# Risk of being killed by police use-of-force in the U.S. by age, race/ethnicity, and sex

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**Abstract**

We use novel data on police-involved deaths to estimate how the risk of being killed by police use-of-force in the United States varies across social groups. First, we estimate the lifetime risk of being killed by police force by race and sex. Second, we estimate the age-specific risk of being killed by police by race and sex. Finally we provide estimates of the proportion of all deaths accounted for by police use-of-force.

## Introduction

Policing is an important cause of social, economic, political, and health inequalities (1–7). Violent encounters with the police have profound effects on individual and community health, neighborhood change, perceptions of government legitimacy, and educational outcomes (6, 8, 9, 9, 10). Policing plays a key role in maintaining structural inequalities between between people of color and white people in the United States (1, 6, 8).

The U.S. is exceptional among advanced industrial democracies in rates of police involved killing (11). While a substantial body of evidence shows that people of color, especially African Americans, are at greater risk for experiencing criminal justice contact and police-involved harm than are whites [(12); (13); (14); (15); (16); (17); (18)}, we lack basic estimates of the prevalence of police-involved deaths.

The killings of Oscar Grant, Michael Brown, Charleena Lyles, Stephon Clark, Tamir Rice, among many others, and the protests that followed have brought sustained national attention to the racialized character of police violence against civilians (19). These very public deaths have pivoted interest in criminal justice inequalities to topics beyond arrest and incarceration. Social scientists and public health scholars now widely acknowledge that police contact is a key vector of health inequalities (4, 7), and is an important cause of early mortality for people of color (20).

It is here where large gaps in our understanding of racial disparities in police contact remain. In the absence of definitive official data, journalists have initiated systematic efforts to track police-involved killings. Because of the availability of these data, we are now just beginning to better understand geographic and demographic patterning in police involved deaths (15). An understanding of these patterns is critical to better assess the scope of inequality in exposure to police violence and its population health consequences. This work can also inform policy and practice aimed at reducing these disparities and addressing their consequences.

Prior research has clearly established that race, sex, and age are closely correlated with exposure to the criminal justice system (21–23). Age, race, and gender are also central to the logics that police and legal systems use to decide who to target, how to intervene, and how much force should be applied in the process of policing (3, 6, 24–26).

## Research Strategy and Key Findings

This paper provides descriptive estimates of the national prevalence of fatal police violence. In doing so, we contribute to a body of research that uses demographic methods to systematically describe the depth and intensity of the involvement of the criminal justice system in the lives of Americans (23, 27–30).

We use novel data to provide estimates of the risk of being killed by police use-of-force in the United States by age, race, and sex. We also provide estimates of the lifetime risk of being killed by police use-of-force by race and sex. We construct period life tables (31) that provide estimates of the risk of death across the life course if risk profiles observed between 2013 and 2018 remain stable. We use Bayesian simulation to

provide uncertainty intervals for our mortality estimates. Our analyses indicate that people of color face a significantly higher likelihood of being killed by police than do white men and women, that risk peaks in adolescence and young adulthood, and that men of color face a non-trivial lifetime risk of being killed by police.

Focal measures for this analysis rely on data compiled by Fatal Encounters (FE), a journalist-led effort to document deaths involving police. Cases are identified through public records and news coverage, and each variable in the data is validated against published documents. Unofficial media-based methods for collecting data on police-involved killings in the United States provide more comprehensive information on police violence than do the limited official data currently available (32, 33).

We describe the data and methods, their limitations, and their assumptions in more detail in the methods and materials section below and in the supplementary information.

## Materials and methods

Our analysis relies on a combination of official and unofficial sources of mortality data. Focal measures of police use-of-force deaths come from Fatal Encounters (FE), an independent source of data on police-involved deaths collected and fact-checked by journalists. Fatal Encounters collects data on all deaths involving police officers through systematic searches of online news coverage, public records, and social media. Data is collected by experienced journalists and trained researchers, and is fact-checked by the project lead, D. Brian Burghart, a former newspaper editor and veteran journalist. FE provides more comprehensive data on police-involved deaths than do official mortality files (33), has a broader scope than similar journalist-led efforts to document police-involved deaths, and has been endorsed as a sound source of data by the Bureau of Justice Statistics (34).

