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Extreme Vulnerability to Overdose Mortality: Intersections of Detailed Race/Ethnicity, Educational Attainment, Age, Sex, and Nativity

Manuel Cano[1,*], **David T. Zhu**[2], **Joseph R. Friedman**[3]

[1]School of Social Work, Arizona State University

[2]Medical Scientist Training Program, School of Medicine, Virginia Commonwealth University

[3]Department of Psychiatry, University of California San Diego

Abstract

Background: This study examined which specific sociodemographic groups are most affected by drug overdose deaths in the United States (US).

Methods: The study consisted of a cross-sectional analysis of US death certificate data (2018–2023) from 512,198 drug overdose deaths. We calculated drug overdose mortality rates and proportionate mortality for subpopulations formed based on the concurrent intersection of detailed race/ethnicity, sex, age, nativity, and educational attainment.

Results: In the US, 2018–2023, of all subpopulations examined, male foreign/territory-born Puerto Rican Americans ages 35–49 with a high school education or lower experienced the highest estimated drug overdose mortality rate (261.9 per 100,000) and highest overdose proportionate mortality (with overdoses accounting for 42.8% of all deaths in the group). Following this group, the highest overdose mortality rates (per 100,000) were observed in: male US-born Non-Hispanic (NH) American Indian/Alaska Native Americans ages 35–49 with a high school education or lower (235.2); male foreign/territory-born Puerto Rican Americans ages 50–64 with a high school education or lower (218.4); and male US-born NH Black Americans ages 50–64 with a high school education or lower (213.2). Elevated overdose proportionate mortality was observed in female US-born NH White-and-Black Americans ages 21–34 with a high school education or lower and male US-born South Americans ages 21–34 with a high school education or lower (with overdoses accounting for 42.2% and 42.1% of all deaths in these groups, respectively).

Conclusions: Low educational attainment intersects with risks related to age, sex, nativity, and racial/ethnic identification to shape disparities in US drug overdose deaths.

[*]Corresponding Author: Manuel Cano; mcanomor@asu.edu.

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Keywords

drug overdose; mortality; race; disparity

1. Introduction

Recent declines in drug overdose deaths in the United States (US) have not reached all racial/ethnic groups equally; from 2022–2023, overdose death rates decreased in the Non-Hispanic (NH) White population while remaining stable or increasing in several other racial/ethnic groups (Garnett and Miniño, 2024). Identifying which populations continue to experience disproportionate rates of fatal overdoses is critical in ensuring that harm reduction and treatment are implemented effectively and equitably.

Disparities in overdose deaths have been well-documented in studies comparing major racial/ethnic groups (e.g., Garnett and Miniño, 2024; Friedman and Hansen, 2022; Friedman et al., 2024; Han et al., 2022), but reliance on broad classifications (e.g., "Hispanic," "Asian") can obscure within-group heterogeneity and mask disparities in specific subpopulations (Cano, 2020; Cano and Gelpí-Acosta, 2022; Zhu and Park, 2025). Moreover, the literature on intersectionality highlights how race and ethnicity interact with other dimensions of identity (e.g., age, gender, educational attainment) to create different positions in social hierarchies (López et al., 2017; López and Gadsden, 2017). These social hierarchies reflect power dynamics embedded in society that influence social determinants of health such as education, housing, and employment, ultimately shaping health outcomes and disparities (López et al., 2017; López and Gadsden, 2017).

Prior studies of drug overdose disparities (e.g., Althoff et al., 2020; Cano and Sparks, 2022; Friedman et al., 2024; Ho, 2017; Jones et al., 2024; Lippold and Ali, 2020; Monnat, 2022; Powell, 2023) have explored the intersection of race with one or two additional demographics (e.g., race and sex, race and age and region). The present study builds on earlier work in two specific ways: 1) leveraging detailed race/ethnicity categories (e.g., Chinese instead of "Asian," Mexican instead of "Hispanic"); while 2) examining drug overdose mortality at the *concurrent* intersection of five demographic dimensions, rather than two or three demographics at a time. The five demographics examined in this study–racial/ethnic group, nativity, sex, age, and educational attainment —may be considered dimensions of identity which often form part of the values and experiences that may be relevant when designing culturally responsive services. At the same time, these demographics also reflect historical and contemporary societal, structural, and environmental factors that influence access to health-protective resources and exposure to health risks.

In this study, we consider race as a social construct (Roth et al., 2023). Rather than reflecting self-identified race, death certificate data specify an individual's observed race (Roth, 2016, 2018); observed race (the way others perceive/label a person's race) shapes an individual's experiences and opportunities throughout life (López and Hogan, 2021; Roth, 2018). Just like race/ethnicity, nativity and educational attainment are often markers of social position, associated with access to resources and exposure to risks. These measures are not

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exhaustive, yet examining their intersection represents a step toward a deeper understanding of drug overdose disparities, which reflect inequalities in factors such as living conditions and neighborhood contexts, stress, stigma, unemployment and poverty, underlying health conditions, criminal/legal involvement, and access to effective and appropriate treatment (Park et al., 2020; Valasek and Bazzi, 2023).

