Officer characteristics and racial disparities in fatal officer-involved shootings

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Despite extensive attention to racial disparities in police shootings, two problems have hindered progress on this issue. First, databases of fatal officer-involved shootings (FOIS) lack details about officers, making it difficult to test whether racial disparities vary by officer characteristics. Second, there are conflicting views on which benchmark should be used to determine racial disparities when the outcome is the rate at which members from racial groups are fatally shot. We address these issues by creating a database of FOIS that includes detailed officer information. We test racial disparities using an approach that sidesteps the benchmark debate by directly predicting the race of civilians fatally shot rather than comparing the rate at which racial groups are shot to some benchmark. We report three main findings: 1) As the proportion of Black or Hispanic officers in a FOIS increases, a person shot is more likely to be Black or Hispanic than White, a disparity explained by county demographics; 2) race-specific county-level violent crime strongly predicts the race of the civilian shot; and 3) although we find no overall evidence of anti-Black or anti-Hispanic disparities in fatal shootings, when focusing on different subtypes of shootings (e.g., unarmed shootings or "suicide by cop"), data are too uncertain to draw firm conclusions. We highlight the need to enforce federal policies that record both officer and civilian information in FOIS.

officer-involved shootings | racial disparity | racial bias | police use of force | benchmarks

Recent high-profile police shootings of Black Americans have raised questions about racial disparities in fatal officer-involved shootings (FOIS). These shootings have captured public concern, leading in part to the Black Lives Matter movement and a presidential task force on policing (1). Central to this debate are questions of whether Black civilians are overrepresented in FOIS and whether racial disparities are due to discrimination by White officers. However, a lack of data about officers in FOIS and disagreement on the correct benchmark for determining racial disparity in FOIS have led to conflicting conclusions about the degree to which Black civilians are more likely to be fatally shot than White civilians. We address both issues by creating a comprehensive database of FOIS that includes officer information and by using a method for testing racial disparities that does not rely on benchmarks.

Until recently, the only nationwide data on FOIS was compiled yearly in the Federal Bureau of Investigation (FBI) Uniform Crime Report. On a voluntary basis, departments report the number of justifiable homicides by on-duty law-enforcement officers. Not only are these shootings underreported (by ∼50%; ref. 2), such reports do not provide information about the officers or circumstances surrounding these shootings. Beginning in 2015, news companies such as *The Washington Post* and *The Guardian* began to collect information about FOIS to address the issues with the FBI data. Through reporting and Freedom of Information Act requests to law-enforcement agencies, such organizations have created more complete FOIS databases. These databases provide information about shootings not available in federal databases: where they took place, what police departments were involved, and demographic information about civilians. However, even these databases fail to provide information about involved officers, which prevents asking whether certain types of officers are more likely to show racial disparities.*

When officers fire their weapons at civilians, there are three possible outcomes: 1) They miss the civilian, 2) they result in a nonfatal hit, or 3) they result in a fatal hit. Not only do officers miss civilians the majority of times they fire [estimates of hit rates range from 20 to 40% (5, 6)], many shootings do not result in fatalities. Thus, it is important to be clear at the outset that our analyses speak to racial disparities in the subset of shootings that result in fatalities, and not officers' decisions to use lethal force more generally.

Why should we expect officer characteristics to relate to the race of a person fatally shot? Decades of research from criminal justice have investigated whether officer characteristics relate to the degree of force used by police. Whereas officer race does not typically predict how much force an officer uses (7–11), male and inexperienced officers use more force (7, 8, 10), perhaps due to their use of more aggressive tactics (e.g., initiating more stops; ref. 11). One issue with this research is that it focuses on whether officer characteristics increase the degree of force used, not whether force is used disproportionately by civilian race. Some researchers have proposed that racial disparities in FOIS might be driven by discrimination by White officers (12), but research on this issue is uncommon due to a lack of officer

Significance

There is widespread concern about racial disparities in fatal officer-involved shootings and that these disparities reflect discrimination by White officers. Existing databases of fatal shootings lack information about officers, and past analytic approaches have made it difficult to assess the contributions of factors like crime. We create a comprehensive database of officers involved in fatal shootings during 2015 and predict victim race from civilian, officer, and county characteristics. We find no evidence of anti-Black or anti-Hispanic disparities across shootings, and White officers are not more likely to shoot minority civilians than non-White officers. Instead, race-specific crime strongly predicts civilian race. This suggests that increasing diversity among officers by itself is unlikely to reduce racial disparity in police shootings.

