 2020 Federal Poverty Levels). We use these variables to construct an Economic Vulnerability Index (EVI) and, separately, a variable indicating a high proportion Black population in the community, "High Black."

We link socioeconomic tract data on the economic and social characteristics of communities surrounding the SOR service providers in the ACS to our study area's SOR treatment data. Place-based urban research has for years identified neighborhoods based on boundaries (Burgess, 1925; Spielman & Logan, 2013; and Lebel, Pampalon & Villeneuve, 2007). Galster (2001) describes neighborhoods as the variation of social and physical political attributes varying by spatial scale. To analyze the effects of SOR on its surrounding community, we define a SOR community as a 10-mile concentric ring area, or tracts within a 10-mile radius, surrounding the SOR service provider's treatment location. For this research, we are assuming service providers serve their surrounding community. Within the ten-mile radius, prospective neighborhood clients can either walk (for those close to the service provider), drive or take other forms of transportation to reach the treatment centers. Likewise, counselors within the treatment centers can easily reach and access clients within 10 miles of the treatment centers.

Linked SOR and ACS data

The physical address of each of the 53 service providers was used to integrate the SOR data with the ACS data at the tract level, aggregated to the SOR community of tracts within 10 miles of each SOR provider. With the assumption that people within the 10-mile concentric ring neighborhood of a service provider's location are potential users or clients (neighborhoods served), our next step involves spatial analysis of 10-mile concentric rings around each service provider facility location address. We extract the relevant estimates for the 10-mile radius neighborhoods using ACS 2020 demographic, economic, education, and other social data.

Economic Vulnerability Index

We calculate the economic vulnerability index within a 10-mile radius of each SOR provider using the 2020 5-year ACS data. To do so, we compute three measures for each SOR community (defined as the set of Census tracts within 10 miles of a SOR): unemployment rate (population-weighted average unemployment rate across tracts in the SOR community), percent living below

poverty (total people with incomes below poverty divided by the total population in the SOR community), and percent with a bachelor's degree (population-weighted average percent with a bachelor's degree across Census tracts in that SOR community). We then form an economic vulnerability index based on whether the unemployment rate is above the State's average of 4 percent in January 2020, whether the percent living below poverty in that SOR community is above the median of 9 percent in the State, and whether the percent of adults with a bachelor's degree (BA/BS) is below the median for the state. Summing these, an EVI value of "3" represents a high level of community economic vulnerability, "2" represent moderate, "1" represents low economic vulnerability, and "0" represents very low-level economic vulnerability.

High Black Proportion in a SOR Community

The High Black indicator will receive one if Census tracts within a 10-mile radius of a SOR provider have a Black population greater than 50 percent or zero otherwise. The 50 percent or greater threshold was chosen to indicate that most residents within the 10-mile radius community race were majority Black over all other races and ethnicities.

Using this integrated data, we use the non-parametric Independent-Samples Kruskal-Wallis test to determine if there are statistically significant differences between two or more groups of communities on the SOR measures. Furthermore, the chi-square independence test is used to determine if significant differences exist in the proportion of services given to different groups of individuals.

4. **Results**

The SOR program data is drawn from counties across the state. For this paper, data originate from 18 jurisdictions or counties. For simplicity, we refer to the counties defining each jurisdiction when presenting jurisdiction or county-level information. The data are based on monthly progress

reports submitted by 53 service providers. These service providers are dispersed across the county

jurisdictions to serve residents across the state, as indicated in Table 1. Table 1 shows that the

service providers in Jurisdiction J3 have the highest number of State Opioid Response clients, 3,351

(38.7% of the total) served. However, Jurisdictions J2 and J5 have the most service providers (seven

each). Jurisdiction J3, where most clients reside, is served by just three service providers.

