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Understanding and Addressing Widening Racial Inequalities in Drug Overdose

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Abstract

The fourth wave of the United States overdose crisis—driven by the polysubstance use of fentanyl with stimulants and other synthetic substances—has driven sharply escalating racial/ethnic inequalities in drug overdose death rates. Here we present a detailed portrait of the latest overdose trends, and synthesize the literature, to describe where, how, and why these inequalities are worsening. By 2022 overdose deaths among Native and Black Americans rose to 1.8 and 1.4 times the rate seen among White Americans, respectively. This reflects that Black and Native Americans have been disproportionately affected by fentanyl and the combination of fentanyl and stimulants at the national level, and in virtually every state. The highest overdose deaths rates are currently seen among Black Americans age 55–64, as well as younger cohorts of Native Americans age 25–44. In 2022—the latest year of data available—deaths among White Americans decreased relative to 2021, whereas rates among all other groups assessed continued to rise. Moving forward, Fundamental Cause Theory shows us a relevant universal truth of implementation science: in socially unequal societies, new technologies typically end up favoring more privileged groups first, thereby widening inequalities unless underlying social inequalities are addressed. Therefore, interventions designed to reduce addiction and overdose death rates that are not explicitly designed to also improve racial/ethnic inequalities will often unintentionally end up worsening them. Well-funded community-based programs, with Black and Native leadership, providing harm reduction resources, naloxone, and medications for opioid use disorder in the context of comprehensive, culturally appropriate healthcare and other services, represent the highest priority interventions to decrease inequalities.

The United States is now in the midst of the 'fourth wave' of its fatal drug overdose crisis (1, 2). This wave is characterized by rapidly rising rates of polysubstance use, both intentional and unintentional. In particular it is driven by the polysubstance use of illicitly manufactured high potency opioids such as fentanyl with stimulants—such as methamphetamine—as well as a host of other synthetic compounds, across various classes of substances (2–4). The fourth wave of the overdose crisis has also been marked by sharply increasing racial and ethnic inequalities in drug overdose rates (5). Here we provide a portrait of the latest

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trends describing racial/ethnic inequalities in overdose mortality in detail with respect to substances involved, geography, and demographic trends. We also review recent literature to explain why these shifts are occurring and provide recommendations for how meaningful improvements can be made.

Characterizing Racial and Ethnic Inequalities Drug Overdose Mortality

Widening National Level Gaps

Reviewing the course of the overdose crisis over the past several decades, highly distinct trajectories can be seen by race and ethnicity (Figure 1). In the year 1999, Black, White, and Native Americans had similar overdose mortality rates of 7.0, 6.3, and 5.8 per 100,000 respectively. Over the course of the next decade, mortality rates among White and Native individuals rose sharply, during the first wave of the overdose crisis. By 2010, mortality among White and Native Americans had risen considerably to 15.9 and 16.4 per 100,000 respectively, while mortality among Black Americans remained relatively similar to those seen a decade prior, at 7.9 per 100,000. This reflects that between 1999 and 2010, the average annual percent change among White and Native Americans was 9.0% and 10.5% respectively, compared to 1.5% among Black Americans. However, as the crisis began to transition from being driven by prescription opioids largely derived from legal markets, to opioid products like heroin and fentanyls produced illicitly, a reversal was seen. Starting in 2011, the year-to-year percent change among Black Americans has been higher each year than that seen among White Americans.

Particularly sharp increases among Black Americans began in 2016, when the overdose mortality rate increased by 41.2% in a single year, and large increases have continued through 2022. Overdose death rates among Black Americans overtook those seen among White Americans in 2020. By 2022, the overdose death rate among Black Americans had reached 1.4 times the rate seen among White Americans, at 49.5 per 100,000 compared to 34.6 per 100,000. Rates among Native Americans rose steadily alongside those of White Americans between 1999 and 2018. However, in 2019 they surpassed those of White individuals, and by 2022 had reached a rate 1.8 times higher, at 62.9 per 100,000. In 2022, the latest year of data available, deaths among White Americans decreased relative to 2021, whereas rates among all other groups assessed continued to rise.

Of note, overdose deaths among Latinx individuals have been lower than those of other groups in all years of available data. However, since 2015 the annual percent change of Latinx individuals has been considerably higher than that seen among Non-Hispanic White individuals. Should this trend continue, overdose deaths among Latinx individuals would be expected to overtake those among Non-Hispanic White individuals in the next decade(6).