2. Methods

2.1 Data

Mortality data were drawn from the National Center for Health Statistics (NCHS) restricted-access Multiple Cause of Death file, which compiles death certificate data from 57 US vital statistics jurisdictions through the Vital Statistics Cooperative Program (National Center for Health Statistics, 2024). The study was restricted to US resident deaths in any of the 50 US states or District of Columbia (DC) from 2018–2023. We combined six years of data for robust estimates given the relatively small size of some of the subgroups examined. The year 2023 represented the most recent year with restricted-access data available, and pre-2018 data were excluded from the main analyses because pre-2018 data used a race categorization system in which multi-race responses were reclassified into a “bridged” race category (Heron, 2021).

Consistent with prior studies (Cano and Gelpí-Acosta, 2022; Cano and Sparks, 2022; Powell, 2023; Xu et al., 2024; Zhu and Park, 2025), we obtained population estimates from the US Census Bureau’s American Community Survey (ACS), using 2023 five-year estimates from IPUMS microdata with person-level survey weights (Ruggles et al., 2025). We were unable to use other population sources (e.g., US Census Bureau postcensal estimates, US Decennial Census, or Current Population Survey) as they lack nativity and/or detailed race/ethnicity categories.

2.2 Measures

Drug overdose deaths were identified from the Multiple Cause of Death file via International Classification of Diseases-10 (ICD-10) codes of X40–44 (unintentional drug poisoning), X60–64 (intentional/suicide drug poisoning), X85 (drug poisoning classified as homicide), or Y10–14 (drug poisoning of undetermined intent) as reported on the death certificate as underlying cause of death per a medical certifier (e.g., coroner, medical examiner). Demographics in the Multiple Cause of Death data are drawn from death certificates; funeral directors complete the demographic information on death certificates, ideally in consultation with the decedent’s next of kin (Arias et al., 2016). In contrast, demographics in the ACS are based on respondent self-report. We examined: race/ethnicity; sex; age category; nativity (place of birth); and educational attainment, using consistent categories across both the Multiple Cause of Death data and the ACS data.

Race/ethnicity categories were selected from the most detailed options available in the Multiple Cause of Death file, comprising 19 mutually-exclusive (but not exhaustive) groups: Non-Hispanic (NH) White only; NH Black only; NH American Indian/Alaska Native (AI/AN) only; NH White-and-Black; NH White-and-AI/AN; Mexican; Puerto Rican;

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Cuban; Dominican; Central American; South American; NH Asian Indian; NH Chinese; NH Filipino; NH Japanese; NH Korean; NH Vietnamese; NH Hawaiian; and NH Samoan. We excluded categories with small numbers that would preclude further disaggregation (e.g., Spaniard, NH Guamanian, NH Black-and-Asian) and categories lacking specificity, such as "NH Other Asian" (0.25% of all overdose deaths) or "NH Other Pacific Islander" (0.04% of all overdose deaths).

Sex was coded as male or female in our data source. We coded age into categories of 0–20, 21–34, 35–49, 50–64, and 65+. We categorized nativity as "born in the US" (50 states or DC) versus "born in a foreign country or a US territory" (e.g., Puerto Rico). We coded educational attainment as "high school education/GED/lower" versus "some college+." Several prior studies of education and mortality (e.g., Case and Deaton, 2015) include a separate category for "Bachelor's degree+"; however, this category accounts for less than 7% of overdose deaths (Centers for Disease Control and Prevention, 2025) and thus was included within the "some college+" category in the present study.

2.3 Analyses

We examined two different drug overdose mortality outcomes: (1) proportionate mortality and (2) mortality rates. (1) Proportionate mortality measures the percentage of all deaths that were attributed to the specific cause (drug overdose), given in the present study as:

$$\frac{number\ of\ overdose\ deaths\ in\ specific\ demographic\ subgroup,\ 2018\ -\ 2023}{number\ of\ deaths\ from\ all\ causes\ in\ specific\ demographic\ subgroup,\ 2018\ -\ 2023} \times 100$$

(2) Mortality rates measure deaths per living population, given in the present study as:

$$\frac{mean\ yearly\ number\ of\ overdose\ deaths\ in\ specific\ demographic\ subgroup,\ 2018\ -\ 2023}{estimated\ yearly\ population\ size\ of\ specific\ demographic\ subgroup,\ 2018\ -\ 2023} \times 100{,}000$$

We included these two measures because each provides distinct information with specific strengths and limitations; whereas mortality rates can be used to compare drug overdose deaths per capita in different groups, proportionate mortality can be used to compare the extent to which drug overdose contributes to deaths in different groups. Mortality rates are limited by uncertainty in population estimates and differences between death certificate versus self-reported race classification. In contrast, proportionate mortality is not subject to the limitations related to population estimates but is always influenced by rates of other causes of death.

We calculated proportionate mortality and mortality rates for 684 detailed demographic subgroups formed by the intersection of racial/ethnic category, sex, age category, nativity, and educational attainment (e.g., US-born NH Chinese male ages 35–49 with at least some college education). Educational attainment was not included in subgroups for the age category 0–20, considering that education is often in progress during this age range. We limited results to subgroups with at least 20 drug overdose deaths over 2018–2023 to avoid presenting estimates from very small subgroups; population estimates from very small subgroups generally involve more uncertainty/error, and random variation of just one or

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two deaths recorded could produce a substantial change in the proportionate mortality. The threshold of 20 deaths was consistent with the NCHS threshold for “reliable” rates (Centers for Disease Control and Prevention, 2025; Garnett and Miniño, 2025).