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*Although some news organizations have gathered officer information, they have either not released it (3) or gathered information only about large departments (4).

data. The only national examination of this question found that White officers were no more likely to fatally shoot Black or Hispanic civilians than non-White officers (13). However, their key analyses were based on only a small subset (19–23%) of all fatal shootings. Beyond race, researchers have not tested whether officer sex or experience impact racial disparities in fatal shootings. To address this gap, we created a comprehensive database of all FOIS in 2015 with information about officer race, sex, and years of experience. However, even with this officer information on hand, there is still a challenge of exactly how to quantify racial disparities in FOIS.

How to Calculate Racial Disparities in FOIS

A persistent point of debate in studying police use of force concerns how to calculate racial disparities. Racial disparities in fatal shootings have traditionally been tested by asking whether officers fatally shoot a racial group more than some benchmark, such as that group's population proportion in the United States. Disparity is assumed when the rate of fatal shootings deviates from this benchmark. For example, 26% of civilians killed by police shootings in 2015 were Black (3, 14), even though Black civilians comprise only 12% of the US population. According to this 12% benchmark, more Black civilians are fatally shot than we would expect, indicating disparity. News organizations and researchers using this method (12, 15–19) find robust evidence of anti-Black disparity in fatal shootings.

However, using population as a benchmark makes the strong assumption that White and Black civilians have equal exposure to situations that result in FOIS. If there are racial differences in exposure to these situations, calculations of racial disparity based on population benchmarks will be misleading (20, 21). Researchers have attempted to avoid this issue by using race-specific violent crime as a benchmark, as the majority of FOIS involve armed civilians (22). When violent crime is used as a benchmark, anti-Black disparities in FOIS disappear or even reverse (20, 23–25).

In essence, benchmarking approaches test whether members from certain racial groups are shot more than we would expect relative to some benchmark. The issue is that conclusions regarding racial disparities depend more on the benchmark used (population or violent crime) than the data (the number of people fatally shot). Rather than trying to identify which benchmark is best, another way to test for racial disparities in FOIS is to directly predict the race of a person fatally shot. Specifically, we used multinomial regression with civilian race as the outcome and various factors—officer, civilian, and county characteristics—as predictors. In this way, we approached racial disparity from a different angle and asked: "What factors predict the race of a person fatally shot by police?"

This approach has several benefits. By focusing on individual shootings, we can test how much officer and civilian characteristics predict racial disparities in FOIS. A benchmark approach necessarily blends data on individual shootings with the broader population, stripping away the context in which FOIS take place. Second, this approach can test the degree to which common benchmarks like violent crime predict the race of a person shot. This is more informative than tying FOIS deaths to a single benchmark, which provides no information about the predictive validity of that factor. Third, this approach estimates racial disparity in FOIS, controlling for civilian, officer, and other contextual variables simultaneously. Whatever remains when controlling for all relevant variables provides an upper bound for racial disparity in FOIS. Finally, this approach can test whether racial disparities vary by the type of shooting.

Racial Disparities by Type of Shooting

By creating a more detailed database of FOIS and focusing on individual shootings, we are able to address how the type of shooting might impact racial disparities in FOIS. For example, anti-Black or anti-Hispanic disparities in fatal shootings may depend on whether the civilian was armed or suicidal.

Examination of National Violent Death Reporting System data shows racial differences across types of fatal shootings. Black civilians fatally shot by police (relative to White civilians) are more likely to be unarmed and less likely to pose an immediate threat to officers (26). In contrast, White civilians (relative to Black civilians) are nearly three times more likely to be fatally shot by police when the incident is related to mental-health concerns and are seven times more likely to commit "suicide by cop" (26). These are incidents where a civilian threatens a police officer for the purpose of ending their life (27) and reflect higher rates of suicide overall among Whites relative to Black and Hispanic civilians (28).