Tracing Race Through Each of the Substance-Specific Waves of the Crisis

Examining substance-specific trends reveals highly racialized trajectories through each of the four waves of the US overdose crisis. The four waves are depicted in Figure 2 and collectively, they can be thought of as overlapping and interacting phenomena, not mutually exclusive periods of time. Wave one of the crisis is represented by deaths involving

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prescription opioids, removing any deaths involving fentanyls (Figure 1). This wave began to rise in the early 2000s, and was linked to the widespread proliferation of prescription opioids through legal markets and the healthcare system (7). As access to these opioids was reduced, this wave peaked in 2011, and has been declining ever since. Wave two—characterized by heroin without fentanyl—began to rise in 2010, in response to crackdowns in the availability of prescription opioids, and rose precipitously to a peak in 2015, before declining sharply as fentanyl took over the illicit market(8, 9). Wave three began in 2013 as illicitly manufactured fentanyls began to outcompete heroin, leading to rapidly rising overdose deaths(10). Wave four—characterized by polysubstance use including fentanyl—is represented by deaths involving both fentanyls and stimulants. This is a helpful visual guide, however the extent of fentanyl-based polysubstance use extends far beyond stimulants, to also include numerous other substances, across myriad drug classes, such as xylazine, novel synthetic benzodiazepines, non-fentanyl synthetic opioids, and others(3, 4, 11). This wave began to rise sharply in 2015, and as of 2022 overtook wave three in absolute magnitude; the combination of fentanyl and stimulants is now the single most common set of substances involved in drug overdose deaths.

Race-specific trajectories highlight that White and Native Americans were disproportionately affected by wave one of the crisis (Figure 2). At its height in 2011, the prescription opioid involved death rate among White and Native Americans was 3.4 and 3.0 that seen among Black Americans. However, that gap has closed considerably in the proceeding years, as prescription opioid-involved deaths have dropped among White and Native Americans, and remained relatively more stable among Black Americans. The stark racial gradient seen during the first wave of the opioid epidemic has been the matter of much speculation, and is multifactorial(12). However a key factor is certainly the differential exposure to prescription opioids through the healthcare system for different racial groups (13, 14). There is a long history in the United states of privileged groups with access to physicians receiving psychoactive substances through legal prescriptions, while marginalized groups must access the same substances through illicit markets with much higher social and legal consequences(14, 15). For instance, in California between 2011 and 2015 a 300% gradient in the percent of individuals receiving an opioid each year could be seen according to the race and income of a neighborhood's residents (13). These inequalities do not, of course, reflect underlying differences in the burden of painful conditions. Rather, they reflect deep seated racial inequalities in access to healthcare and pain medications in the context of acute and chronic pain. Numerous studies have consistently found that physicians are less likely to prescribe opioid medications to individuals who belong to minoritized racial and ethnic groups, for both acute and chronic ailments(13, 16, 17). These differences are often related to implicit, or unconscious biases, that make physicians more likely to prescribe medications to White patients. Furthermore, racist and inaccurate ideas about people of color having a higher tolerance for pain continue to be found among some providers(17). An additional critical factor is the highly segregated nature of the for-profit U.S. healthcare system, which preferentially delivers care to wealthier and White patients(18). Opioid manufacturers also aggressively marketed prescription opioid products to low-income White areas, perhaps believing this approach would be less likely to trigger societal and law enforcement backlash given the long-history of the villanization of drug

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users belonging to minoritized groups(14). Native American communities were also areas of particularly high prescription opioid distribution, combined with high rates of structural vulnerability and lack of access to non-pharmaceutical treatments for chronic pain (19, 20).

With the transition to heroin, the racial gap started to close, although this initially occurred slowly. Wave two of the crisis—characterized by death rates from heroin without fentanyl—disproportionately affected White and Native Americans, however with a much smaller gradient between other groups. At its peak in 2015, the heroin involved death rate among White and Native Americans was 1.6 and 1.6 times the rate seen among Black Americans, respectively. These persistent, albeit closing, racial gaps likely reflect momentum from the first wave of the overdose crisis, with a greater share of White and Native individuals whose drug use began with prescription opioids, transitioning to heroin.

With the transition to fentanyl, racial disparities in overdose have become profound. Wave three of the crisis (fentanyl without stimulants) did initially affect White Americans to a greater extent during the 2013–2017 period. However, this quickly shifted to disproportionately affecting Black and Native Americans. By 2022, the death rate from fentanyl without stimulants among Black and Native Americans was 1.4 and 1.8 times, respectively, that among White Americans. The fourth wave of the overdose crisis, from it's very beginning, has exerted a higher toll on Black and Native Americans. By 2022, the death rates from the combination of fentanyl and stimulants among Black and Native Americans were 1.7 and 1.8 that of White Americans.

The more recent, rapid rise of overdose deaths among Latinx individuals began in 2015, in the midst of waves 3 and 4, with the rate of change among Latinx individuals outpacing non-Hispanic White individuals.