Our subgroup analyses initially included 514,303 overdose deaths in which the decedent: was categorized in one of the 19 racial/ethnic categories examined in the study; and was not missing data on educational attainment (for 21+), age, sex, Hispanic origin, or nativity. After further excluding subgroups with fewer than 20 deaths, 512,198 overdose deaths remained, representing 93.2% of the total 549,443 drug overdose deaths in the US from 2018–2023.

We also conducted a post-hoc analysis of the four subgroups with the highest estimated drug overdose mortality rates (i.e., with rates above 200 deaths per 100,000 persons); we calculated overdose mortality rates incrementally, starting by race alone and subsequently adding one additional sociodemographic factor in each step (race plus sex, followed by race plus sex and nativity, etc.). Finally, we summarized key characteristics of overdose deaths in the four subgroups with the highest estimated drug overdose mortality rates, including percentages of overdose deaths that: 1) were coded as *accidental/unintentional* (ICD-10 codes X40–44 as underlying cause of death); 2) had a contributing/multiple cause of death corresponding to synthetic opioids (ICD-10 code T40.4; category excludes methadone), cocaine (T40.5), or psychostimulants such as methamphetamine (T43.6; category excludes cocaine); and 3) occurred in residents of each US Census Region. We also identified states with the highest numbers of resident deaths in each of these four subgroups.

2.4 Supplemental Analyses

First, we repeated our analyses of proportionate mortality using data from 2013–2017 (the years immediately preceding the time frame used in the main analyses; Supplemental Figure S1), in consideration of prior research indicating notable changes over time in terms of which racial/ethnic groups experienced the highest overdose mortality rates in the US (Friedman and Hansen, 2022; Friedman et al., 2024). Second, because multiple small subgroups had fallen below the threshold of 20 deaths in main analyses, we re-calculated proportionate mortality without dividing by age or education (Supplemental Table S1). This analysis was focused on ages 21–64 (the age range comprising most overdose deaths). To examine geographic variation, we repeated this analysis for each US census region individually (Supplemental Tables S2–5). Last, we calculated proportionate mortality using more detailed age categories of 0–17 and 18–25 (Supplemental Tables S6–7), based on developmental stages.

3. Results

3.1 Proportionate Mortality

Figure 1 presents *proportionate mortality*, or the percentage of all deaths in each subgroup that were attributed to drug overdose, 2018–2023. *Overall*, drug overdose proportionate mortality was highest in male foreign/territory-born Puerto Rican Americans ages 35–49 with a high school education or lower; overdoses accounted for 42.8% of all deaths in this subgroup. Drug overdoses also accounted for 42.2% of all deaths in female US-born

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NH White-and-Black Americans ages 21–34 with a high school education or lower and 42.1% of all deaths in male US-born South Americans ages 21–34 with a high school education or lower. When focusing on *ages 0–20* only, male foreign/territory-born Central Americans ages 0–20 had the highest drug overdose proportionate mortality; drug overdoses accounted for 12.7% of all deaths in this group. Focusing on ages *65+ only*, male US-born Puerto Rican Americans with a high school education or lower had the highest drug overdose proportionate mortality, with drug overdoses accounting for 2.0% of all deaths in this group. In supplemental analyses examining proportionate mortality across earlier years (2013–2017; Supplemental Figure S1), different regions (Supplemental Tables S2–5), or different youth age categories (Supplemental Tables S6–7), additional variation and additional subgroups with high proportionate mortality were observed. At the same time, US-born NH White-and-Black subgroups consistently experienced relatively high proportionate mortality across regions and in ages 18–25.

3.2 Overdose Mortality Rates

Figure 2 presents *drug overdose mortality rates* (instead of proportionate mortality) for each demographic subpopulation with at least 20 overdose deaths from 2018–2023. Across all subpopulations examined, the *overall* highest estimated drug overdose mortality rate was observed in male foreign/territory-born Puerto Rican Americans ages 35–49 with a high school education or lower (261.9 per 100,000), followed by male US-born NH AI/AN Americans ages 35–49 with a high school education or lower (235.2 per 100,000), male foreign/territory-born Puerto Rican Americans ages 50–64 with a high school education or lower (218.4 per 100,000), and male US-born NH Black Americans ages 50–64 with a high school education or lower (213.2 per 100,000). Within *female* subgroups specifically, the highest estimated drug overdose mortality rate was observed in female US-born NH AI/AN Americans ages 35–49 with a high school education or lower (176.3 per 100,000). When focusing on *ages 0–20*, the highest estimated drug overdose mortality rates were observed in male foreign/territory-born Central American (9.9 per 100,000) and male US-born NH AI/AN (8.6 per 100,000) groups. Focusing on *ages 65+* only, male US-born NH Black Americans with a high school education or lower had the highest drug overdose mortality rate (81.8 per 100,000).