Racial differences in the frequency of certain types of FOIS matter because they may mask racial disparities in other types of fatal shootings. Even if a person fatally shot during a criminal encounter is more likely to be Black than White, this disparity will be difficult to detect if White civilians commit suicide by police intervention more frequently and such cases represent a large proportion of the overall FOIS. As past work has not distinguished between shootings where the civilian is or is not suicidal, it is unclear how much these disparities cancel each other out.

Results

Given the lack of national data on officers in FOIS, we first briefly described the officers involved in fatal shootings during 2015. Civilian and county characteristics are provided in *SI Appendix*. In a majority of FOIS (56%), a single officer fired their weapon. In 39% of cases, two to four officers fired their weapons. Cases with five or more officers were rare (5%). Compared with officers nationwide (73% White, 12% Black, 12% Hispanic, 88% male; ref. 29), 79% of officers were White, 12% Hispanic, 6% Black, and 3% from other racial groups. Officers were overwhelmingly male (96%). The average officer had almost 10 y of experience (officers often retire after 20 y; ref. 30).

Officer and Civilian Characteristics. To test whether officer characteristics predict the race of a person fatally shot, we regressed victim race against all officer and civilian predictors. Predictors and coefficients for this model are reported in Table 1. For all effects, we report odds ratios (*OR*) comparing Black or Hispanic individuals to Whites and 95% CIs (in brackets). In terms of officer race, as the percentage of Black officers who shot in a FOIS increased, a person fatally shot was more likely to be Black

Table 1. Predicting Race from Officer and Civilian Factors

	Black		Hispanic	
Variable	*OR*	95% CI	*OR*	95% CI
Intercept	0.25	0.14, 0.44	0.29	0.18, 0.47
Civilian age	0.54	0.45, 0.66	0.57	0.47, 0.70
Civilian armed	0.57	0.26, 1.23	0.98	0.35, 2.75
Civilian mental health issue	0.70	0.44, 1.14	0.59	0.29, 1.20
Civilian suicidal	0.28	0.12, 0.64	1.15	0.45, 2.91
Civilian attacking	1.74	0.54, 5.56	1.04	0.30, 3.63
Officer number	1.04	0.89, 1.22	1.08	0.91, 1.28
Officer % Black	1.23	1.03, 1.48	1.15	0.92, 1.44
Officer % Hispanic	1.29	1.07, 1.56	1.84	1.54, 2.20
Officer % women	1.13	0.95, 1.35	1.04	0.84, 1.28
Average officer experience	1.12	0.93, 1.33	1.00	0.82, 1.23

OR above (below) 1.00 indicate a positive (negative) relationship between the predictor and the odds that a person fatally shot is Black or Hispanic. Whites served as the referent group. $n = 917$. $\chi^2(20) = 71.73$; $P < 0.001$; $R^2 = 0.24$.

Table 2. Predicting Race from Officer, Civilian, and County Factors

Variable	Black		Hispanic	
	OR	95% CI	*OR*	95% CI
Intercept	0.14	0.08, 0.25	0.18	0.12, 0.27
Civilian age	0.58	0.46, 0.72	0.55	0.44, 0.70
Civilian armed	0.54	0.24, 1.24	1.13	0.44, 2.91
Civilian mental health issue	0.52	0.30, 0.89	0.41	0.19, 0.87
Civilian suicidal	0.28	0.13, 0.61	1.24	0.43, 3.63
Civilian attacking	2.22	0.63, 7.81	1.02	0.33, 3.15
Officer number	1.04	0.86, 1.26	1.11	0.90, 1.37
Officer % Black	1.06	0.87, 1.30	1.02	0.81, 1.29
Officer % Hispanic	1.23	1.00, 1.51	1.26	1.05, 1.51
Officer % women	1.04	0.87, 1.25	0.94	0.75, 1.19
Average officer experience	1.04	0.85, 1.26	1.01	0.80, 1.28
County population size	1.18	0.96, 1.46	1.13	0.91, 1.39
County median income	1.42	1.10, 1.82	1.16	0.89, 1.52
County income inequality	1.15	0.88, 1.50	1.07	0.77, 1.49
County % rural	1.24	0.89, 1.72	1.25	0.78, 1.98
County % White homicide	1.31	0.28, 6.13	0.61	0.30, 1.27
County % Black homicide	4.52	1.09, 18.8	0.96	0.48, 1.89
County % Hispanic homicide	1.32	0.36, 4.77	2.12	1.07, 4.20