Table 1. Number of State Opioid Service Providers & Unduplicated Clients by County during

October 1, 2020, to May 30, 2022

County	Number of Service Providers	Unduplicated Clients Served	%
J1	1	78	0.90
J2	7	1631	18.84
J3	3	3351	38.70
J4	2	94	1.09
J5	7	595	6.87
J6	2	30	0.35
J7	3	377	4.35
J8	1	932	10.76
J9	2	78	0.90
J10	2	7	0.08
J11	6	213	2.46
J12	3	249	2.88
J13	2	95	1.10
J14	2	269	3.11
J15	3	103	1.19
J16	2	422	4.87
J17	3	90	1.04
J18	2	45	0.52
Total	53	8,659	100

4.1. Clients Served by Race and Ethnicity

The SOR program served 8,659 unique individuals (clients) from October 1, 2020, to May 30, 2022 . Figure 1 displays a breakdown of clients served by race. About 53 percent of the clients admitted for opioid treatments are White, 40 percent are Black, and the remaining 7 percent of clients reflecting individuals with more than one race, Asian, American Indian, and Hawaiian populations. The race-specific population rate of service receipt per 100,000 residents aged 18 and older is significantly higher among Black adults (248) than White adults (186). This higher population-based rate of SOR service receipt mirrors the trend of faster growth in opioid use disorders, overdose, and death among Black adults in the state.

Figure 1. Distribution of State Opioid Response Clients Served by Race

Race	Clients
White	4,585
Black	3,476
Unknown	472
More Than 1 Race	77
East Asian	35
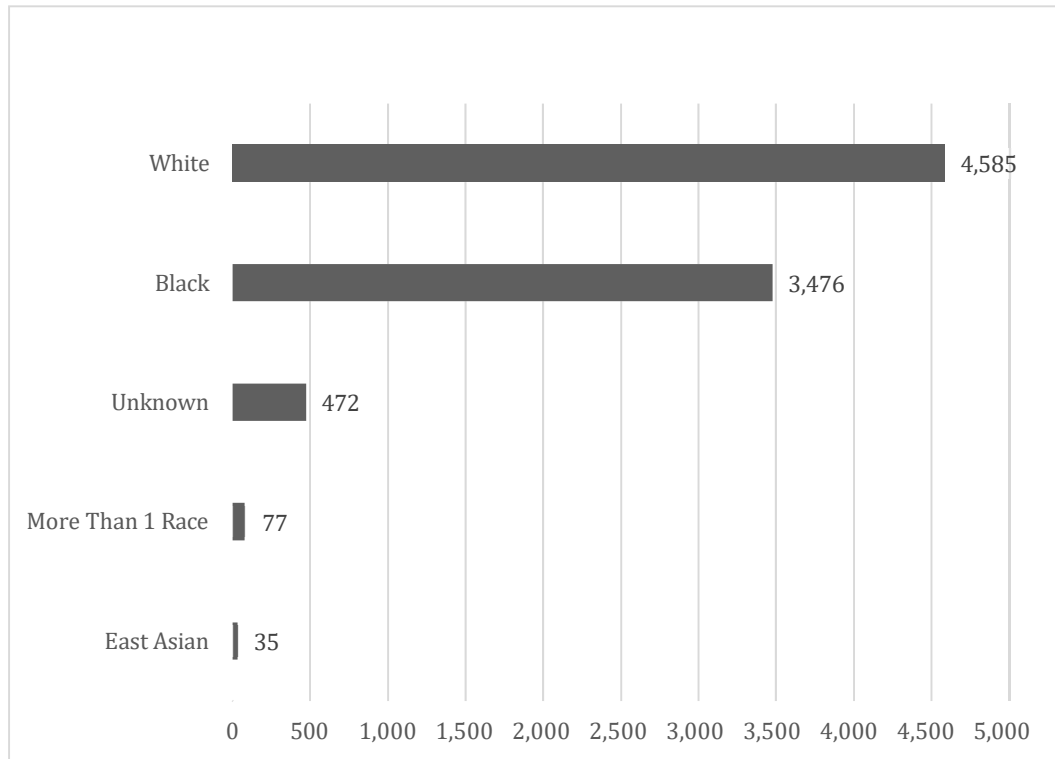
Table 2. Individuals Receiving State Opioid Response Services, October, 2020 through May, 2022

Race	Percent	Population Rate of Service Receipt Per 100, 000 residents
White	52.95	186
Black	40.14	248
Unknown	5.45	168
More than 1 Race	0.89	25
Asian	0.40	10
American Indian	*	*
Hawaiian	*	*
Total	100.00	180

*numbers suppressed due to small numbers of American Indian and Hawaiian or Pacific Islander individuals served by the State's State Opioid Response program. The population rate of service recipients is significantly higher for Black residents of the State than White residents ($\chi^2 = 152.3$, p<0.0001).

