Racial/Ethnic disparities in children's experience of parent death: the role of drugs and firearms in the US

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Introduction

During the last two decades, death rates in the United States (U.S.) have declined more slowly compared to other high-income countries (Heuveline 2023; Preston and Vierboom 2021). This relatively worse performance is in part explained by high death rates from both intentional and unintentional injuries (Richardson and Hemenway 2011; Ho 2019) with the leading cause being drug overdose (Ho 2019).
The overall mortality rate for unintentional drug poisonings grew exponentially from 1979 through 2016 (Jalal et al. 2018), reaching 17 per 100,000 population with no sign of leveling off (Hedegaard et al. 2021). Looking at the trend of mortality from individual drugs offers a contrasting picture. Cocaine-being a leading cause in the early 2000s-was overtaken successively by prescription opioids, then heroin, and then synthetic opioids such as fentanyl (Jalal et al. 2018). Since 2016, we observe an even more rapid increase in both drug- and opioid-related mortality (Spencer et al. 2023). Focusing on individual drugs further highlights that the geographic pattern of mortality is drug-specific with the eastern United States having experienced a sharp increase in synthetic opioids-related mortality (Kiang et al. 2019).
Similarly, intentional injuries in form of firearm mortality has been increasing since 2015 after having been relatively steady during the start of the 21st century (Goldstick et al. 2019). Gun-related deaths reached 48,830 in 2021, an increase of 8% from 2020 (Centers for Disease Control and Prevention 2021). In the year 2021, age groups with the highest gun-related mortality rate were 15-24 and 25-34 years old at 23.5 and 24.8 deaths per 100,000 population, respectively (Centers for Disease Control and Prevention 2021). These national trends hide important geographical heterogeneity with counties in the West and Midwest showing increase in firearm suicide and countries in Southeast experiencing increase in firearm homicide (Degli Esposti et al. 2022). More recently, research has found increases in both gun-related mortality and opioid-related mortality among children and adolescents with gun-related mortality as the number one cause of death (Goldstick, Cunningham, and Carter 2022; Friedman et al. 2022).

The worse health performance of the U.S. could also be apprehended in terms of racial and economic inequalities. These two types of disparities have been made extremely visible during the COVID-19 pandemic (J. T. Chen and Krieger 2021; Aschmann et al. 2022; Siegel et al. 2022; Goldman and Andrasfay 2022; Wrigley-Field 2020). Comparing racial subgroups in term of their life expectancy at birth suggests that the risk of dying is not uniformly distributed across the American population. In 2019, there was a 4-year gap in life expectancy between Black non-Hispanic and White non-Hispanic (Arias and Xu 2022). This suggests that the different ethnic groups are not equally impacted by the specific causes of mortality discussed earlier. For example, during the period 1981-2020, the Black population had a firearm-related homicide death rate that was on average seven times higher than the White population (Rees et al. 2022). This differential in mortality seems to have been exacerbated during the COVID-19 pandemic (Young and Xiang 2022; R. Chen et al. 2022). The opioid epidemic in the US is also characterized by racial differences. In the earlier stage of the epidemic, the White american population was mostly affected through a prescription drug problem. More recently, both Black and White population are affected following the shift to a heroin/fentanyl epidemic (Alexander, Kiang, and Barbieri 2018).

The varying levels of mortality experienced by the different ethnic groups translates into differing exposure to deaths in the family (Umberson et al. 2017). In other words, the racial inequalities translate into kinship inequalities which refers to "the differences in kin presence, availability, and resources that create distinct environments for individuals to develop, support each other, and obtain a sense of shared identity" (Alburez-Gutierrez et al. 2022). More precisely, kin loss in childhood affect educational attainment in later life (Patterson, Verdery, and Daw 2020), has medical and psychological implications (Umberson et al. 2017), and reduce economic support for kin (Zagheni 2011). While the direct effects of guns and drugs on child health has been well-documented, less is known about the indirect effect of gun and drug deaths through bereavement.

In the current paper, we will study firearms and drugs mortality from a kinship perspective. We will assess the children's experience of parental loss due to firearms and drugs in the U.S. during the period 1999-2020, stratifying by ethnic group. To do so, we used the matrix kinship model developed by Caswell (2019) using time-variant, sex-differentiated vital rates (Caswell and Song 2021; Caswell 2022), and augmented to include causes of death of kin (Caswell, Margolis, and Verdery 2023).