Odds ratios (*OR*) above (below) 1.00 indicate a positive (negative) relationship between the predictor and the odds that a person fatally shot is Black or Hispanic. Whites served as the referent group. $n = 917$. $\chi^2(34) = 183.57$; $P < 0.001$; $R^2 = 0.52$.

(*OR* = 1.23 [1.03, 1.48]) than White. As the percentage of Hispanic officers who shot in a FOIS increased, a person fatally shot was more likely to be Hispanic (*OR* = 1.84 [1.54, 2.20]) or Black (*OR* = 1.29 [1.07, 1.56]) than White. The number of officers, percentage of female officers, and average experience of officers did not predict civilian race. Older civilians were 1.85 times less likely (*OR* = 0.54 [0.45, 0.66]) to be Black than White and 1.75 times less likely (*OR* = 0.57 [0.47, 0.70]) to be Hispanic than White. Suicidal civilians were 3.57 times less likely (*OR* = 0.28 [0.12, 0.64]) to be Black than White. In sum, as the percentage of Black or Hispanic officers increased, the likelihood that a civilian fatally shot was Black or Hispanic (respectively) also increased.

Greater anti-Black and anti-Hispanic disparity among fatal shootings where more Black or Hispanic officers were involved might not be due to bias on the part of Black or Hispanic officers, but instead to simple overlap between officer and county demographics. To test this, we reran the model including county demographics. Model coefficients are reported in Table 2. When county variables were included, the relationship between officer and civilian race was attenuated or eliminated. Black officers were not more likely to fatally shoot Black civilians (*OR* = 1.06 vs. 1.23), and Hispanic officers were less likely to fatally shoot Black (*OR* = 1.23 vs. 1.29) and Hispanic (*OR* = 1.32 vs. 1.84) civilians, although the latter disparity was still significant. This suggests that the association between officer race and Black and Hispanic disparities in FOIS largely occur because officers and civilians are drawn from the same population. Additional analyses (*SI Appendix*) provided converging evidence for this account; counties with more Hispanic civilians also had more Black or Hispanic officers ($r = 0.82$ and 0.87, respectively).

County Characteristics. We also tested whether county variables predict the race of a person fatally shot. An advantage of conducting our analyses at the level of individual shootings is the ability to test the degree to which race-specific violent crime and population proportions predict the race of a person fatally shot. We could not test this question in the model with all county-level predictors because of the strong correlation between violent crime and population size for all races ($r > 0.85$; *SI Appendix*). We therefore examined the effects of each variable independently.

If crime matters for police shootings, as race-specific crime rates increase for a given group (i.e., Black or Hispanic civilians), the odds of a person fatally shot belonging to that group should increase as well. Conversely, as the rate at which Whites commit violent crime increases, the odds of a person fatally shot being Black or Hispanic should decrease (because Whites serve as the comparison group in our models). Finally, crime-rate changes for the noncomparison minority group (Hispanics for Blacks and Blacks for Hispanics) should not predict the race of a person fatally shot.