Differential Age and Cohort Dynamics by Race

Demographic analysis highlights distinct age and cohort patterns by race and ethnicity. Across each of the ten-year age groups assessed (15–24 through 56–74), by 2022 overdose deaths rates among Black Americans had either reached or surpassed those seen among White individuals (Figure 3A). A more detailed look at single-year birth cohorts from 1940 to 2022 can be found in Figure 3B, for Non-Hispanic Black and Non-Hispanic White individuals. The cohort pattern among White individuals highlights that each generation has experienced overdose mortality rising at progressively earlier ages, with the highest mortality rates now found among individuals born in the 1980s. A distinct pattern is seen among Black individuals, where mortality rates have risen sharply across nearly all birth cohorts during the last 10 years with the introduction of fentanyls. However, the highest rates are now seen among Black individuals born in the 1960s (21). Among White individuals, the highest death rates now occur from ages 25–44. In these younger age groups, by 2022, Black and White overdose death rates had largely equalized. However, among older age groups (45–74) large inequalities have emerged. For instance, the highest overdose death rates among Black individuals can be seen in the 55–64 year old age group, at 101.0 per 100,000 in 2022, representing 2.4 times the rate of 42.8 per 100,000 seen among White individuals in the same age group and year. The particular vulnerability of older Black individuals is somewhat epidemiologically novel, as overdose deaths have

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previously tended to affect younger individuals. These increases represent, at least in part, the precarity of a cohort of Black individuals who have used heroin for decades, and who have been caught off guard by the market takeover of fentanyl.

Among Native Americans, large increases have been observed among individuals age 25–64, with the highest rates seen in the 35–44 age group, with 136.8 per 100,000, representing 1.8 times the rate seen among White individuals of the same age in the same year. These inequalities are known to relate, at least in part, to very high rates of stimulant-involved overdose deaths among Native communities(22). It is also important to note that overdose death rates among Native Americans have been shown to represent an underestimate of the true burden of mortality due to misclassification(23, 24). Therefore, even these stark inequalities reported here likely underestimate the true magnitude of inequalities by 20 to 50%.

Among the youngest age group assessed, individuals age 15–24, overdose death rates among Latinx individuals have largely reached those of Non-Hispanic White and Black individuals, with 15.3, 16.3, and 16.2 per 100,000 respectively in 2022. This again, foreshadows how Latinx individuals are being increasingly affected by the overdose crisis, and are on course to overtake White individuals should recent trends continue(6). Notably, very sharp increases in overdose deaths have occurred among Latinx individuals in each age group assessed.

Geographic Differences in Racial Inequalities

Figure 4 highlights the ratio of overdose mortality among Black, Native, Asian, and Latinx individuals, relative to their White counterparts, by state, in 2010, 2015, and 2022. This figure highlights that racial inequalities in overdose have worsened in virtually every state in the US—however considerable variation can be seen between geographies. In 2010, overdose mortality among Black individuals was higher than that of White individuals in only 5 of 37 states where a comparison could be made (requiring at least 10 deaths in both groups, due to suppression of small numbers). By 2022 Black individuals experienced a higher overdose death rate in 36 of 43 (84%) of states.

For Native American individuals, in 2010 comparisons could be made in 13 states, of which 9 had higher rates for Native individuals compared to their White counterparts. By 2022 this had risen to 24 of 27 states. The sharpest inequalities were seen in states on the Northern border, including Minnesota, Wisconsin, the Dakotas, and Idaho. Of note, although not assessed here, sharp inequalities in overdose death rates are also seen among Indigenous communities in Canada, near to these heavily affected US States (25).

For Latinx individuals, overdose mortality rates were lower than those of Non-Hispanic White individuals in 100% of states assessed in 2010. However, by 2022, in 11 of 43 states assessed, Latinx individuals experienced higher rates. It is critical to recognize that Latinx communities do not represent a homogeneous group, and instead represent numerous subpopulations at highly differential risk to one another. For instance, Puerto Rican individuals have greatly elevated overdose risk relative to Mexican American individuals, due to their very high level of structural vulnerability (26, 27). Asian or Pacific Islander

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individuals across all states had overdose mortality rates that are lower than among their White counterparts in all years assessed. Nevertheless, it is important to similarly recognize that this group contains a diversity of ethnicities and identities, and further work is required to parse apart differential vulnerabilities that these high-level statistics may be masking.

Understanding the Drivers of Racial Inequalities in The Fentanyl Era

Understanding why the shift to a fentanyl-based illicit drug supply has driven sharply rising racial and ethnic inequalities in overdose for Black and Native communities requires situating the overdose crisis in the broader context of deep-seated health inequalities in the United states (28). A key takeaway is that with the shift from a crisis driven largely by products derived from a legal market, to those delivered through an illicit market, racial inequalities have worsened(15). Overdose now resembles the myriad causes of death for which sharp racial inequalities can be seen in the US(29). Collectively these causes of mortality have resulted in Black and Native Americans having life expectancies at birth that are 5.6 and 11.2 years lower than their White counterparts respectively, in 2021(30). These inequalities broadly relate to deep-seated disparities in economic and social conditions, wealth, income, housing, access to high-quality healthcare, exposure to environmental pollution, and numerous other drivers of health and determinants of illness(31). It is also important to consider that increases in overdose deaths have occurred almost exclusively among individuals who have less than a college-level educational attainment, highlighting the importance of intersectional inequalities (32, 33). Nevertheless, there are a number of specific factors relating more uniquely to the overdose crisis that must also be considered.