Figure 3 focuses on the four specific subgroups with the highest overdose mortality rates, illustrating escalating mortality rates by the intersection of an increasing number of sociodemographic factors. Patterns differed between group; for example, adding male sex resulted in greater increases in overdose mortality rates for Puerto Rican and NH Black populations compared to the NH AI/AN population, and the addition of nativity and lower educational attainment produced the greatest increase in overdose mortality rates in the Puerto Rican male population. Finally, as shown in Table 1, overdose deaths in the four subgroups with the highest overdose mortality rates differed considerably in terms of region and drug involvement. For instance, synthetic opioids were most frequently reported in deaths in the Puerto Rican subgroups, concentrated in the Northeast, whereas psychostimulants like methamphetamine were most frequently reported in deaths in the NH AI/AN subgroup, concentrated in the West.

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4. Discussion

This study examined US drug overdose proportionate mortality and mortality rates across detailed intersections of specific race/ethnicity, sex, age, nativity, and educational attainment. The time frame of this study (2018–2023) included the COVID-19 pandemic and the spread of illicitly manufactured fentanyl westward across the US. The pandemic was accompanied by disruptions to social support, employment, healthcare and substance use treatment systems, and illicit drug supply chains, and many pandemic impacts were disproportionately experienced by minoritized populations (Friedman and Hansen, 2022; Friedman et al., 2024; Ghose et al., 2022). Results of this study highlighted disparate drug overdose mortality rates in several racial/ethnic minority subgroups and subgroups with lower educational attainment (a proxy measure of socioeconomic status). Disparities in specific subgroups in this study suggest that “one size fits all” programs and policies (that do not account for distinct risks and barriers experienced by different groups) may leave behind populations at high risk of drug overdose death, and an intersectional understanding of the sociodemographic dimensions of overdose vulnerability may help more effectively target prevention efforts.

4.1 Results Consistent with Prior Literature on Educational and Race Disparities

A body of prior literature has demonstrated disproportionately high drug overdose mortality rates in Americans with lower educational attainment (e.g., Powell, 2023; Xu et al., 2024). Findings from the present study add that this pattern is consistently observed across demographic/intersectional groups, although there is likely additional variation by detailed education level (e.g., Cano and Gelpí-Acosta, 2022; Powell, 2023) beyond the two categories used in this study.

Previous studies have also documented disparities in drug overdose mortality for NH Black, NH AI/AN, and Puerto Rican populations in the US in the fentanyl era (Cano and Gelpí-Acosta, 2022; Friedman and Hansen, 2022; Friedman et al., 2024; Han et al., 2022). In the present study, many of the subgroups with the highest drug overdose mortality rates pertained to these three racial/ethnic categories. This likely reflects cumulative structural disadvantage, including residential segregation, poverty, and disproportionate criminal penalties for drug use in racial/ethnic minoritized populations, as well as barriers to evidence-based treatment (Friedman et al., 2024). For example, studies indicate that minoritized groups are less likely to be prescribed (or have geographic access to) medications for opioid use disorder (MOUD), especially buprenorphine, further impacted by Medicaid-related gaps, limited availability of culturally appropriate care, and clinic closures in underserved areas (Amiri et al., 2024; Barnett et al., 2023; Lagisetty et al., 2019). Such clinical disparities compound upstream social determinants that increase vulnerability to substance use and fatal overdose (Park et al., 2020).

Each intersectional subgroup may experience distinct combinations of historical and contemporary structural influences on health and wellbeing. For instance, historically, Puerto Rico’s status as a US colony and territory limited economic opportunities on the island, driving employment-motivated migration to rust-belt cities in the mainland US even as de-industrialization reduced available jobs in these areas and left dilapidated buildings,

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shuttered factories, and a scarcity of employment outside of the narcotics industry (Bourgois et al., 2021; Hart et al., 2025). Contemporary ethnographic research details high poverty, residential segregation, neighborhood violence, chronic incarceration, and constrained economic opportunities and social mobility in Puerto Rican communities in Philadelphia, Pennsylvania (Bourgois et al., 2021; Friedman et al., 2019). Qualitative research with Puerto Rican migrants who use drugs in New York City also documents internalized stigma rooted in experiences of a primarily abstinence-based treatment system in Puerto Rico, adverse impacts of trauma or displacement from Puerto Rico's natural disasters and economic crises, drug use practices acquired in Puerto Rican prisons that increase vulnerability to HIV and hepatitis C, and a shortage of services that are culturally appropriate and accessible in mainland US areas (Gelpí-Acosta et al., 2019, 2021). These are only a few examples of social and economic factors that may contribute to the disproportionate drug overdose mortality rates and proportionate mortality in the subgroup of territory-born Puerto Rican-heritage males ages 35–49 with a high school education or lower.