We found strong support for these predictions, as the race of a person fatally shot closely followed race-specific homicide rates. As illustrated in Fig. 1, as the proportion of violent crime committed by Black civilians increased, a person fatally shot was more likely to be Black (*OR* = 3.66 [2.97, 4.51]). As the proportion of violent crime committed by Hispanic civilians increased, a person fatally shot was more likely to be Hispanic (*OR* = 3.34 [2.45, 4.56]). Conversely, as White crime rates increased, a person fatally shot was less likely to be Black (*OR* = 0.28 [0.22, 0.37]) or Hispanic (*OR* = 0.29 [0.20, 0.41]). Finally, Hispanic crime rates were unrelated to the odds of a person fatally shot being Black (*OR* = 0.88 [0.66, 1.17]), and Black crime rates were unrelated to the odds of a person fatally shot being Hispanic (*OR* = 0.95 [0.73, 1.23]).

Race-specific violent crime was a very strong predictor of civilian race, explaining 44% of the variance in the race of a person fatally shot. This reveals that the race of a person who is fatally shot closely tracks same-race violent crime, at least as indexed by Centers for Disease Control and Prevention homicide data. We largely replicated this pattern with population data (lower half of Fig. 1). Race-specific population rates accounted for 43% of the variance in civilian race, showing that the race of a person who is fatally shot also closely tracks population size.

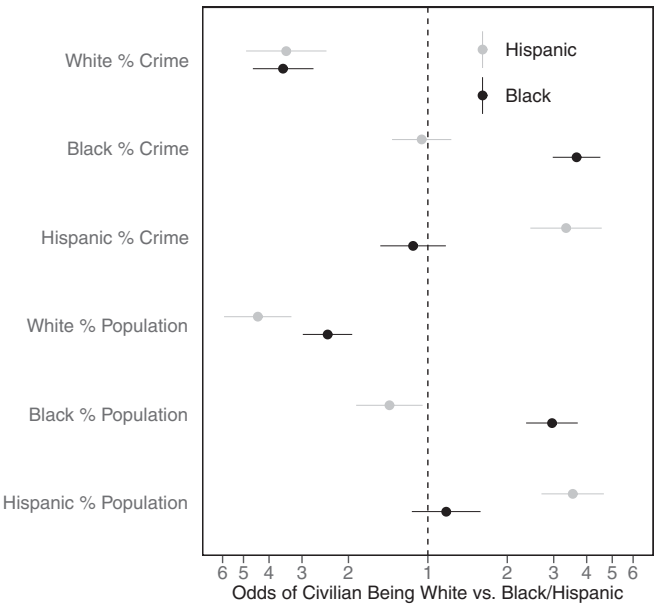

Fig. 1. Odds ratios predicting the race of civilians fatally shot by police from county-level race-specific violent crime (estimated by race-specific homicide data) and population size. Values to the left (right) of the dotted line indicate that the civilian was more likely to be White (Black/Hispanic). Civilian race was regressed on each variable individually due to multicollinearity. Lines represent 95% CI. $n = 917$.

Do Racial Disparities in FOIS Vary by Type of Shooting? We conducted a set of regression models to test whether a person fatally shot was more likely to be Black (or Hispanic) than White in certain types of FOIS. In this set of models, we strategically centered predictors to identify racial disparities across shooting types. When all predictors are centered or effects coded, the test of the intercept indicates racial disparities in the average shooting. This provides an estimate of racial disparities across all shootings. When categorical predictors are dummy-coded so that zero represents the absence of the factor, model intercepts reflect whether anti-Black and anti-Hispanic racial disparity was observed for this type of shooting (e.g., unarmed shootings). When continuous predictors are centered a SD below the mean, model intercepts reflect whether anti-Black and anti-Hispanic racial disparity was observed for this type of shooting (e.g., shootings of young civilians). We tested racial disparities across all types of shootings as defined by civilian and officer factors.

Table 3 reports tests of racial disparities by type of shooting. Model 0 tests whether there is evidence of racial disparity in the typical shooting (all variables are centered or effects coded). Controlling for predictors at the civilian, officer, and county levels, a person fatally shot by police was 6.67 times less likely (*OR* = 0.15 [0.09, 0.27]) to be Black than White and 3.33 times less likely (*OR* = 0.30 [0.21, 0.47]) to be Hispanic than White. Thus, in the typical shooting, we did not find evidence of anti-Black or anti-Hispanic disparity.