It is important to note that despite the relatively high quality of Fatal Encounters data relative to other sources, because the data rely on media reports to generate case information, counts of deaths generated from the data are likely negatively biased. If any death is not covered by news organizations or is not documented in searchable public records, it will not appear in the data.

Between 2013 and 2018, about 9 percent of cases are missing data on race / ethnicity (see Table S1). We use multiple imputation by chained equations (35) to produce ten imputed datasets for all entries in Fatal Encounters between 2012 and 2018. Imputation models include data on victim age, sex, race, cause of death, and the racial / ethnic composition of the county in which a death occurred. We also include surname-specific estimates of the probability of racial / ethnic group identification on the US Census compiled by Imai and Khanna (36) in our imputation models. Results from imputation models yield similar racial / ethnic case compositions as those we observe in NVSS data and the observed data from FE, as shown in appendix Figure S7. Listwise deletion of missing cases unrealistically understates uncertainty in our parameter estimates and negatively biases mortality risk estimates (see appendix Figure S8).

We use FE data from 2013 through 2018 to construct Bayesian count models of mortality risk that allow us to directly estimate uncertainty in risk driven by small annual age-race-sex specific death counts for some groups, uncertainty driven by variation in underlying risk over the 6 years of FE data included here, and uncertainty driven by missing data and modeled by our imputations of missing data on race / ethnicity. Intervals reported in the text are derived from pooled simulations drawn from the posterior predictive distribution of each of the ten models estimated on imputed data. These methods are described in more detail in the appendix.

Because we lack sufficient data to track a birth cohort over the life course, we rely on synthetic cohorts to construct multiple decrement period life tables (31). Period life tables allow us to estimate deaths over the life course within a compressed period of time by tracking age-specific mortality risk over hypothetical cohorts of men and women in each racial and ethnic group with the key assumption that underlying age-specific mortality risks remain constant at observed levels throughout the life course. All risk estimates presented in this paper can be interpreted as estimates of age-specific or cumulative lifetime risk at 2013 - 2018 police use-of-force mortality rates and 2017 total mortality rates. We construct life tables using the median, 95th, and 5th percentiles of our model-based simulated mortality rates. The methods used to construct these tables