4.2 New Findings and Departures from Prior Literature

Whereas results regarding disparities by educational attainment and NH Black, NH AI/AN, or Puerto Rican race/ethnicity expanded similar (broader) findings from prior studies, other study results diverged from patterns in prior literature. For instance, in the youngest age group (0–20 years of age), the male foreign-born Central American group had the highest drug overdose mortality rate and proportionate mortality. This contrasts with prior literature documenting comparatively low drug overdose mortality rates in the Central American-heritage US population as a whole (without disaggregating by sex/age; Cano and Gelpí-Acosta, 2022). This also departs from general patterns of lower overdose mortality in foreign-born, versus US-born, groups (Cano and Sparks, 2022). Results of this study indicate that in many subgroups in the 0–20 age, drug overdose mortality rates and proportionate mortality are higher in the foreign-born than the US-born—the reverse of the pattern in other age groups.

Including both drug overdose proportionate mortality and mortality rates in this study highlighted differences between these two measures. For example, differences by educational attainment were relatively less pronounced when examining overdose proportionate mortality rather than overdose mortality rates; moreover, there were a few subgroups, particularly ages 65+, in which proportionate mortality was equal or lower in those with lower versus higher educational attainment. One possible explanation is that overdose proportionate mortality is always relative to other causes of death; many different causes of death are elevated in groups with lower educational attainment (Steenland et al., 2002) and older ages, likely rendering elevated drug overdose mortality less noticeable if measured as a percentage of all deaths when deaths of many causes are elevated. Potentially also reflecting high levels of deaths due to other causes beyond overdoses (Dwyer-Lindgren et al., 2023), many NH AI/AN or NH Black intersectional subgroups in this study had relatively high overdose mortality rates but relatively lower overdose proportionate mortality. In contrast, other specific subgroups (e.g., South American or NH Korean US-born male ages 21–34 with a high school education or lower) had relatively low overdose mortality rates but high overdose proportionate mortality; that is, overdoses

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accounted for a large share of all deaths in these groups, even though there were relatively few overdoses per capita in these groups.

Whereas prior studies have primarily examined single race groups, results of the present study also highlight a multiracial subgroup (i.e., “female US-born NH White-and-Black ages 21–34 with a high school education or lower”) as another group with high overdose proportionate mortality. Further research is needed to better understand drug overdose risks for multiracial groups that may face unique identity-related stressors (both internal, such as difficulties integrating multiple racial identities, and external, such as increased exposure to discrimination) that can increase risk for mental health conditions and substance use (Fisher et al., 2019; Franco and Carter, 2019).

4.3 Limitations

First, mortality rates in this study are based on subpopulation estimates from the US Census Bureau’s ACS, representing the best available data yet not a full census; margin of error around these estimates is especially salient for smaller subpopulations. Second, death certificate data are subject to misclassification or underreporting regarding cause of death, overdose intent, and drugs involved (Gutkind et al., 2025), as well as education (Rostron et al., 2010) and race/ethnicity (Arias et al., 2016). Based on levels of race misclassification estimated in an analysis of deaths from any cause (Arias et al., 2016), mortality rates presented in this study are likely to be most notably underestimated for NH AI/AN and Central and South American groups, although levels of misclassification are unknown for some other specific subpopulations.

Third, this study was limited to categories available in national mortality data, including broad categories like White, Black, or AI/AN, which do not distinguish, for example, between Haitian or Nigerian or specific AI tribal enrollment or residence on tribal land. Death certificate data do not include specific heritage within Central or South American groups, and they also provide a limited list of Asian and Pacific Islander groups. Moreover, relatively small subgroup sizes limited the number of groups we presented in main results, since estimates for very small groups could be particularly influenced by any random variation or error.

Death certificate data do not include measures such as income or poverty level, age at the time of immigration (for those born outside the US), housing, mental or physical health, health insurance, treatment history, or history of incarceration. We were also unable to incorporate detailed education levels, geographic measures, year, or decedent occupation because dividing by additional categories would have produced many subgroups too small to examine. Although not included in main analyses, geographic measures are particularly relevant for disparity research due to wide geographic variation in social and economic conditions, illicit drug supply characteristics, and healthcare and drug-related policies and resources, all of which influence risk of fatal overdose (Park et al., 2020). Finally, results from main analyses reflect six years combined (2018–2023); patterns from individual years or different time frames may differ, considering that racial/ethnic disparities in drug overdose deaths have changed substantially over time (Friedman and Hansen, 2022; Friedman et al., 2024).

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4.4 Implications

Taken together, the study's results suggest several implications for drug overdose research, prevention, harm reduction, and treatment. First, disaggregating racial/ethnic categories and accounting for social factors such as nativity and educational attainment is crucial in identifying subpopulations at greatest risk and guiding the development of culturally appropriate interventions. Second, given that lower educational attainment is a consistent risk factor across nearly all subpopulations, comprehensive overdose prevention efforts proactively address such upstream socioeconomic factors. In clinical settings, healthcare providers can screen for social determinants of health and refer patients to clinical or community-based initiatives that offer integrated social services (Park et al., 2020). For example, strengthening partnerships with local agencies can help connect individuals to educational programs, vocational training, and employment support services (Auerbach and Miller, 2019).