However, averaging across shootings may provide an incomplete picture if racial disparities vary across types of fatal shootings. The remaining models (1–20) separate different types of shootings to test for this variation. No model showed significant evidence of anti-Black or -Hispanic disparity, although evidence for anti-Black and anti-Hispanic disparities was stronger when civilians were young (Model 1 vs. 2). Evidence for anti-Black disparities was also stronger when civilians were not suicidal (Model 7 vs. 8). Overall, there was considerable variation in racial disparities (*OR* ranges from 0.09 to 0.54) across different types of shootings.

Table 3. Racial Disparity in Civilian Race by Shooting Type

		Black		Hispanic	
Model and variable	Level	*OR*	95% CI	*OR*	95% CI
0. Typical shooting	—	0.15	0.08, 0.26	0.30	0.20, 0.46
1. Civilian age	Low	0.25	0.14, 0.47	0.54	0.33, 0.88
2. Civilian age	High	0.09	0.05, 0.16	0.17	0.10, 0.27
3. Civilian armed	No	0.20	0.10, 0.37	0.28	0.15, 0.53
4. Civilian armed	Yes	0.11	0.05, 0.24	0.32	0.17, 0.61
5. Civilian MH issue	No	0.21	0.11, 0.39	0.47	0.25, 0.86
6. Civilian MH issue	Yes	0.11	0.06, 0.20	0.19	0.11, 0.32
7. Civilian suicidal	No	0.27	0.16, 0.48	0.27	0.16, 0.46
8. Civilian suicidal	Yes	0.08	0.03, 0.18	0.33	0.17, 0.75
9. Civilian attacking	No	0.10	0.03, 0.30	0.30	0.13, 0.68
10. Civilian attacking	Yes	0.21	0.12, 0.36	0.30	0.17, 0.53
11. Officer number	Low	0.14	0.08, 0.26	0.27	0.18, 0.41
12. Officer number	High	0.15	0.08, 0.28	0.33	0.20, 0.56
13. Officer % Black	Low	0.14	0.07, 0.26	0.29	0.18, 0.48
14. Officer % Black	High	0.16	0.09, 0.29	0.31	0.19, 0.49
15. Officer % Hispanic	Low	0.12	0.07, 0.22	0.24	0.15, 0.38
16. Officer % Hispanic	High	0.18	0.10, 0.34	0.38	0.24, 0.59
17. Officer % women	Low	0.14	0.08, 0.26	0.32	0.20, 0.51
18. Officer % women	High	0.15	0.08, 0.28	0.28	0.17, 0.46
19. Officer experience	Low	0.14	0.08, 0.26	0.30	0.18, 0.49
20. Officer experience	High	0.15	0.08, 0.28	0.30	0.19, 0.49

Model 0 represents the typical shooting (all variables are effect coded or centered). Models 1–20 are coded to indicate certain types of shootings. Level indicates at what level of the variable racial disparity is tested. MH, mental health. $n = 917$.

Discussion

Concerns that White officers might disproportionately fatally shoot racial minorities can have powerful effects on police legitimacy (31). By using a comprehensive database of FOIS during 2015, officer race, sex, or experience did not predict the race of a person fatally shot beyond relationships explained by county demographics. On the other hand, race-specific violent crime strongly predicted the race of a civilian fatally shot by police, explaining over 40% of the variance in civilian race. These results bolster claims to take into account violent crime rates when examining fatal police shootings (20).

We did not find evidence for anti-Black or anti-Hispanic disparity in police use of force across all shootings, and, if anything, found anti-White disparities when controlling for race-specific crime. While racial disparity did vary by type of shooting, no one type of shooting showed significant anti-Black or -Hispanic disparity. The uncertainty around these estimates highlights the need for more data before drawing conclusions about disparities in specific types of shootings.

Policy Implications. Overall, officer demographics such as sex and experience were not related to racial disparities in fatal shootings. Although officer race was related to racial disparities, the fact that Black and Hispanic civilians were more likely to be shot by same-race officers was largely explained by similarities between officer and county demographics. Because racial disparities in FOIS do not vary based on officer race, hiring more diverse officers may not reduce racial disparities in FOIS. This is not to say that increasing officer diversity is without merit, as increasing officer diversity may broaden understanding of diverse communities and increase trust in law enforcement. However, these data suggest that increasing racial diversity would not meaningfully reduce racial disparity in fatal shootings (32).