With the increased danger presented by a fentanyl-based drug supply, the risk of post incarceration overdose has greatly increased (34, 35). Although the exact fraction of overdose deaths that involve individuals recently released from jail or prison is not known, it is likely to be considerable (36, 37). Numerous studies have found extremely sharp increases in overdose risk in the immediate period after release from incarceration (34). This risk partially relates to the fact that individuals who have been incarcerated have been socially isolated—cut off from the social networks that can keep them informed of evolving risks in the drug landscape. They are also frequently cut off from needed health and social services; their criminal record itself often disqualifies them from social benefits such as public housing. In many cases, individuals have also received no treatment for their substance use disorder while incarcerated and have been exposed to highly traumatizing events in the often-brutal US prison and jail systems, which worsen substance use patterns and mental illness. Additionally, during incarceration, individuals may have no access to, or less frequent access to illicit opioids, which leads to a decrease in opioid tolerance, thus rendering them more vulnerable to overdose upon return to use. Release from incarceration therefore represents a key risk factor driving the overdose crisis. Combined with the mass incarceration of Black and Native individuals at far higher rates than their White counterparts(38, 39), this is a clear structural driver of rising racial inequalities in overdose.

The moment of release from incarceration is a key opportunity for intervention. Providing incarcerated individuals with medications for opioid use disorder (MOUD) for instance has been shown to drastically reduce their risk of post-release overdose death (37). Yet

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despite the clear mortality benefit, a huge fraction of people who are incarcerated still do not have access to MOUD. Moving forward, individuals leaving carceral settings should be universally offered MOUD—funded through Medicaid or other specially dedicated federal funds. This would require concerted federal leadership, and a shift in federal policy, however it would represent a powerful effort to combat one of the key drivers of the overdose crisis.

Another critical factor for understanding racial inequalities and the overdose crisis can be found in inequalities in access to MOUD and other substance-related healthcare (40, 41). Numerous studies have found that Black individuals are far less likely than White individuals to be successfully recruited into MOUD programs following a sentinel interaction with the healthcare system(41). Black victims of fatal overdose are significantly less likely than their White counterparts to have previously received MOUD (42). Again, we must recognize that the wider context of the for-profit U.S. healthcare system has often made accessing MOUD costly and complicated, requiring out of pocket expense, and navigating bureaucratic hoops. The removal of the X-waiver requirement from the Drug Enforcement Agency required to prescribe buprenorphine provides a powerful opportunity for a broad swath of primary care physicians working in clinics serving minoritized communities to prescribe buprenorphine in general medical settings. Nevertheless, efforts must go beyond this recent change, as historically only a fraction of providers with x-waivers have put them to use prescribing buprenorphine(43).

There are also important disparities in access to harm reduction services (a set of practical strategies and ideas aimed at reducing negative consequences associated with drug use), and a broad swath of other related support and social services, which can help provide people who use drugs with the stability needed to avoid overdose amidst a dangerous drug supply (44, 45). For instance, profound inequalities have been noted between Black and White patients in naloxone distribution, as well as buprenorphine prescription(40, 46, 47). Each of these represents actionable gaps in access to technologies that can assist people who use drugs in remaining safe in the face of an increasingly toxic illicit drug supply Lack of access to these resources represent key—yet solvable—barriers.

For Native communities, recent increases in overdose deaths must be understood in the deep historical context of structurally induced social and health inequalities. Hundreds of years of genocide, disenfranchisement, social and economic isolation, and impoverishment are key factors highlighted by Native scholars as drivers of health inequalities broadly, and more specifically crises of mental health, suicide, substance use disorders, and overdose. (20, 48, 49). The historic underfunding of the Indian Health Service, and lack of access to culturally-appropriate, Native-led behavioral healthcare represent some of the most actionable areas for immediate intervention (20, 24, 50). We find here that Native communities have long been among the groups most affected by the overdose crisis. However, this has not received the same attention that overdose mortality among White individuals during the first wave of the crisis, and now Black individuals during the third and fourth waves, has garnered. This highlights a persistent theme of exclusion of inequalities among Native communities from public view and discourse, which Native scholars have argued connect back to a long history of exclusion and isolation in the United States.