Methods

We use the kinship matrix model developed by Caswell (2019). This methodology builds on the fact that any type of kin of a randomly chosen individual can be seen as a population. Hence, they can be modeled using traditional projection methods. The kin we will focus on are parents.
The model used here combine several extensions to use time-varying and sex-differentiated vital rates while accounting for death from multiple causes (Caswell and Song 2021; Caswell 2022; Caswell, Margolis, and Verdery 2023). DETERMINISTIC. The model can be expressed as follows

$$\left(\begin{array}{c} \boldsymbol{d}_L^f \\ \boldsymbol{d}_L^m \\ \hline \hat{\boldsymbol{d}}_D^f \\ \hat{\boldsymbol{d}}_D^m \end{array}\right)(x+1,t+1) = \left(\begin{array}{cc|c} \boldsymbol{U}^f_{\omega\times\omega} & \mathbf{0} & 0 \\ \mathbf{0} & \boldsymbol{U}^f_{\omega\times\omega} & \\ \hline \hat{\boldsymbol{M}}^f_{\alpha\omega\times\omega} & \mathbf{0} & 0 \\ \mathbf{0} & \hat{\boldsymbol{M}}^m_{\alpha\omega\times\omega} & \end{array}\right)\left(\begin{array}{c} \boldsymbol{d}_L^f \\ \boldsymbol{d}_L^m \\ \hline \hat{\boldsymbol{d}}_D^f \\ \hat{\boldsymbol{d}}_D^m \end{array}\right)(x,t)$$

where

Data

Matrix Kinship Model

Male fertility

(Number of children affected)

Uncertainty

Results

Fig 1

Fig 2

References

Alburez-Gutierrez, Diego, Nicola Barban, Hal Caswell, Martin Kolk, Rachel Margolis, Emily Smith-Greenaway, Xi Song, Ashton M Verdery, and Emilio Zagheni. 2022. "Kinship, Demography, and Inequality: Review and Key Areas for Future Development." *SocArXiv*. https://doi.org/10.31235/osf.io/fk7x9.

Alexander, Monica J, Mathew V Kiang, and Magali Barbieri. 2018. "Trends in Black and White Opioid Mortality in the United States, 1979–2015." *Epidemiology (Cambridge, Mass.)* 29 (5): 707.

Arias, E, and JQ Xu. 2022. "United States Life Tables, 2019." *National Vital Statistics Reports* 70 (19).

Aschmann, Hélène E, Alicia R Riley, Ruijia Chen, Yea-Hung Chen, Kirsten Bibbins-Domingo, Andrew C Stokes, M Maria Glymour, and Mathew V Kiang. 2022. "Dynamics of Racial Disparities in All-Cause Mortality During the COVID-19 Pandemic." *Proceedings of the National Academy of Sciences* 119 (40): e2210941119.

Caswell, Hal. 2019. "The Formal Demography of Kinship." *Demographic Research* 41: 679–712.

———. 2022. "The Formal Demography of Kinship IV." *Demographic Research* 47: 359–96.

Caswell, Hal, Rachel Margolis, and Ashton M Verdery. 2023. "The Formal Demography of Kinship v: Kin Loss, Bereavement, and Causes of Death." *SocArXiv*. https://doi.org/10.31235/osf.io/mk64p.

Caswell, Hal, and Xi Song. 2021. "The Formal Demography of Kinship III." *Demographic Research* 45: 517–46.

Centers for Disease Control and Prevention, National Center for Health Statistics. 2021. "Multiple Cause of Death 1999-2021 on CDC WONDER Online Database."

Chen, Jarvis T, and Nancy Krieger. 2021. "Revealing the Unequal Burden of COVID-19 by Income, Race/Ethnicity, and Household Crowding: US County Versus Zip Code Analyses." *Journal of Public Health Management and Practice* 27 (1): S43–56.

Chen, Ruijia, Hélène E Aschmann, Yea-Hung Chen, M Maria Glymour, Kirsten Bibbins-Domingo, Andrew C Stokes, and Mathew V Kiang. 2022. "Racial and Ethnic Disparities in Estimated Excess Mortality from External Causes in the US, March to December 2020." *JAMA Internal Medicine* 182 (7): 776–78.

Degli Esposti, Michelle, Jason Gravel, Elinore J Kaufman, M Kit Delgado, Therese S Richmond, and Douglas J Wiebe. 2022. "County-Level Variation in Changes in Firearm Mortality Rates Across the US, 1989 to 1993 Vs 2015 to 2019." *JAMA Network Open* 5 (6): e2215557–57.

Friedman, Joseph, Morgan Godvin, Chelsea L Shover, Joseph P Gone, Helena Hansen, and David L Schriger. 2022. "Trends in Drug Overdose Deaths Among US Adolescents, January 2010 to June 2021." *Jama* 327 (14): 1398–1400.