Table 3 presents the population rate of service receipt per 100,000 adults living in the State by ethnicity: non-Hispanic or Latino (195) residents were significantly more likely to receive services than Hispanic or Latino residents (50). Service receipt among Hispanic or Latino residents differs dramatically by sex, with a 5 to 1 ratio of males to females receiving SOR program services compared to 2 to 1 for non-Hispanic residents.

Table 3. Individual Served from October 2020 through May 2021 by Ethnicity

	Number of Clients Served			**Population Rate of Service Receipt Per 100, 000 residents**
Race	**Total**	**Male**	**Female**	
Non-Hispanic or Latino	8,412	5,883	2,544	195
Hispanic or Latino	247	206	42	50

The population rate of service recipients is significantly higher for residents of the State who are non-Hispanic or Latino compared with Hispanic or Latino residents (χ^2 = 493, p<0.0001). *Counts suppressed due to small numbers of Asian, American Indian, and Hawaiian or Pacific Islander individuals served by the SOR when split out by sex. Differences in the population rate of recipients by sex of 150 per 100,000 are statistically significant (χ^2= 1454.5, p<0.0001).

4.2. Clients Served by Sex, Age, and Race

Table 4 presents the distribution of individuals served by sex and race. The population rate of service receipt per 100,000 adult males (260) is significantly higher than that for females (110). Furthermore, for each White female client, there are two White male clients served, and for each Black female, there are three Black male clients who received treatment services. More Black men, compared to White, are receiving treatment services as well.

Figure 2 shows the distribution of SOR clients by age by the end of May 2022. Most clients (56 percent) are aged 25-44, with an additional 31 percent aged 45-64. Very few clients are over 65 or under 18, and just 8 percent are 18 – 25. Population rates of SOR service receipt per 100,000 by age group are presented in Table 5.

Figure 2. Clients Served by Age
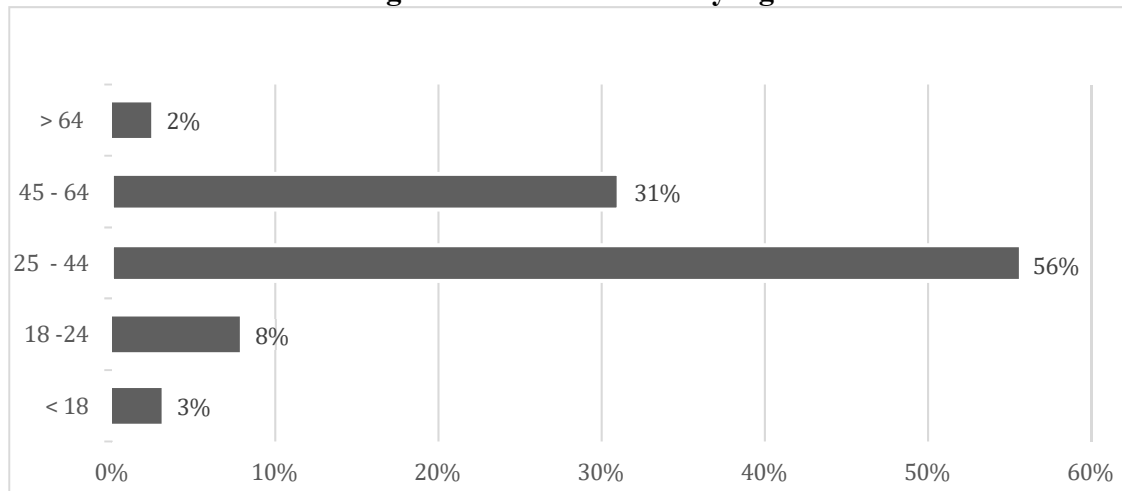
Considering ages when Social Security Disability Insurance benefits are most common, 45 to 64, among Black adults, 45% of service users were 45 to 64 years old, in contrast to just 21% of White service users (Table 5).

Table 5. Distribution of Clients Receiving the Mid-Atlantic's State Opioid Response Services, By Age and Race

Race	Age, N (row percent)					Total*, N
	< 18	18 -24	25 - 44	45 - 64	> 64	
White	63(1%)	453(10%)	3,074(67%)	952(21%)	43(1%)	4,585
Black	146(4%)	183(5%)	1,430(41%)	1,568(45%)	149(4%)	3,476
More than One Race	17(22%)	*	38(49%)	10(13%)	*	77
Unknown Race	34(7%)	27(6%)	242(51%)	153(32%)	16(3%)	472
Total*	263(3%)	678(8%)	4,822(56%)	2,688(31%)	208(2%)	8,659
Population- Rate of clients served Per 100, 000 in the age group	20	127	300	165	22	143

 * The percentage adds up to 100% across age columns, and raw (age groups) sum to the raw count in the "Total" column. The table does not show Asian, Hawaiian or Pacific Islander, or American Indian due to small cell sizes.