Finally, study findings underscore the relevance of equity-driven allocation of overdose prevention, harm reduction, and treatment resources. Clinicians and health systems may prioritize outreach to populations experiencing high overdose mortality by partnering with trusted community members or organizations and incorporating culturally responsive care models. This includes care delivered by providers who reflect the communities they serve and are trained to address cultural, linguistic, structural, and historical barriers to engagement (Banks et al., 2023). Embedding substance use education and harm reduction services in housing programs, reentry support, and mobile outreach can also help reach individuals who may not interact with brick-and-mortar healthcare facilities (Banks et al., 2023; Frankeberger et al., 2023). Overall, care delivery that meets the distinct needs of each subgroup is essential in narrowing overdose disparities in the US.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- Analysis of 2018–2023 US overdose deaths by detailed race/ethnicity, sex, age, nativity, and educational attainment:
- Across all racial groups, the highest overdose mortality rates were in subgroups with lower educational attainment.
- Highest overdose mortality rate and proportionate mortality in territory-born Puerto Rican males ages 35–49 with a high school/lower education.
- Second-highest overdose mortality rate in US-born American Indian/Alaska Native males ages 35–49 with a high school/lower education.
- Overdoses accounted for 42% of all deaths in those identified as female US-born Non-Hispanic White-and-Black ages 21–34 with a high school/lower education.

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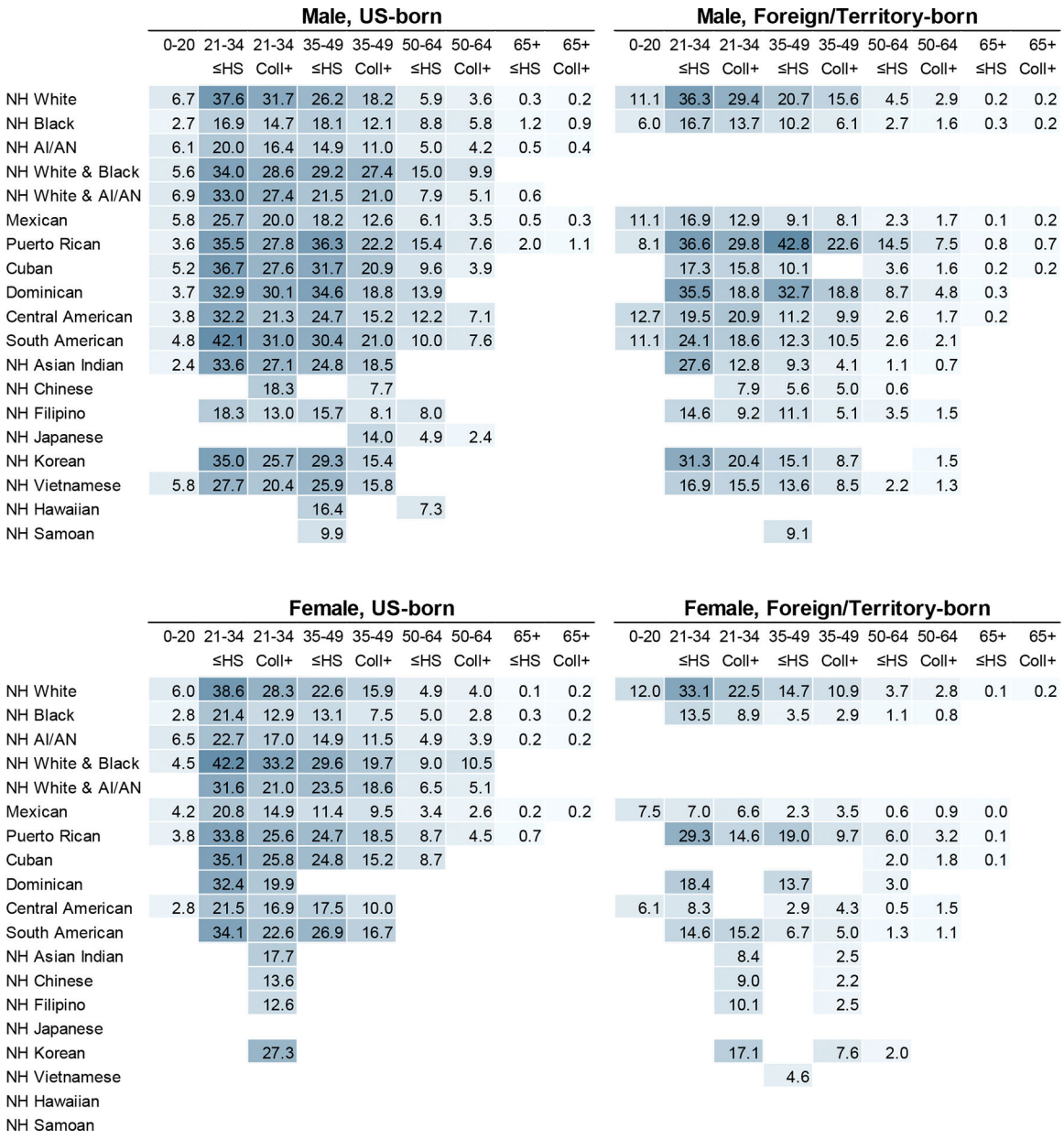


Figure 1.

US drug overdose *proportionate mortality* (overdose deaths as a percentage of deaths of all causes) by subgroups at the intersection of race/ethnicity, sex, nativity, age, and educational attainment, 2018–2023.