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The lower mortality rates among Latinx communities, for various causes of death, compared to their White counterparts, despite higher levels of poverty and decreased access to many of the key social determinants of health, has often been referred to as the “Hispanic Health Paradox”(51, 52). Similar trends can be observed for overdose deaths. However, Latinx communities are highly heterogenous in composition, including various subpopulations that are at particularly high, and some that are at quite low, risk of substance use disorders and overdose. For instance Puerto Rican individuals have been shown to be at extremely elevated risk compared to other groups(26, 53, 54). These inequalities relate, at least in part, to the stark structural disadvantages for Puerto Rican individuals who moved from agricultural areas of Puerto Rico to racially-segregated parts of the mainland US, in the midst of deindustrialization, and faced profound economic and social exclusion(27). Immigration dynamics are also essential for understanding overdose death rates among Latinx communities. Nearly half of the adult Latinx population is foreign-born, and overdose death rates among foreign-born individuals have been shown to be considerably lower than US-born Latinx individuals (54). Given much lower substance use and overdose rates in Latin America, compared to the US, and the increasing risk among the children of Latinx immigrants compared to their parents, exposure to US society during formative years has been conceptualized as a key vector of risk for developing a substance use disorder among migrant families(55). Given that we observe a closing of the gaps between Latinx and non-Latinx individuals among the youngest age groups currently, these trends may reverse in the near future as overdose death rates climb sharply among new generations of US-born Latinx individuals.

Inequalities in overdose mortality—as well as overall mortality and life expectancy—worsened considerably during the COVID-19 pandemic, along lines of race/ethnicity as well as measures of socioeconomic status such as educational attainment(5, 32, 33). Rapid spikes in overdose during the pandemic have been hypothesized to relate to greater psychological stress and isolation, disruptions to substance use or mental health treatment, and disruptions in the illicit drug supply. Each of these factors has been shown to lead to more dangerous drug use, and requires increased resources to achieve safety. Given the increased economic precarity, experienced disproportionately by minoritized communities, each of these factors likely played a role in short-term spikes in inequalities. However, long-term trends in inequalities were rising prior to COVID-19, and pandemic-related disruptions likely only accelerated processing already occurring(56).

Inequalities in underlying health conditions that predispose individuals to overdose must also be considered, such as lung disease, increasing the risk of opioid-induced respiratory depression, or liver disease—including from hepatitides(57) — reducing the metabolism of opioids. With the rising contribution of stimulants to the overdose crisis, sharp inequalities in untreated hypertension and other cardiovascular risk factors are likely also playing an important role (58, 59).

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Overdose Interventions Will Worsen Inequalities Unless Tailored To Reduce Them

In the face of the rapidly escalating drug overdose crisis in the US, numerous interventions have been funded at the federal, state, and local levels. However, it is critical that we recognize that these interventions will not automatically address the sharply rising racial and ethnic inequalities that are documented here. In fact, a powerful sociological theory known as Fundamental Cause Theory demonstrates that these interventions may actually worsen inequalities unless they are directly tailored to reduce them(60).

Fundamental cause theory seeks to explain the enduring persistence of health inequalities by socioeconomic status, despite all of the material progress and technological advancements seen in recent decades (60, 61). It describes how a flexible set of social and cultural resources—which can be collectively described as social capital—serve to empower more privileged individuals as they adapt to evolving contexts. Social conditions are therefore adaptable resources that function in an ever-changing variety of manners, leading to health inequalities. This helps us understand how new technologies (the application of scientific knowledge for practical purposes)—such as MOUD—often benefit the most privileged individuals in society. Although the overdose crisis predominates in communities with less education and among individuals pertaining to minoritized racial and ethnic groups, the people most likely to access MOUD and other substance-use treatment innovations are more likely to be highly educated and possess greater social capital.

Another very instructive example can be found in vaccine distribution during the COVID-19 pandemic(62). Despite government acquisition and distribution of COVID-19 vaccines, wealthier and higher SES individuals had far more access to vaccines during initial rollouts in the midst of scarcity. As access to vaccines often required being able to navigate highly bureaucratic environments, such as web platforms, phone lines, and reservations systems, skills, technological understandings, and scheduling flexibility, represented social resources with a large impact on *de-facto* vaccine access. Parallels can be drawn to individuals currently trying to access substance use related health care in the often complex U.S. healthcare system.

In this manner, Fundamental Cause Theory shows us a relevant, nearly universal truth of implementation science: new technologies and programs typically end up favoring more privileged groups, thereby initially widening inequalities. Therefore, interventions designed to reduce addiction and overdose death rates that are not explicitly designed to improve racial/ethnic inequalities will, unintentionally, likely end up worsening them. Endeavors seeking to be “race neutral” will likely exacerbate disparities. Instead, incentives to provide care to individuals in difficult-to-reach, minoritized communities, must be codified into the bureaucratic mechanisms that provide programmatic funding for much of the substance-use related services in the US. Well-funded community-based programs, with Black and Native leadership, providing MOUD in the context of comprehensive, culturally appropriate healthcare and other services, represent the highest priority interventions to decrease inequalities. By definition numerous and diverse models will be required, in order to address the highly diverse contexts in the United States within which the overdose crisis

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is unfolding. Powerful examples can already be found of interventions that explicitly seek to address racial and ethnic inequalities as a core aspect of their implementation.