Goldman, Noreen, and Theresa Andrasfay. 2022. "Life Expectancy Loss Among Native Americans During the COVID-19 Pandemic." *Demographic Research* 47 (9): 233–46.

Goldstick, Jason E, Rebecca M Cunningham, and Patrick M Carter. 2022. "Current Causes of Death in Children and Adolescents in the United States." *New England Journal of Medicine* 386 (20): 1955–56.

Goldstick, Jason E, April Zeoli, Christina Mair, and Rebecca M Cunningham. 2019. "US Firearm-Related Mortality: National, State, and Population Trends, 1999–2017." *Health Affairs* 38 (10): 1646–52.

Hedegaard, Holly, Arialdi M Miniño, Merianne Rose Spencer, and Margaret Warner. 2021. "Drug Overdose Deaths in the United States, 1999–2020."

Heuveline, Patrick. 2023. "The Covid-19 Pandemic and the Expansion of the Mortality Gap Between the United States and Its European Peers." *PLoS One* 18 (3): e0283153.

Ho, Jessica Y. 2019. "The Contemporary American Drug Overdose Epidemic in International Perspective." *Population and Development Review* 45 (1): 7.

Jalal, Hawre, Jeanine M Buchanich, Mark S Roberts, Lauren C Balmert, Kun Zhang, and Donald S Burke. 2018. "Changing Dynamics of the Drug Overdose Epidemic in the United States from 1979 Through 2016." *Science* 361 (6408): eaau1184.

Kiang, Mathew V, Sanjay Basu, Jarvis Chen, and Monica J Alexander. 2019. "Assessment of Changes in the Geographical Distribution of Opioid-Related Mortality Across the United States by Opioid Type, 1999-2016." *JAMA Network Open* 2 (2): e190040–40.

Patterson, Sarah E, Ashton M Verdery, and Jonathan Daw. 2020. "Linked Lives and Childhood Experience of Family Death on Educational Attainment." *Socius* 6: 2378023120975594.

Preston, Samuel H, and Yana C Vierboom. 2021. "Excess Mortality in the United States in the 21st Century." *Proceedings of the National Academy of Sciences* 118 (16): e2024850118.

Rees, Chris A, Michael C Monuteaux, Isabella Steidley, Rebekah Mannix, Lois K Lee, Jefferson T Barrett, and Eric W Fleegler. 2022. "Trends and Disparities in Firearm Fatalities in the United States, 1990-2021." *JAMA Network Open* 5 (11): e2244221–21.

Richardson, Erin G, and David Hemenway. 2011. "Homicide, Suicide, and Unintentional Firearm Fatality: Comparing the United States with Other High-Income Countries, 2003." *Journal of Trauma and Acute Care Surgery* 70 (1): 238–43.

Siegel, Michael, Isabella Critchfield-Jain, Matthew Boykin, Alicia Owens, Taiylor Nunn, and Rebeckah Muratore. 2022. "Actual Racial/Ethnic Disparities in COVID-19 Mortality for the Non-Hispanic Black

Compared to Non-Hispanic White Population in 353 US Counties and Their Association with Structural Racism.” *Journal of Racial and Ethnic Health Disparities* 9 (5): 1697–1725.

Spencer, Merianne Rose, Margaret Warner, Jodi A Cisewski, Arialdi Miniño, David Dodds, Janaka Perera, and Farida B Ahmad. 2023. “Estimates of Drug Overdose Deaths Involving Fentanyl, Methamphetamine, Cocaine, Heroin, and Oxycodone: United States, 2021.”

Umberson, Debra, Julie Skalamera Olson, Robert Crosnoe, Hui Liu, Tetyana Pudrovska, and Rachel Donnelly. 2017. “Death of Family Members as an Overlooked Source of Racial Disadvantage in the United States.” *Proceedings of the National Academy of Sciences* 114 (5): 915–20.

Wrigley-Field, Elizabeth. 2020. “US Racial Inequality May Be as Deadly as COVID-19.” *Proceedings of the National Academy of Sciences* 117 (36): 21854–56.

Young, Lindsay J, and Henry Xiang. 2022. “US Racial and Sex-Based Disparities in Firearm-Related Death Trends from 1981–2020.” *PLoS One* 17 (12): e0278304.

Zagheni, Emilio. 2011. “The Impact of the HIV/AIDS Epidemic on Kinship Resources for Orphans in Zimbabwe.” *Population and Development Review* 37 (4): 761–83.