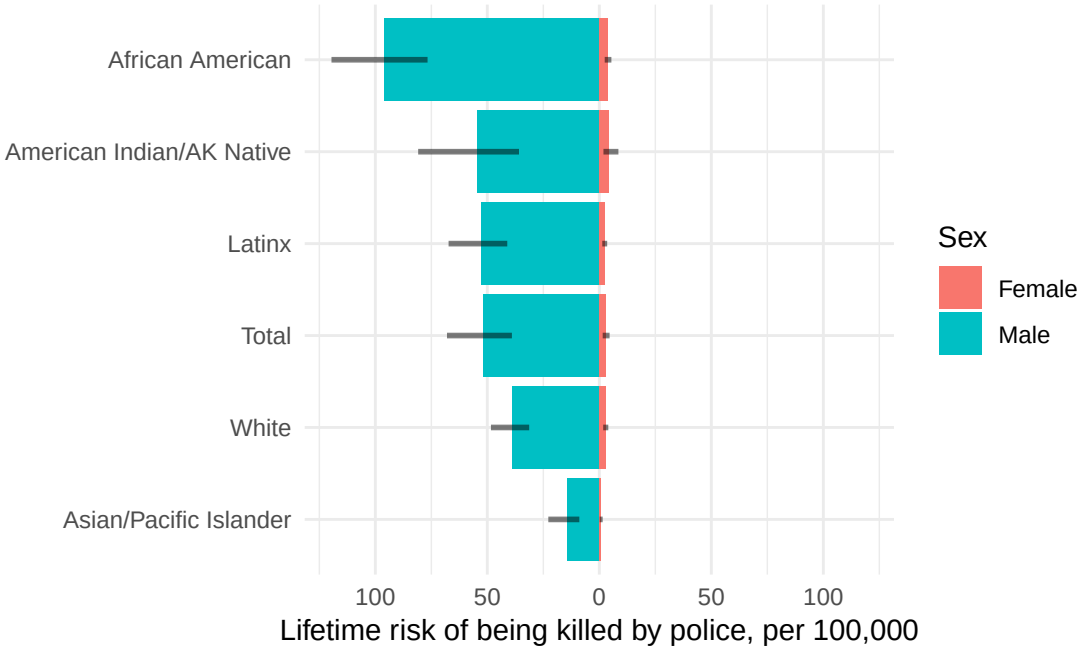


Figure 1: Lifetime risk

are described in more detail in the appendix, and an excerpt of our multiple-decrement period life table is displayed in Table S4.

A replication package containing all scripts and data used in this analysis are available through an Open Science Framework project repository (https://osf.io/c8qxh/).

## Results

Figure 1 displays estimates of lifetime risk of being killed by police use-of-force by race and sex, derived from statistical simulation of mortality rates using data from 2013 - 2018. We estimate that over the life course, at levels of risk similar to those observed betweeen 2013 and 2018, about 52 [39, 68] (90 percent uncertainty interval) of every 100,000 men and boys in the United States will be killed by police use of force over the life course, and about 3 [1.5, 4.5] of every 100,000 women and girls will be killed by police over the life course.

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union

## Version:  1.36.23
## Date:     2017-03-03
## Author:   Philip Leifeld (University of Glasgow)
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## Please cite the JSS article in your publications -- see citation("texreg").
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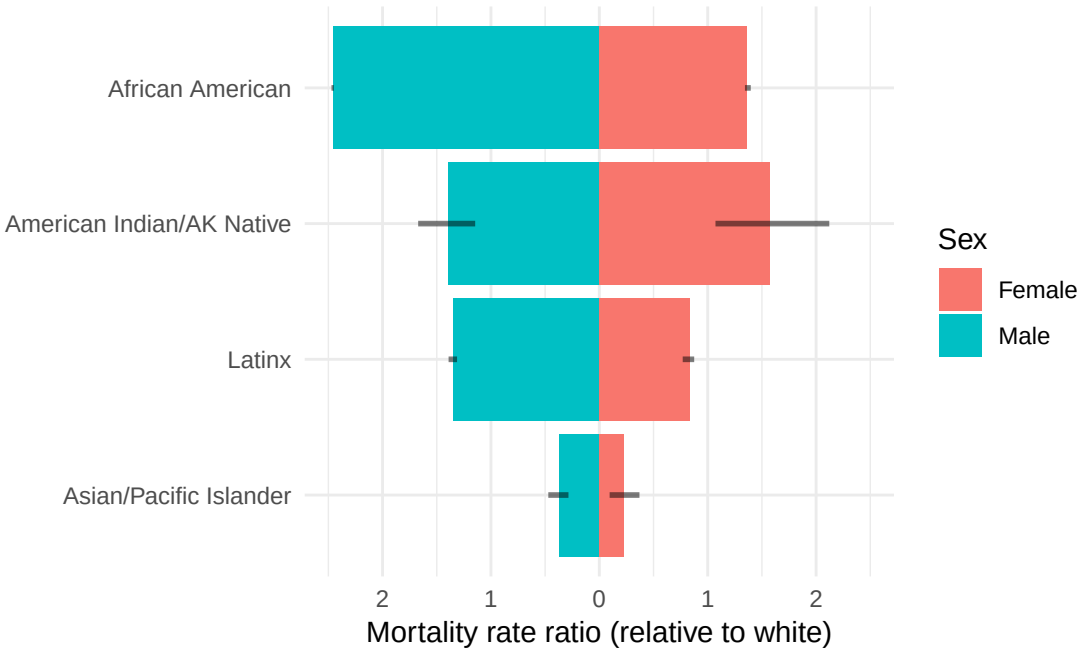