4.3. Individuals Receiving SOR Services in Homeless Populations

To understand how the SOR serves an especially vulnerable population of adults, and homeless populations, we computed the race, and sex-specific estimated clients served among the homeless population, for whom the consequences of OUD and any barriers to treatment may be especially important. Table 6 shows homeless SOR program clients separately by sex and race. Nearly 23% of SOR clients are homeless. Nearly 18% of Black clients are homeless compared to 27% of White clients. Furthermore, most homeless clients, 85%, are male.

Table 6. Homeless Clients Served by Sex and Race

Race	Clients Served			All Clients	Percent of Clients who Are Homeless
	Homeless Male	Homeless Female	Homeless Total		
White	1,030	227	1,257	4,585	27%
Black	581	58	639	3,476	18%
Unknown Race	43	6	49	472	10%
Total	1,679	296	1,975	8,659	23%

*Counts for Asian, Hawaiian, American Indian, and More than Race are suppressed due to small cell sizes.

4.4. Analysis of Services Provided at the Community Level

There are 53 SOR service providers with a physical address serving surrounding communities. In this analysis, we define people residing within a 10-mile radius of a service provider's location as potential clients for that service provider. We define the SOR community served based on neighborhoods, measured as Census tracts, within a 10-mile radius of the service provider. Figure 3 presents patterns for SOR service measures by percent of people in 2020 living under the Federal poverty level in the SOR community served. The result shows a decrease in service receipts and referrals as the percent living below the poverty line increases to the third quintile (9.08-11.58 percent). In the fourth quintile of the population living below the poverty line, service receipt increases and then drops to zero in the poorest (5th quintile) communities. Similarly, Figure 4 presents patterns for SOR service measures by percent of people in the neighborhood with a

bachelor's degree and above in 2020. The figure shows that SOR communities where 21 to 31 percent of the population with a bachelor's degree and above are likely to be located near a high SOR service area.