Notes. Data from the restricted-access Multiple Cause of Death file from the National Center for Health Statistics. Data are presented only for subgroups with at least 20 overdose deaths over the study period (2018–2023); cells without data represent subgroups with fewer than 20 overdose deaths. Educational attainment is not applicable for ages 0–20. Abbreviations: US, United States; ≤HS, high school or lower; Coll+, college or higher; NH, Non-Hispanic; AI/AN, American Indian/Alaska Native.

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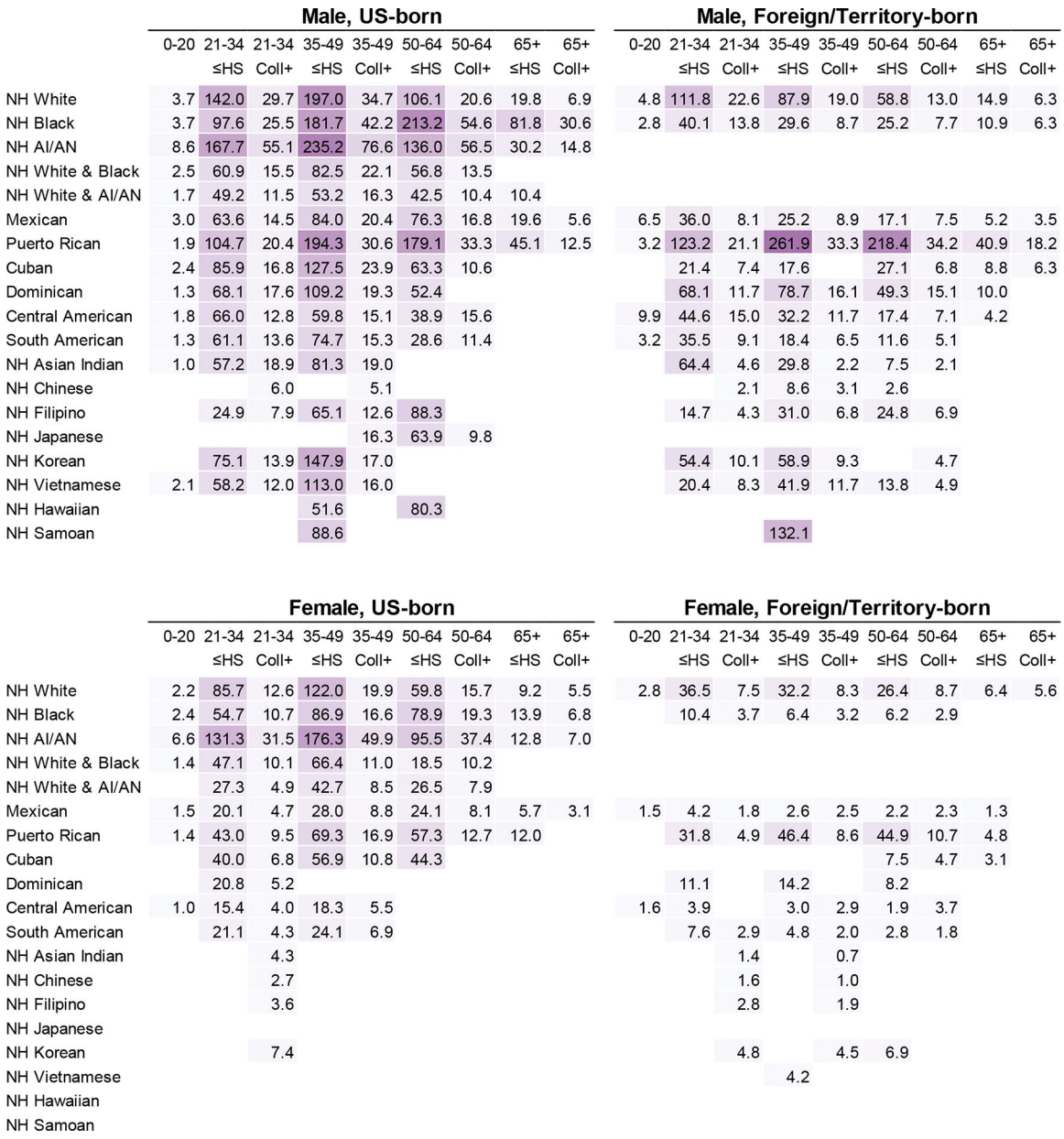


Figure 2.

US drug *overdose mortality* rates (per 100,000) by subgroups at the intersection of race/ethnicity, sex, nativity, age, and educational attainment, 2018–2023.

Notes. Mortality data from the restricted-access Multiple Cause of Death file from the National Center for Health Statistics; population estimates from the US Census Bureau's American Community Survey via IPUMS. Rates are presented only for subgroups with at least 20 overdose deaths over the study period (2018–2023); cells without data represent subgroups with fewer than 20 overdose deaths. Educational attainment is not applicable for ages 0–20. Abbreviations: US, United States; ≤HS, high school or lower; Coll+, college or higher; NH, Non-Hispanic; AI/AN, American Indian/Alaska Native.