One of our clearest results is that violent crime rates strongly predict the race of a person fatally shot. At a high level, reducing race-specific violent crime should be an effective way to reduce fatal shootings of Black and Hispanic adults. Of course, this is no simple task—crime rates are the result of a large and dynamic set of forces. However, the magnitude of these disparities speaks to the importance of this idea. In counties where minorities committed higher rates of violent crime, a person fatally shot was 3.3 times more likely to be Hispanic than White and 3.7 times more likely to be Black than White. This suggests that reducing disparities in FOIS will require identifying and changing the socio-historical factors that lead civilians to commit violent crime (20).

One limitation of our results is that they only focus on officers who fired at a civilian that was fatally wounded. Not all officers responding to such calls fire their weapons. Therefore, characteristics such as officer race, sex, or experience may impact racial disparities in FOIS through whether officers fire their weapons. Testing this will require additional information about responding officers who do not fire their weapons.

What Is the Evidence for Racial Disparity? When considering all FOIS in 2015, we did not find anti-Black or anti-Hispanic disparity. How do we explain these results? Our data are consistent with three possible explanations.

One police-centered explanation is that these disparities reflect depolicing (33, 34). Depolicing occurs when police officers' concerns about becoming targets in civil litigation and the media spotlight impede officers from enforcing the law. Such concerns have been heightened due to recent high-profile shootings of Black men (35). The disparities in our data are consistent with selective depolicing, where officers are less likely to fatally

shoot Black civilians for fear of public and legal reprisals. All else equal, this would increase the likelihood that a person fatally shot was White vs. Black. However, depolicing might be limited to areas with high-profile shootings (36). This explanation also does not explain the disparity observed when comparing White and Hispanic civilians. Future research could test for depolicing more rigorously by using a quasiexperimental time-lagged study investigating police use of force in cities before and after high-profile shootings where racial issues are prominent.

On the other hand, a civilian-centered explanation for these disparities is that White civilians may react differently toward police than racial minorities in crime-related situations. If White civilians present more threat toward police, this could explain why a person fatally shot was more likely to be White than Black or Hispanic. Among those fatally shot by police, Whites are more likely (relative to racial minorities) to be armed and pose a threat (26). We attempted to control for civilian threat level by measuring whether they were armed and attacking, but found these variables unrelated to the race of a person fatally shot. These issues illustrate a broader challenge in inferring civilian characteristics during fatal shootings. The newspaper databases we analyzed contained at least some errors (e.g., in whether civilians are coded as armed; ref. 37). There are likely more false positives and negatives in these databases, such as when separating individuals committing suicide who are not experiencing a mental health crisis from those who are experiencing a mental health crisis. Another challenge is that dichotomous variable codes may not capture the complexity of these interactions (e.g., a person is coded as attacking, but they had stopped struggling before they were fatally shot). One solution is to code civilian threat level in a more continuous way (e.g., ref. 10). But this will only be realistic if better records of FOIS are kept at the federal level. For this reason, we urge caution when interpreting the impact of civilian characteristics on racial disparities in fatal shootings.

Finally, the lack of anti-Black or anti-Hispanic disparity and the impact of race-specific crime are consistent with an exposure argument, whereby per capita racial disparity in fatal shootings is explained by non-Whites' greater exposure to the police through crime. This explanation is consistent with studies that have used violent crime as a benchmark for testing disparity (20, 23–25). However, this does not mean that researchers should continue to use benchmarking approaches, even if using violent crime over population size. Rather, researchers can take one or both predictors into account with our approach. Moreover, unlike the benchmark approach, our conclusions regarding racial disparity do not depend on which predictors are used (*SI Appendix*).

