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Effect of race on opioid drug overdose deaths in the United States: an observational cross-sectional study

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Editor—The increasing prevalence of opioid-related deaths across the USA prompted the US Department of Health and Human Services to declare opioid overdoses a public health crisis in 2017.^{1,2} Here we hypothesised that disaggregating opioid-related overdose deaths and intention by race will uncover differences in geography, age, and opioid overdose intention within the USA. To test our hypothesis, we conducted an observational, cross-sectional study utilising death certificate data from the US National Vital Statistics System (NVSS) dataset containing vital events from 2005 to 2017 under a data use agreement. This study was approved by the Stanford Institutional Review Board (#53429) as non-human subject research.

The *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision* (ICD-10) codes T40.0–T40.4 and T40.6 were used to identify deaths attributable to opioid overdose. Data collected were disaggregated by race and subanalysis was conducted by state, age, gender, and overdose intention. The mean crude 13-yr overdose prevalence rates per 100 000 people for state-level data were calculated using the US Census Bureau American Community Survey (ACS) population estimate for each race as the denominator (Supplementary Fig. S1). Heat maps indicating population-adjusted death rates attributable to opioid overdose (deaths per 100 000 people) were generated using Geographic Heat Map in Microsoft Excel (Redmond, WA, USA). The age and gender of opioid overdose deaths were

examined for each race. Overdose intention was identified using ICD-10 code categories derived from associated cause-of-death terms on death certificates. The ICD-10 codes for overdose intention consisted of accidental (X40–X44), assault (X85), intentional self-harm (X60–X64), and undetermined intent (Y10–Y14). Descriptive statistics were applied to summarise opioid-related deaths for each racial group. Mean death rate and 95% confidence interval (CI) were reported for state-level data.³ All analyses were conducted in R Studio version 1.4.1717 (RStudio, Inc., Boston, MA, USA).

We identified 330 217 opioid-related deaths from the NVSS dataset including 274 378 for non-Hispanic White, 25 657 for Hispanic, 2037 for Asian/Pacific Islander, and 28 145 for Black individuals. The prevalence of opioid overdose deaths per 100 000 within the USA was highest for non-Hispanic White (10.693, [10.691–10.695]), followed by Black (5.699, [5.695–5.703]), Hispanic (3.862, [3.861–3.864]), and Asian/Pacific Islander (1.018, [1.016–1.019]) individuals. For each state, the 13-yr average opioid overdose prevalence by race was determined (Supplementary Table S1). As observed by others,^{4,5} West Virginia had the highest prevalence of opioid overdoses among non-Hispanic White (26.47, [26.41–26.54]) and Black (23.7, [22.1–25.7]) populations (Fig 1a). However, when disaggregating the state-level data by race, New Mexico, rather than West Virginia, had the highest prevalence of opioid overdose deaths for the Hispanic population (16.0, [15.8–16.1]). For Black individuals opioid