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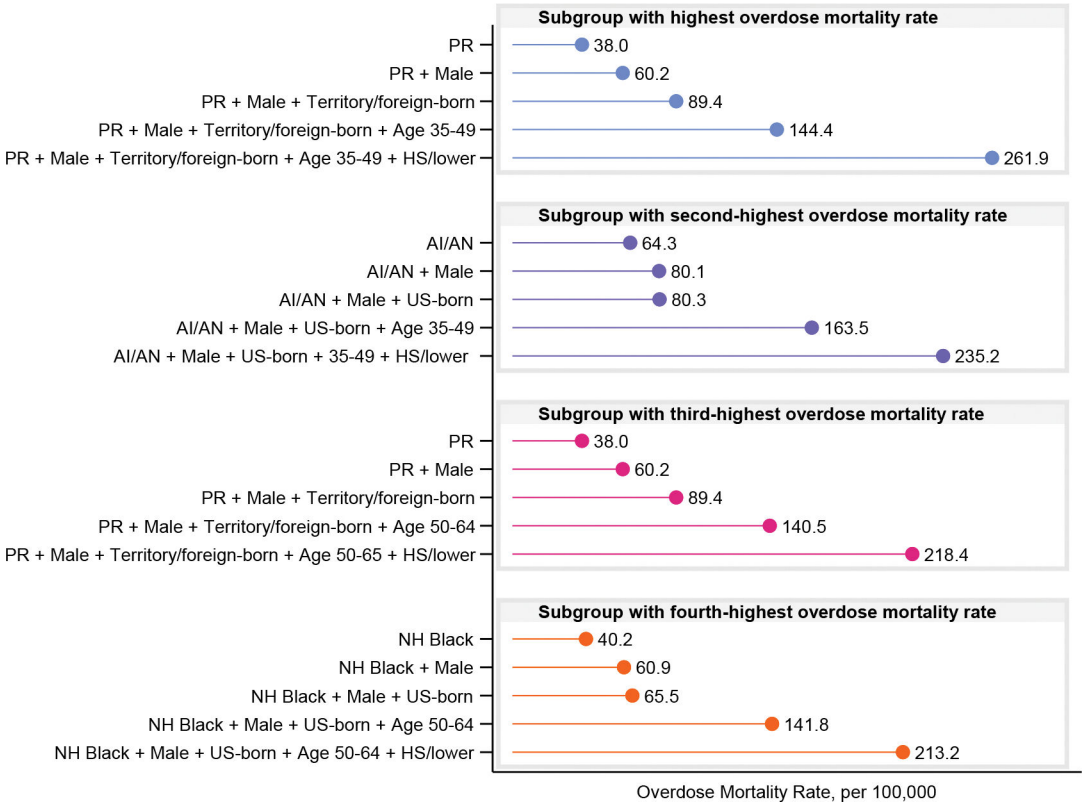


Figure 3.

Incremental intersectional overdose mortality rates (per 100,000) for the four demographic subgroups with the highest overdose mortality rates, 2018–2023.

Notes: Mortality data from the restricted-access Multiple Cause of Death file from the National Center for Health Statistics; population estimates from the US Census Bureau's American Community Survey via IPUMS. *Abbreviations*: PR, Puerto Rican; HS, high school education; AI/AN, American Indian/Alaska Native; NH, Non-Hispanic.

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Table 1.

Summary characteristics of drug overdose deaths in the four subgroups with the highest rates of drug overdose deaths, 2018–2023.

	Subgroup			
	Male, Puerto Rican, Territory/ foreign-born, Age 35–49, HS/lower	**Male, AI/AN (NH), US-born, Age 35–49, HS/ lower**	**Male, Puerto Rican, Territory/ foreign-born, Age 50–64, HS/lower**	**Male, Black (NH), US-born, Age 50–64, HS/ lower**
N Overdose Deaths	1,752	1,215	1,404	19,634
Overdose Intent:				
Unintentional, %	98.0	96.1	98.2	93.7
Drugs Involved:				
Synthetic opioid,[a] %	84.8	58.7	82.1	67.7
Cocaine, %	45.7	11.6	39.9	55.9
Psychostimulant,[b] %	6.1	53.4	3.1	10.7
US Census Region of Residence:				
Northeast, %	63.6	4.9	77.2	23.5
Midwest, %	9.8	18.6	7.1	27.0
South, %	25.0	26.4	14.2	41.0
West, %	1.7	50.0	1.6	8.6
States with the highest numbers of deaths, (*n*)	FL (346)	AZ (154)	NY (370)	IL (1,902)
	PA (296)	OK (125)	MA (191)	MD (1,725)
	NY (255)	NC (106)	PA (186)	NY (1,577)
	MA (224)	MN (97)	NJ (167)	PA (1,239)
	CT (154)	WA (92)	FL (151)	NJ (1,152)
	NJ (150)	CA (90)	CT (144)	CA (1,093)

Notes. Data from the restricted-access Multiple Cause of Death file from the National Center for Health Statistics. Region percentages may not add to 100 due to rounding.

[a]Synthetic opioids (e.g., fentanyl) other than methadone.

[b]Psychostimulants with "abuse potential" (e.g., methamphetamine) excluding cocaine. *Abbreviations*. HS, high school; NH, Non-Hispanic; AI/AN, American Indian/Alaska Native.