Figure 3. SOR Referrals and Service Receipt by Percent of People under the Poverty Level
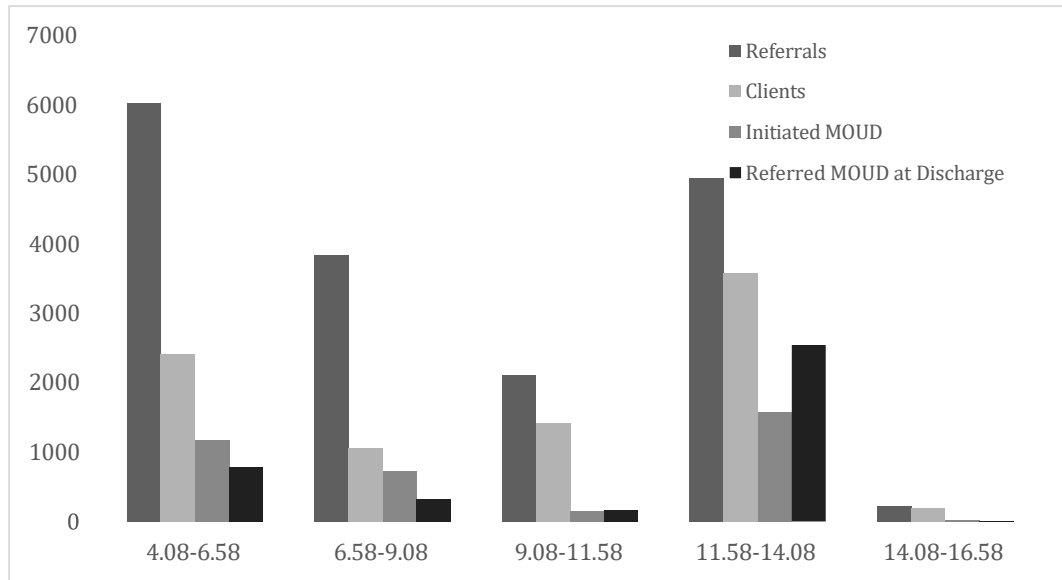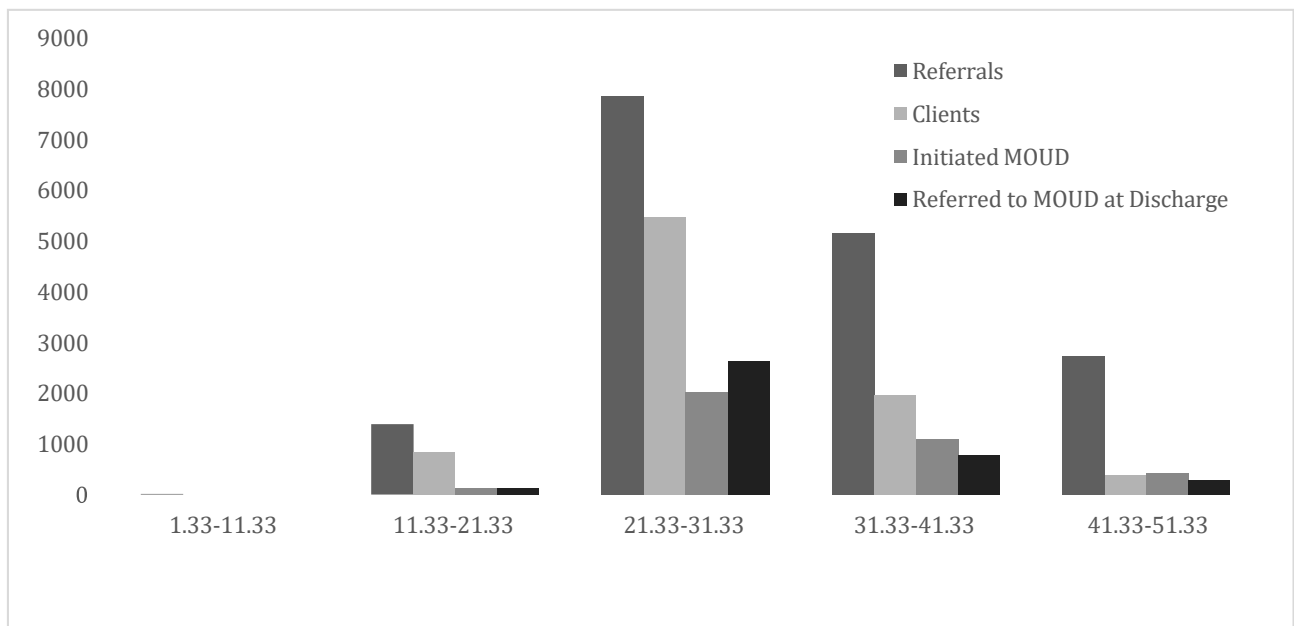

Figure 4. SOR Measures by 2020 Percentage of the Population with a Bachelor's Degree or Above

There was no statistically significant difference in associations between the SOR measures of referrals, clients, or MOUD starts and the two social and economic determinants measured in SOR communities (as defined within 10 miles of a SOR service provider).

4.4.1 Analysis by the Proportion of Residents in SOR Community Who are Black

Table 7 presents the frequency distribution of SOR service measures by High (50% and above) and Low (Below 50%) Black SOR communities. The results suggest that SOR service providers were an important point of access for MOUD among the State residents with OUD treatment needs living in majority Black communities. More referrals were made in low Black communities, yet more of those referred adults enrolled as SOR clients started MOUD in the program and were referred to MOUD after discharge in high Black neighborhoods. Taken together, it suggests that clients from communities with more Black residents were more likely to take up services (in line with the possibility that their needs are more acute or have been addressed less often than for White adults with OUD).

Table 7. Frequency Distribution of SOR service measures by High and Low Black Neighborhoods

SOR service measures	Under 50% Black	50% or More Black	Total
Referrals (Total)	9,186 (53.56%)	7,966 (46.44%)	17,152
Clients (Unique)	2,964 (34.23%)	5,695 (65.77%)	8,659
MOUD Start in Program	852 (23.39%)	2,791 (76.61%)	3,643
MOUD Referral at Discharge	548 (14.36%)	3,267 (85.64%)	3,815

4.4.2. Analysis by Neighborhood Economic Vulnerability Index (EVI)

Table 8 presents the distribution of the neighborhoods served by the SOR program with their levels of economic vulnerability. About 49% of the neighborhoods have moderate or high economic vulnerabilities. Table 9 presents the different types of services provided by EVI.