Figure 2: Lifetime inequality

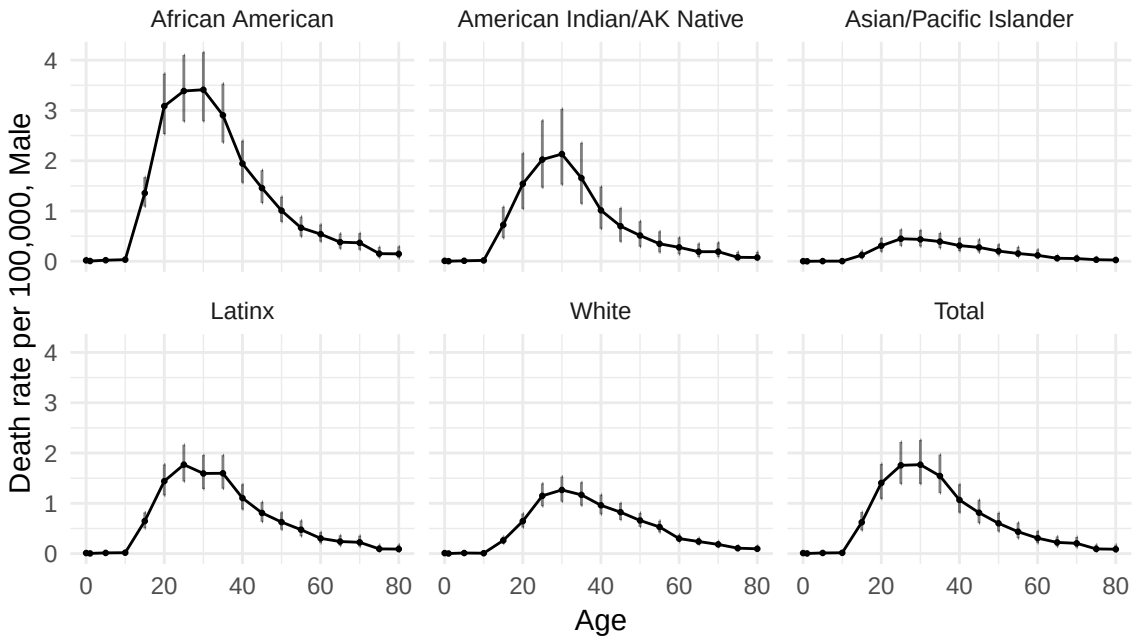


Figure 3: Lifetime inequality

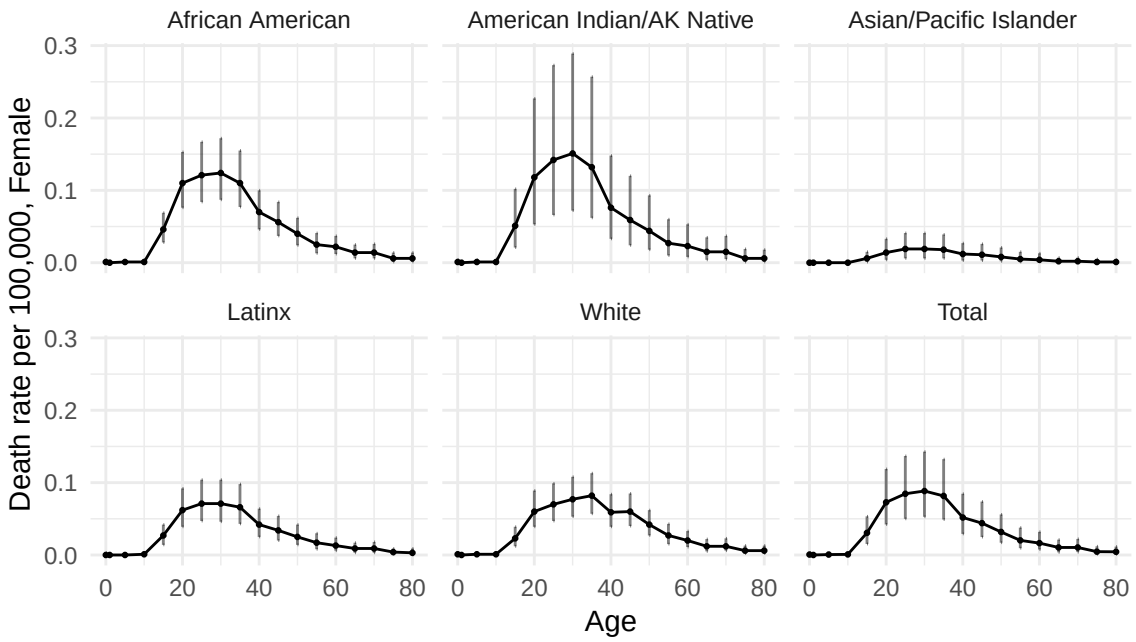


Figure 4: Lifetime inequality

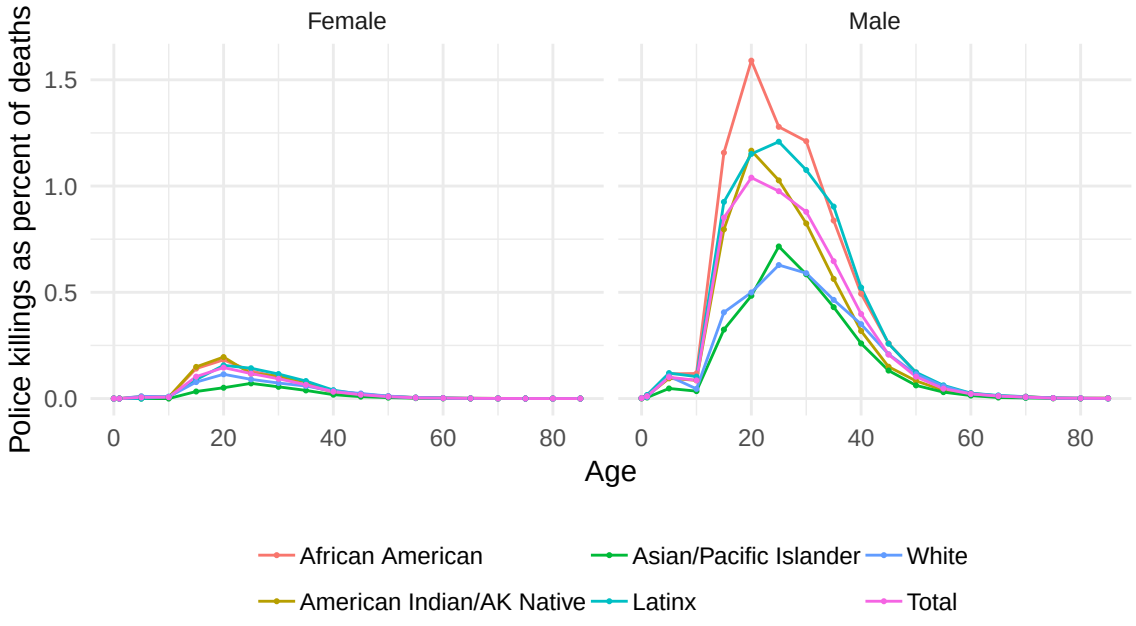


Figure 5: Lifetime inequality

Table 1: A table of the first 10 rows of the mtcars data.

| | mpg | cyl | disp | hp | drat | wt | qsec | vs |
|---|---|---|---|---|---|---|---|---|
| Mazda RX4 | 21.0 | 6 | 160.0 | 110 | 3.90 | 2.620 | 16.46 | 0 |
| Mazda RX4 Wag | 21.0 | 6 | 160.0 | 110 | 3.90 | 2.875 | 17.02 | 0 |
| Datsun 710 | 22.8 | 4 | 108.0 | 93 | 3.85 | 2.320 | 18.61 | 1 |
| Hornet 4 Drive | 21.4 | 6 | 258.0 | 110 | 3.08 | 3.215 | 19.44 | 1 |
| Hornet Sportabout | 18.7 | 8 | 360.0 | 175 | 3.15 | 3.440 | 17.02 | 0 |
| Valiant | 18.1 | 6 | 225.0 | 105 | 2.76 | 3.460 | 20.22 | 1 |
| Duster 360 | 14.3 | 8 | 360.0 | 245 | 3.21 | 3.570 | 15.84 | 0 |
| Merc 240D | 24.4 | 4 | 146.7 | 62 | 3.69 | 3.190 | 20.00 | 1 |
| Merc 230 | 22.8 | 4 | 140.8 | 95 | 3.92 | 3.150 | 22.90 | 1 |
| Merc 280 | 19.2 | 6 | 167.6 | 123 | 3.92 | 3.440 | 18.30 | 1 |