Inspiration can be drawn from the Imani Breakthrough program, a culturally-informed, community-based approach to substance use that is a partnership between a university Psychiatry department and Black and Latinx churches (63–65). The program seeks to serve individuals for whom religious practice functions as a social resource that can improve stability and decrease rates of chaotic drug use likely to lead to drug overdose. The program also leverages harm reduction approaches, centers lived experience through the employment of its facilitators, embodies culturally-responsive care, and features Black and Latinx leadership. Initial results of the program have been positive, with individuals successfully recruited and retained in a culturally-sensitive model(64). Among Native American communities, very successful programs have been implemented providing MOUD integrated with traditional healing practices(66, 67). Looking across distinct examples, what can be learned is that programs explicitly targeted to reduce inequalities often employ less vertical power structures to implement change. Many such models draw upon methods from community based participatory research, where members from the community being served are at a minimum consulted, and ideally hold leadership positions, at every level of implementation. Similarly, programs must be implemented in culturally relevant ways so as to be maximally synergistic with understandings and forms of healing that are most appropriate in each context.

The overdose crisis in the US is of an unprecedented magnitude. We face far higher overdose death rates than those seen among other nations(68). Data show that this crisis is growing progressively starker along lines of race and ethnicity. In response, as a nation we must employ restorative justice and social-structural interventions that empower minoritized communities with the resources they need to keep themselves safe, to create healthful community environments, and to build more robust mental health and addiction services. In the absence of significant structural changes, the overdose crisis that has already ended the lives of more than one million individuals since the turn of the century is likely to increasingly exact a devastating toll on marginalized communities across the US.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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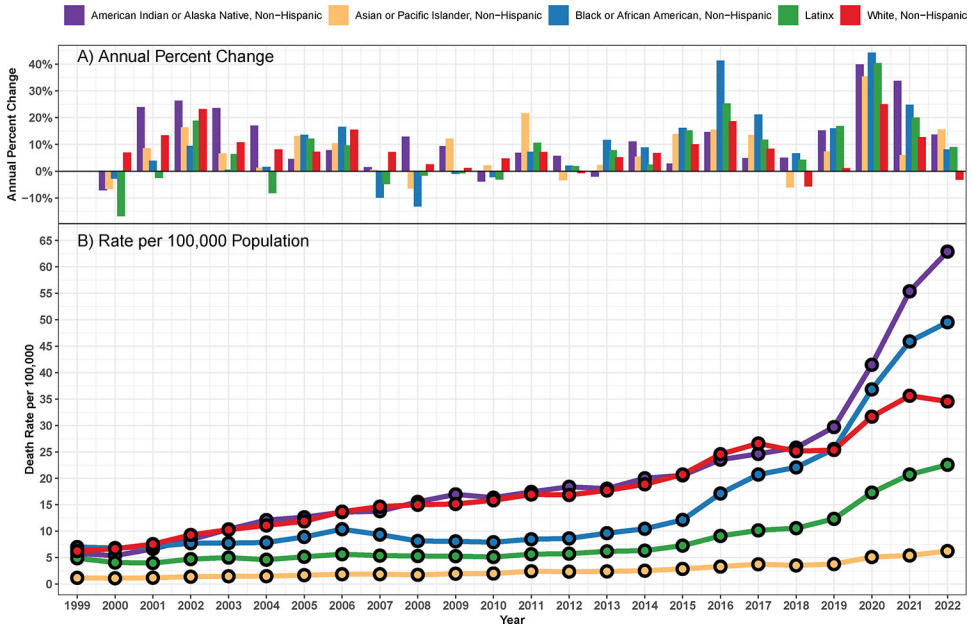


Figure 1. Drug Overdose Mortality by Race/Ethnicity, 1999–2022

Year-to-year percent change in drug overdose mortality by race/ethnicity (top). Drug overdose mortality per 100,000 population by race/ethnicity (bottom). All data were obtained from CDC WONDER. Records from 2022 are provisional and trends may change slightly in final numbers.