Table 8. Frequency Distribution of Neighborhoods

Economic Vulnerability Index (EVI)	Count of SOR Communities	Percent of SOR Communities
0-Very Low	13	24.50
1-Low	15	28.31
2-Moderate	16	30.19
3-High	9	17.00
Total	**53**	**100.00**

Table 9. Frequency Distribution of Counts of SOR Measures by EVI

SOR Measures	Economic Vulnerability Index (EVI) Within 10-miles of SOR Service Provider				Total
	Very Low	**Low**	**Moderate**	**High**	
Total Referred	5,299 (31%)	4,301 (25%)	5,574 (32%)	1,978 (12%)	17,152
Unique Clients	2,299 (27%)	905 (10%)	4,220 (49%)	1,235 (14%)	8,659
MOUD Start	1,435 (27%)	232 (1%)	1,812 (67%)	164 (4%)	3,643
MOUD Referral	1,047 (39%)	41 (6%)	2,567 (50%)	160 (5%)	3,815

One striking feature in Table 9 is the large number of clients referred, enrolled as clients, or starting MOUD in the SOR program from the lowest EVI communities with far fewer coming from the high EVI communities. This suggests that opportunities for outreach may remain in these more economically vulnerable communities.

5. Discussion

We find that, per population, our study area's SOR program delivers slightly more services to Black adults living in the State than White adults. The access to SOR program providers Black adults is expected in the context of opioid overdose death trends in the literature, which document an increasing number of Black adults with opioid and related addictions as the death rate continued to

rise among Black residents while falling for White residents in the first year of the pandemic, or the 12 months through 2nd quarter 2021 (MOOCC Q2, 2021). The report findings are similar to Alexander et al. (2018) because the Black opioid-overdose death rate is increasing while White opioid overdose death rates are declining. Hence, our study area's SOR programs are serving Black communities in line with the way the opioid crisis has intensified for Black residents in recent years. Any beneficial effect of access to the State's SOR providers among the Black population could take time to appear in official reports.

Understanding the treatment patterns for OUD is important not only due to the public health threat of the opioid crisis, overdose, addiction, and the many related negative consequences of opioid disorders but because it affects adults likely to need income and health support from public programs like SSDI and Medicare (with or without additional coverage from Supplemental Security Income and Medicaid). The rapidly rising overdose death rates among Black residents suggest that our study area's SOR program, even with more access for Black adults, is not yet meeting treatment needs. About half of the Black clients in our study area's SOR program and one-quarter of White clients were aged 45 and older, and thus reaching ages when applying for and receiving SSDI is most common. The description of service providers revealed that just three providers serve a county with the most SOR clients (compared with seven service providers each for two other counties in the State). Further, there were drastically different rates of take up (the ratio of clients to referrals and MOUD starts to referrals) of SOR services comparing Black and White adults. These differences suggest there may be more unmet treatment needs among Black adults referred to a SOR provider, while some referrals of White patients yield fewer benefits. Attention to the targeting of referrals and identification of OUD needs could help make more efficient use of SOR program resources. Finally, more work needs to be done to understand the efficacy of these programs. If effective, it is hard to reconcile the accelerating rates of overdose, especially in the Black population, which is currently the population most likely to receive SOR services. If effective, programs like the State for this study

SOR program could dampen the need for income support and health insurance as people reach older working ages.

Finally, given that there are more clients served in communities with low levels of economic vulnerability (low EVI) than the highest level of EVI, future research could examine the targeting of SOR services to help understand whether resources from SOR programs could be allocated more efficiently across communities (and not simply according to the client characteristics).

Sadly, the Center for Disease Control and Prevention (CDC)'s report in July 2022 indicates that nationally, the overdose crisis involving opioids persists across many racial groups. Black Americans experienced a rise in overdose death of 44 percent; the rise was 39 percent for American Indian and Alaska Native people and 22 percent among White individuals compared with 2019 (CDC 2022). This suggests that lessons learned in a Mid-Atlantic State may be needed in many more communities and states as deaths continue to rise.