What These Findings Do Not Show. Our analyses test for racial disparities in FOIS, which should not be conflated with racial bias (21). Racial disparities are a necessary but not sufficient, requirement for the existence of racial biases, as there are many reasons why fatal shootings might vary across racial groups that are unrelated to bias on the behalf of police officers.

For example, we found that a person fatally shot by police was much more likely to be White when they were suicidal. This does not mean that there are department policies or officer biases that encourage fatal shootings of suicidal White civilians. A more plausible explanation is that White civilians are more likely to attempt "suicide by cop" than minorities (38). Similarly, Black and Hispanic officers (compared with White officers) were more likely to fatally shoot Black and Hispanic civilians. This does not mean that there are department policies encouraging non-White officers to fatally shoot minorities. Rather, the link between officer race and FOIS appears to be explained by officers and civilians being drawn from the same population, making it more likely that an officer will be exposed to (and fatally shoot) a same-race civilian.

We stress that these findings cannot incriminate or exonerate officers in any specific case. Findings at the national level do not directly speak to the presence or absence of bias in individual shootings. In other words, whether a particular officer shows bias in any individual case is a different question than whether officers in general show bias. Claims of national bias in FOIS requires examining fatal force in aggregate, and not just in one incident or racial group (39).

Conclusion. Until now, researchers have been unable to test questions related to officer characteristics in fatal shootings. We created a near-complete database of fatal shootings in 2015 to test questions about racial disparities in FOIS. However, continued work on this issue will require more information about the officers, civilians, and circumstances surrounding these events. We encourage federal agencies to enforce policies that require recording information about the civilians and officers in FOIS to better understand the relationship between civilian race and police use of force.

Materials and Methods

We began by creating a list of all 2015 FOIS of civilians by nonfederal on-duty police officers, as this was the first year that news organizations collected near-complete databases of FOIS. We obtained this initial list of civilians by combining information from *The Washington Post* and *The Guardian* databases on January 1, 2016. We limited our analyses to White ($n = 501$), Black ($n = 245$), and Hispanic ($n = 171$) civilians, because there were insufficient data to analyze other racial groups. The institutional review board at Michigan State University deemed this study exempt, as it relied on public information.

We next obtained officer information by contacting all 684 police departments who had officers involved in a fatal shooting. We initially sent letters requesting the race, sex, and years of experience of each officer who fired at the civilian. From this written request, we received information on 62% of shootings. We next called police departments to request missing data. Finally, we searched newspaper articles, court documents, and internet sources to supplement the missing data. In all, we were able to obtain complete officer information in 72% of shootings and partial information in 96% of shootings. Rather than remove shootings with missing information, we estimated the missing data with multiple imputation (ref. 40; *SI Appendix*).

We included several factors to predict the race of a person fatally shot. Officer characteristics included the total number of officers who fired in the shooting, the percent of officers who were Black or Hispanic, the percent of female officers, and the average experience across the officers in years. Civilian characteristics included civilian age and whether they were armed, suffering from a mental health issue, suicidal, or attacking the officer. County-level factors included county population size, median income, income inequality, percent of the county that was urban, and race-specific violent crime rates. Details and correlations are provided in *SI Appendix*.

In defining what constitutes a mental health issue, we relied on *The Washington Post*'s coding, which indicates whether the person was experiencing a mental health crisis or if there was no known crisis. The *Post* does not specify the nature of the crisis. We also used the *Post*'s coding of whether an individual is armed. We used newspaper reports to code that a civilian was suicidal if 1) they left an explicit suicide note; 2) a family member reported the civilian was suicidal; or 3) police reported that the civilian explicitly told officers to shoot him or her. We also used newspaper reports to code civilians as attacking if they were armed or actively struggling with an officer. Behaviors such as fleeing or advancing toward an officer were not coded as attacking. More details about these codes are provided in *SI Appendix*.

All multinomial regression models were estimated with MPlus (Version 8.0; ref. 41). Whites served as the referent category relative to Black and Hispanic civilians. We used clustering to correct standard errors due to county-level nonindependence. Details can be found in *SI Appendix*. Estimates for each predictor were converted to *OR* to facilitate interpretation.

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