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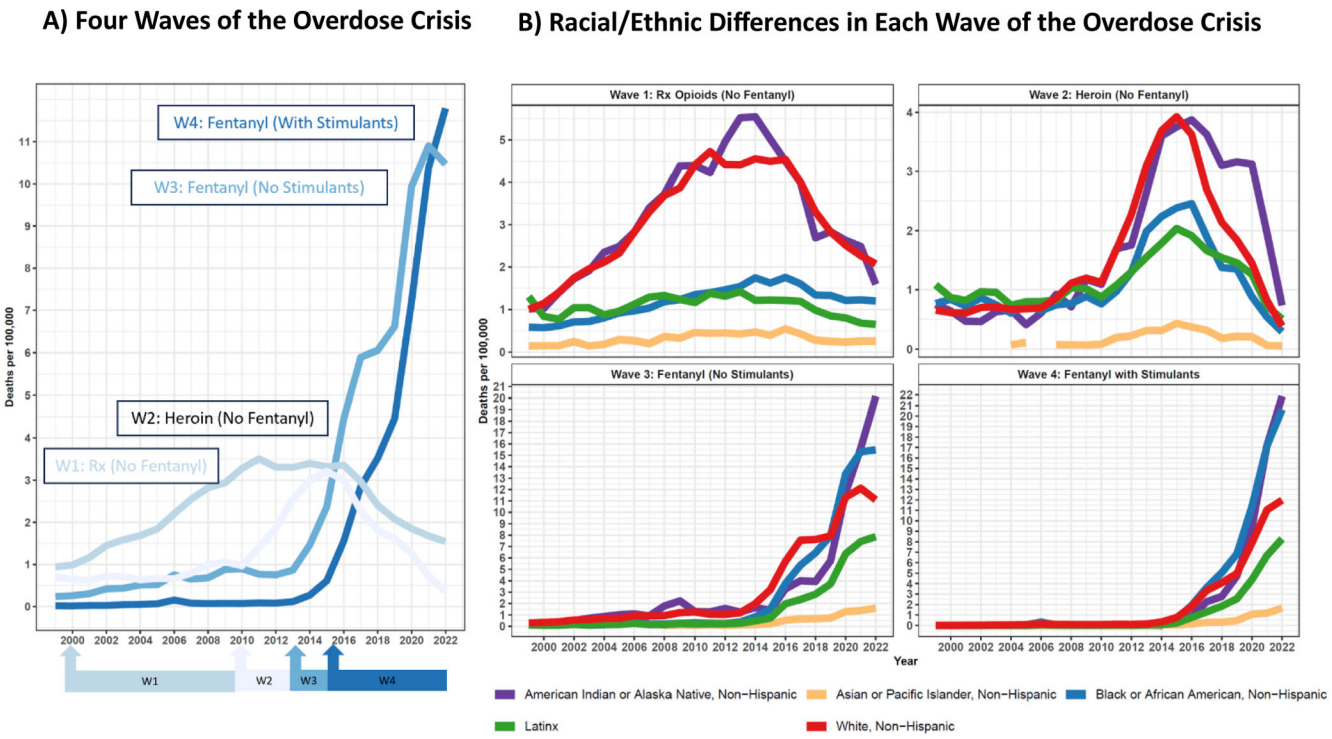


Figure 2. Overall and Race/Ethnicity Trends in the Four Waves of the Overdose Crisis

(Left) A simplified representation of the four waves of the United States overdose mortality crisis. The arrows at the bottom of the graph highlight the onset year of each wave. W1 = Wave 1, starting in the early 2000s, represented by deaths involving prescription opioids (shown here with fentanyl-involved deaths removed). W2 = Wave 2, starting in 2010, represented by deaths involving heroin opioids (shown here with fentanyl-involved deaths removed). W3 = Wave 3, starting in 2013, represented by deaths involving fentanyl and other synthetic opioids (shown here with stimulant-involved deaths removed). W4 = Wave 4, starting in 2015, represented by deaths involving fentanyl and stimulants. (Right) Trends by racial/ethnic group in each wave of the overdose crisis. Each racial/ethnic group is shown by color, separately for each wave of the overdose crisis (as defined in the left panel). All data were obtained from CDC WONDER. Records from 2022 are provisional and trends may change slightly in final numbers.

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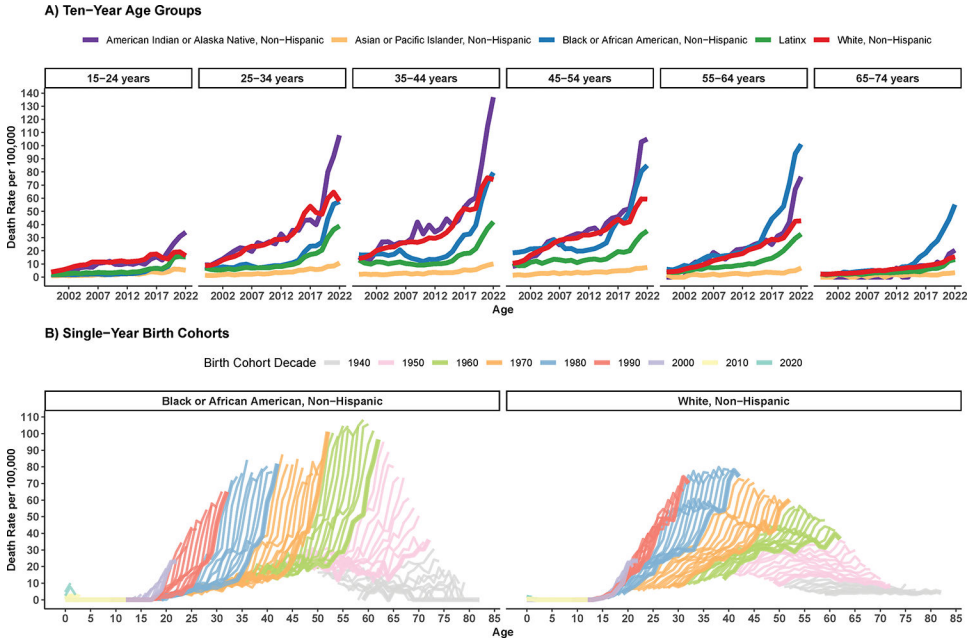