Table 2: Regression output 1

| Estimate | SE | P |
|---|---|---|
| 34.661 | 2.547 | 0.000 |
| -1.587 | 0.712 | 0.034 |
| -0.021 | 0.010 | 0.054 |

Table 1 is not in the paper at all. Table 2 is also not in the paper. Table **??** won't cross reference because you can't have it all.

Figure 2 displays the ratio of lifetime risk for each racial / ethnic group relative to white risk for both men and women. Note that a rate ratio of one indicates equality in mortality risk relative to whites. The highest levels of inequality in mortality risk are experienced by Black men. Black men are about 2.5 times more likely to be killed by police over the life course than are white men. Black women are about 1.4 times more likely to be killed by police than are white women. Though risks are estimated with less precision for American Indian / Alaska Native men and women than for other groups, we show that they face a higher lifetime risk of being killed by police than do whites. American Indian men are between 1.2 and 1.7 times more likely to be killed by police than white men, and American Indian women are between 1.1 and 2.1 times more likely to be killed by police than are white women. Latino men are between 1.3 and 1.4 times more likely to be killed by police than are white men, but Latina women are between 12 and 23 percent less likely to be killed by police than are white women. Both Asian/Pacific Islander men and women are more than 50 percent less likely to be killed by police than are white men and women respectively.

Among all groups, Black men and boys face the highest lifetime risk of being killed by police. Our models

| | Model 1 |
|---|---|
| (Intercept) | 34.66*** |
| | (2.55) |
| cyl | −1.59* |
| | (0.71) |
| disp | −0.02 |
| | (0.01) |
| $R^2$ | 0.76 |
| Adj. $R^2$ | 0.74 |
| Num. obs. | 32 |
| RMSE | 3.06 |

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

Table 3: Statistical models

predict that about 1 in 1,000 Black men and boys will be killed by police over the life course (96 [77, 120] per 100,000). We predict that between 36 and 81 American Indian / Alaska Native men and boys per 100,000 will be killed by police over the life course. Latino men and boys have an estimated risk of being killed by police of about 53 per 100,000 [41, 67]. Asian / Pacific Islander men and boys face a lifetime risk of between 9 and 23 per 100,000, while white men and boys face a lifetime risk of about 39 [31, 48] per 100,000.

Women's lifetime risk of being killed by police is about 20 times lower than men's risk. Anong women and girls, Black women and American Indian / Alaska Native women's risk is highest; we expect between 2.4 and 5.4 Black women and girls to be killed by police over the lifecourse per 100,000 at current rates. American Indian and Alaska Native women and girls are killed by police over the life course at a rate of about 4.2 per 100,000 [1.8, 8.5]. Latina and white women and girls have similar lifetime mortality risks, at about 2 per 100,000. Asian / Pacific Islander women and girls are at the lowest risk of being killed by police for all groups, with a lifetime risk of about 0.6 [0.2, 1.5] per 100,000. However, when other causes of fatality are included in risk estimates, particularly vehicle-related deaths, risk estimates more than double for women across all racial and ethnic groups. We show estimates of lifetime risk at 2013 - 2018 mortality risk levels for multiple causes of police-involved death in Appendix Figure S12.

Figure 3 displays male age-specific rates of death by police use-of-force by race/ethnicity, and Figure 4 displays female age-specific rates of being killed by police by race/ethnicity and age. Risk for all groups peaks during early adulthood, between the ages of 20 and 35, and declines with age. This pattern is similar to the distribution of violent crime victimization and the shape of the age-crime curve (37, 38).