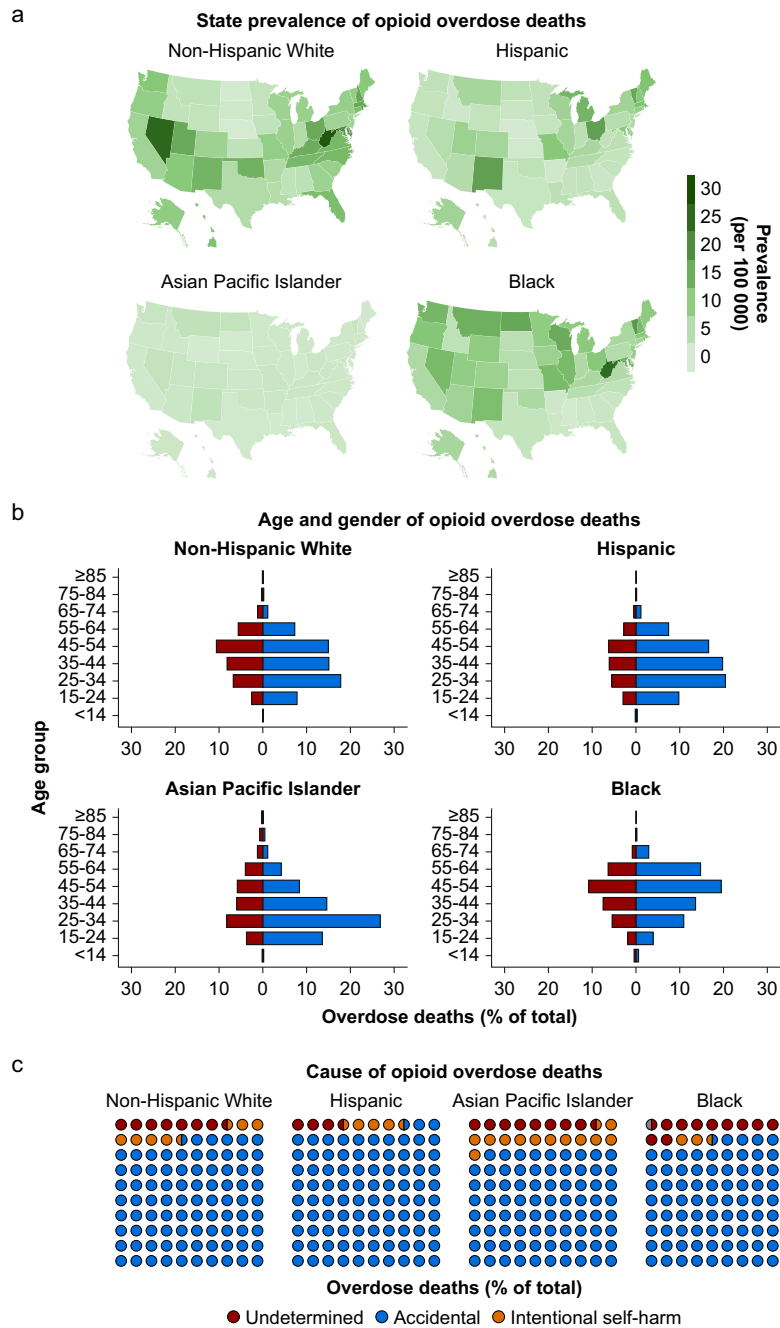


Fig 1. Disaggregation by race of opioid overdose deaths within the United States. (a) Opioid overdose prevalence by state. Average 13-yr crude prevalence of opioid overdose deaths per 100 000 for non-Hispanic White, Hispanic, Asian/Pacific Islander, and Black individuals. Among the non-Hispanic White population, the highest prevalence of opioid overdose deaths included West Virginia (26.47), Nevada (24.51), Maryland (19.30), Rhode Island (19.19), Massachusetts (16.33), New Hampshire (16.30), Utah (15.97), Ohio (15.91), Kentucky (15.65), and Oklahoma (14.87). Among the Hispanic population, New Mexico (15.96), Massachusetts (11.51), New Hampshire (10.65)*, Rhode Island (9.40), Connecticut (8.60), Maine (8.14)*, Michigan (8.04), Ohio (7.75), Utah (7.49), and Alaska (6.91)*. Among the Black population, West Virginia (23.74), Vermont (17.21)*, Montana (16.56)*, Wisconsin (14.65), Maryland (13.98), Washington (12.90), Nevada (12.41), Rhode Island (12.39), Illinois (12.38), and Missouri (12.32). The Asian/Pacific Islander population prevalence was <4 for all 50 states. *Calculations for 13-yr crude prevalence were based on <100 deaths. (b) Gender and age distributions for the opioid overdose deaths in the USA. Age (in years) of opioid overdose death reported as a percentage of opioid overdose cases. Red bar=female, blue bar=male. (c) Percentage of opioid overdose deaths based on ICD-10 code cause, including accidental (blue), intentional self-harm (pink), and undetermined intent (purple). Opioid overdose mortality as a result of assault was <0.5% among each racial/ethnic group (0.2% for non-Hispanic White, 0.1% for Hispanic, 0.2% for Asian/Pacific Islander, and 0.3% for non-Hispanic Black).

overdose deaths were the highest in the Midwestern states including Missouri, Illinois, and Wisconsin when compared with the prevalence for all other races within these states (Supplementary Table S1, Fig 1a). The Asian/Pacific Islander population had a 4–10-fold lower prevalence of opioid overdose deaths relative to other ethnicities. Taken together, the state-level data by race identify that New Mexico has the highest opioid overdose prevalence for Hispanics within the USA. Previously unrecognised regions, such as the Midwest, have a high prevalence of opioid overdose deaths among Black individuals.

When considering age, the distribution of opioid-related deaths among the Black population tends to be older with a median age group (45–54 yr) vs the non-Hispanic White (35–44 yr), Hispanic (35–44 yr), and Asian/Pacific Islander (25–34 yr) populations (Supplementary Table S2). Further separation by gender shows the age groups for the Black population tend to be older whereas that of Asian Pacific Islanders tends to be lower (Fig 1b). However, the number of males overdosing relative to females is approximately two-fold higher across all races (Supplementary Table S3). Although opioid mortality occurs with the highest burden for adults aged 24–35 yr,⁶ we find separating opioid deaths by race that Black males and females have the highest opioid mortality burden at an older age of 45–54 yr. In both metropolitan and non-metropolitan areas, synthetic opioid use among the Black population is linked with more opioid deaths in this older age demographic,^{7,8} which could be responsible for differences in age identified. Understanding these differences is important since the Black population surpassed the White population in average annual growth in opioid-related deaths.⁹ In the context of our study, the age group affected by opioid overdose deaths for Black individuals may require a separate more targeted strategy focusing on this older age demographic relative to other races.

The intention for opioid overdose across all races is primarily accidental (Fig 1c). Importantly, opioid overdose deaths for Asian/Pacific Islander individuals caused by intentional self-harm are also at least two-fold more frequent than for other races (Fig 1c). Subanalysis by gender identifies that 23% of female deaths were classified as intentional self-harm among Asian/Pacific Islander individuals as opposed to 8% for male Asian Pacific Islander individuals and 4–11% for females of other races (Supplementary Table S4). Although suicide is the 10th leading cause of death in the USA, when examined by race, suicide is the leading cause of death for Asians/Pacific Islanders age 15–24 yr old.¹⁰

Within the context of opioid use, this indicates how social and cultural differences need to be understood in order to end the opioid epidemic.¹¹ Our study provides a more in-depth understanding of those impacted by the opioid epidemic in the USA and identifies potential areas where efforts should be focused to address the opioid epidemic. Our data are observational and limited with regards to potential confounders such as income, education, concurrent illness and medications, and differences in opioid treatment policies for each state. The causes of death determined by

the medical examiner are based on available information at the time of death. Even considering these limitations, these findings highlight how race may impact opioid overdose deaths, and suggest that future controlled prospective studies are needed.

Declarations of interest

ERG is a member of the associate editorial board of the *British Journal of Anaesthesia*. The other authors declare no conflicts of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.bja.2022.06.005>.

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