Figure 3. Racial Differences in Age-Period-Cohort Dynamics in the US Overdose Crisis

(Top) Drug overdose mortality per 100,000 population by race/ethnicity is shown for ten-year age groups from 15–24 to 65–74, with progression over year, for the years 1999 to 2022. (Bottom) Drug overdose mortality per 100,000 population is shown for single year birth cohorts spanning 1940–2022, with progression over age, with color corresponding to the decade of each birth cohort. All data were obtained from CDC WONDER. Records from 2022 are provisional and trends may change slightly in final numbers.

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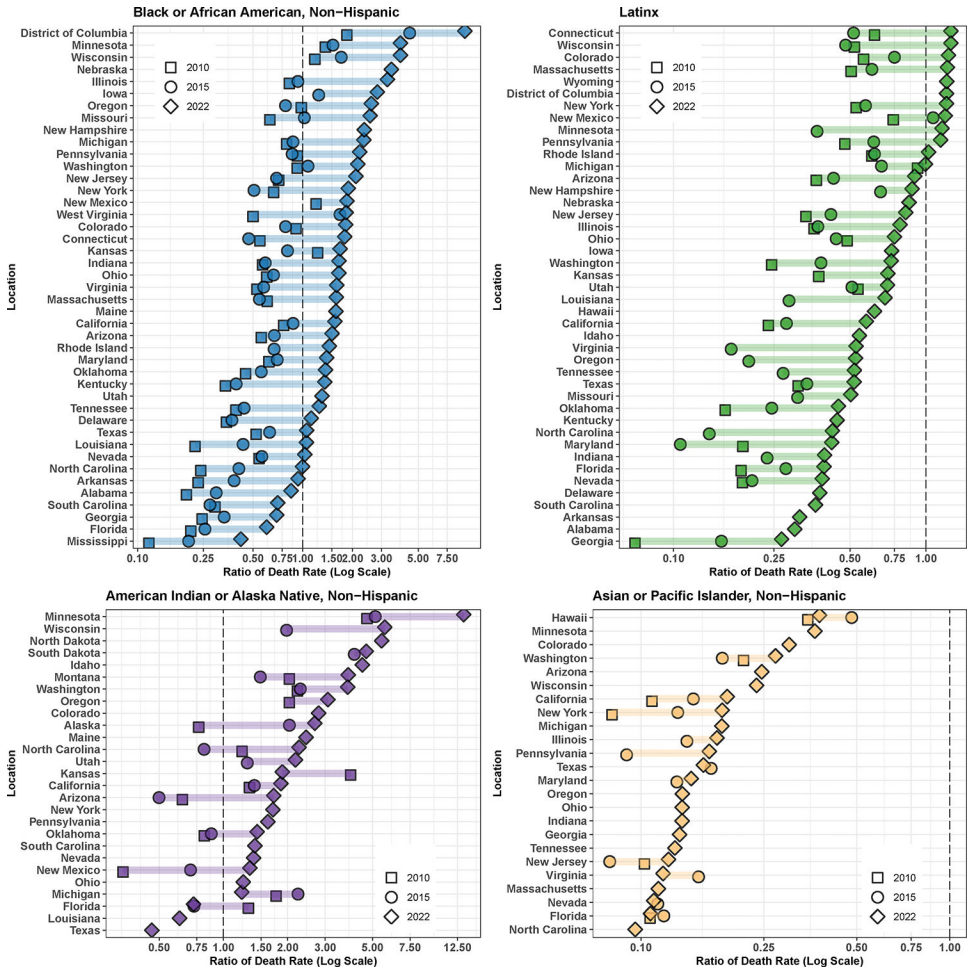


Figure 4. State-Level Ratio of Overdose Deaths Among Minoritized Groups to Non-Hispanic White Individuals, 2010, 2015, and 2022

The ratio of drug overdose mortality per 100,000 population among four minoritized groups, compared to Non-Hispanic White individuals, at the state-level, in 2010, 2015, and 2019. Points are only shown for all state-years with sufficient number of overdose deaths to make a comparison. A vertical dashed line highlights a ratio of 1.0, indicating the same rate as Non-Hispanic White individuals. All data were obtained from CDC WONDER. Records from 2022 are provisional and trends may change slightly in final numbers.