Between the ages of 25 and 29, we estimate that Black men are killed by police at a rate of between 2.8 and 4.1 per 100,000. American Indian and Alaska Native men are killed at a rate of between 1.5 and 2.8 per 100,000; Asian/Pacific Islander men are killed by police at a rate between 0.3 and 0.6 per 100,000, Latino men at a rate between 1.4 and 2.2 per 100,000, and white men at a rate between 0.9 and 1.4 per 100,000. Inequalities in risk persist throughout the life course.

We estimate an overall mortality rate of about 1.8 per 100,000 for men between the ages of 25 and 29. This ranks police use-of-force as one of the leading causes of death for young men. At this age group, only accidents (76.6 per 100,000), suicide (26.7 per 100,000), other homicides (22.0 per 100,000), heart disease (7.0 per 100,000), and cancer (6.3 per 100,000) kill more young men.

Women's risk of being killed by police use-of-force is about an order of magnitude lower than men's risk at all ages, as shown in Figure 4. Between 25 and 29, we estimate a median mortality risk of 0.12 per 100,000 for Black women, a risk of 0.14 for American Indian / Alaska Native women, 0.02 for Asian / Pacific Islander women, 0.07 for Latina women, 0.07 for white women, and an overall mortality risk of 0.08 per 100,000 for women between the ages of 25 and 29. Police use-of-force is not among the 15 leading causes of death for young women.

Figure 5 displays the ratio of police use-of-force deaths to all deaths by age, sex, and race. Police use-of-force accounts for 0.05 percent of all male deaths in the US, and 0.003 percent of all Female deaths. This ratio is strongly correlated with age and race. Police use-of-force is responsible for 1.6 percent of all deaths involving Black men between the ages of 20 and 24. At this age, police are responsible for 1.2 percent of American Indian / Alaska Native male deaths, 0.5 percent of Asian / Pacific Islander male deaths, 1.2 percent of Latino male deaths, and 0.5 percent of white male deaths. For women between the ages of 20 and 24, police use-of-force is responsible for 0.2 percent of all deaths of Black women, 0.2 percent of all deaths of American Indian / Alaska Native women, 0.05 percent of all deaths of Asian / Pacific Islander women, 0.16 percent of all deaths of Latina women, and 0.11 percent of all deaths of white women.

# Discussion

Our analysis shows that the risk of being killed by police is jointly patterned by one's race, gender, and age. Police violence is a leading cause of death for young men, and young men of color face exceptionally high risk of being killed by police. Stark racial inequalities in risk exist throughout much of the life-course for both men and women.

Results should be interpreted with several considerations in mind. First, while the methods used in this paper allow for nationally precise age, race, and gender-specific mortality estimates, they may mask important subnational variation and changes in risk over time (15, 39). Because we focus our analysis on a range of groups that have relatively low age-specific risks, we lack adequate data to closely consider temporal trends and geographic patterns. In appendix Figure S3, using data from FE and NVSS we show that rates of police use-of-force killings have increased by as much as 50 percent since 2008. Our current approach smooths over this change through treating year effects as random error, but future research should closely examine these temporal trends. Analyses of official data suggest that, despite high contemporary rates, the risk of being killed by police was likely much higher in the past (40).

Second, Fatal Encounters researchers rely on published photographs and victim obituaries to classify the perceived race/ethnicity of victims. Fatal Encounters provides a single variable for race/ethnicity, and does not currently collect data on variables that may be associated with variation in risk within racial/ethnic groups such as skin tone, multi-racial identity, or social class, all of which may influence mortality risk. How officers perceive an individual's racial/ethnic identity and the salience of these classifications for perceptions of criminality and dangerousness are a function of culture, social structures, and history (1, 41, 42). We discuss FE's methodology for coding race and compare FE's racial data to other sources of data in the appendix (see Figures S5 and S7).

Our results show that police killings are unevenly distributed among discrete subpopulations within the United States, and reinforce calls to treat police violence as a public health issue (1, 5). Racially unequal exposure to the risk of state violence has profound consequences for public health, democracy, and racial stratification (8–10, 19). Targeted work that examines the mechanisms of inequality in mortality risk, including police practices (3, 43) and persistent structural inequalities, (6, 24) is needed to inform policy interventions to reduce excess deaths and improve population health and well-being.

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