6. **Conclusion**

The SOR program in a Mid-Atlantic State was designed to deliver identification, referral, and treatment service to residents of the State suffering from OUD. We found that the population rate of treatment and recovery services recipients are similar among Blacks and White residents, contributing over 90 percent of the clients the State's SOR program serves. Furthermore, the results from the analysis of the services to clients at the SOR communities level (within 10 miles of a SOR service provider) show no significant difference in the association between the number of referrals, clients, or MOUD starts, and the poverty level and education level; the clients from communities with more Black residents were more likely to take up services; and a large number of clients referred, enrolled, or starting MOUD in the SOR program are from the lowest Economic Vulnerability Index (EVI) communities with far fewer coming from the high EVI communities.

Although the State's SOR treatment program offers access to the Black population in-line with individuals from other racial groups, overdose death rates are stubbornly high and rising for Black

men. This research raises the question of whether or not SOR service provision is effective. If effective, for whom? Future work could investigate the location of treatment needs (overdose deaths and rates of OUD) and the capacity of SOR service providers to improve the efficiency of targeting for outreach and capacity-building efforts in the state. The composition of clients served by race varies across different SOR programs, with some programs serving primarily Black or primarily White clients. Future research should examine differences in the program. Furthermore, future research should examine whether opioid treatment correlates with a decline in opioid-involved deaths and if there is any difference in the quality of SOR provider services delivered by race and by type of program.

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Appendix A

Correlations

			Unduplicated Clients	Referrals	Started MOUD	MOUD Referral	% Poverty (2020)	Poverty Index (2020)	% with Bachelor's and Above (2020)
Kendall's tau_b	Unduplicated Clients	Correlation Coefficient	--						
		Sig. (2-tailed)	.						
		N	53						
	Referrals	Correlation Coefficient	.804**	--					
		Sig. (2-tailed)	<.001	.					
		N	53	53					
	Started MOUD	Correlation Coefficient	.611**	.628**	--				
		Sig. (2-tailed)	<.001	<.001	.				
		N	53	53	53				
	MOUD Referral	Correlation Coefficient	.511**	.495**	.528**	--			
		Sig. (2-tailed)	<.001	<.001	<.001	.			
		N	53	53	53	53			
	% Poverty (202)	Correlation Coefficient	.020	-.041	-.025	-.065	--		
		Sig. (2-tailed)	.836	.667	.806	.536	.		
		N	53	53	53	53	53		
	Poverty Index (2020)	Correlation Coefficient	.020	-.041	-.025	-.065	1.000**	--	
		Sig. (2-tailed)	.836	.667	.806	.536	<.001	.	
		N	53	53	53	53	53	53	
	% Bacherlor's and Above (202)	Correlation Coefficient	-.001	.001	.069	.078	-.281**	-.281**	--
		Sig. (2-tailed)	.994	.988	.502	.457	.003	.003	.
		N	53	53	53	53	53	53	53
		Correlation Coefficient	--						

Spearman's rho			Unduplicated Clients	Referrals	Started MOUD	MOUD Referral	%Poverty (202)	Poverty Index (2020)	% Bachelor's and Above (2020)
	Unduplicated Clients	Sig. (2-tailed)	.						
		N	53						
	Referrals	Correlation Coefficient	.912**	--					
		Sig. (2-tailed)	<.001	.					
		N	53	53					
	Started MOUD	Correlation Coefficient	.737**	.774**	--				
		Sig. (2-tailed)	<.001	<.001	.				
		N	53	53	53				
	MOUD Referral	Correlation Coefficient	.621**	.597**	.594**	--			
		Sig. (2-tailed)	<.001	<.001	<.001	.			
		N	53	53	53	53			
	%Poverty (202)	Correlation Coefficient	.013	-.073	-.036	-.073	--		
		Sig. (2-tailed)	.926	.605	.800	.605	.		
		N	53	53	53	53	53		
	Poverty Index (2020)	Correlation Coefficient	.013	-.073	-.036	-.073	1.000**	--	
		Sig. (2-tailed)	.926	.605	.800	.605	.000	.	
		N	53	53	53	53	53	53	
	% Bachelor's and Above (2020)	Correlation Coefficient	.008	.002	.087	.111	-.421**	-.421**	--
		Sig. (2-tailed)	.955	.991	.538	.431	.002	.002	.
		N	53	53	53	53	53	53	53

**. Correlation is significant at the 0.01 level (2-tailed).