



Fatal police shootings of civilians, by rurality[☆]

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ABSTRACT

In the United States, firearm homicides disproportionately occur in urban areas. We examine whether the same is true for fatal police shootings. We use data on fatal police shootings from Washington Post's "Fatal Force Database" (2015–2017). Using Census population estimates, we examine rates of fatal police shootings, stratified by race/ethnicity (White, Black, Hispanic), across urban and rural areas using five different classification schemes. Two classification schemes—from the National Center for Health Statistics and the US Department of Agriculture—use counties as the basic unit. Three classification schemes—from the National Center for Education Statistics, the US Census Bureau, and the website "FiveThirtyEight" use zip codes. There were just under 1000 fatal police shootings per year from 2015 to 2017, a rate of 0.31 per 100,000 population. Black victimization rates were more than twice those for Whites, with Hispanic victimization rates in between. Across all classification schemes there was little difference in rates of fatal police shootings between urban and rural areas, with suburbs having somewhat lower rates. Among Whites, rates of fatal police shooting victimization were higher in rural areas compared to urban areas, while among Blacks the rates were higher in more urban areas. Our results suggest that efforts to reduce police shootings of civilians should include rural and suburban as well as urban areas.

1. Introduction

Homicide rates are much higher in the United States than in other high-income countries (Grinshteyn and Hemenway, 2019) as are rates of law enforcement killings of civilians (Zimring, 2017). In the US, crime and both firearm homicides and homicides by all methods disproportionately take place in urban core areas (Glaeser and Sacerdote, 1999; Cubbin et al., 2000; Branas et al., 2004).

Zimring, in his book on police homicide (2017), suggested that "there is reason to believe that death rates from police activity are usually substantially higher in big cities than in suburbs, towns and rural areas" (Zimring, 2017, p. 130). He did not follow up on that sentence and we found only one article that actually examined police killing of civilians across the urban-rural continuum. Using data from the FatalEncounters.org website, Edwards et al. examined all police-involved mortality of adult males from 2012-early 2018 (Edwards et al., 2018). They concluded that "although risk is high in the large urban metropolitan areas...the risk is also significant in smaller and rural metropolitan areas" (Edwards et al., 2018, p. 1241).

The current paper further examines fatal police shootings across the urban-rural divide. Because there is no single national standard for defining whether an area is urban, rural or suburban, and definitions vary widely (Hart et al., 2005; Grubestic and Matisziw, 2006; Hall et al., 2006), we use five different definitions for characterizing place along the rural-urban spectrum.

2. Methods

We use the *Washington Post* data ("Fatal Force Database") for the years 2015–2017. The Fatal Force Database has been validated as an accurate count of fatal police shootings (Conner et al., 2019). Since 2015, The *Washington Post* has been compiling a database of every fatal shooting in the US by a police officer in the line of duty by culling local news reports, law enforcement websites and social media, and by monitoring independent databases such as KilledbyPolice.net and Fatal Encounters. Compared to other open-source datasets, the *Washington Post's* database applies a more restrictive case definition and only includes shootings in which a police officer, in the line of duty, shoots and

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Table 1
Rate of fatal police shootings per 100,000 person-years by race based on the NCHS Urban-Rural Classification Scheme 2015–2017.

NCHS code	Victim race												Total		
	White, non-Hispanic			Black, non-Hispanic			Hispanic			Other/Unknown					
	Population ^a	Deaths	Rate ^b	Population ^a	Deaths	Rate ^b	Population ^a	Deaths	Rate ^b	Population ^a	Deaths	Rate ^b	Population ^a	Deaths	Rate ^b
Metro	164.7	1102	0.22	38.2	668	0.58	51.1	475	0.31	23.3	249	0.36	277.3	2494	0.30
Large Central Metro	44.4	304	0.23	17.5	376	0.72	26.1	248	0.32	11.8	92	0.26	99.8	1020	0.34
Large Fringe Metro	53.7	262	0.16	10.0	120	0.40	10.8	53	0.16	6.0	51	0.28	80.5	486	0.20
Medium Metro	44.5	336	0.25	7.7	128	0.55	11.2	134	0.40	4.1	59	0.48	67.5	657	0.32
Small Metro	22.1	200	0.30	3.0	44	0.49	3.1	40	0.43	1.3	47	1.21	29.5	331	0.37
Non-Metro	36.6	318	0.29	4.0	47	0.39	3.6	36	0.33	2.0	50	0.83	46.2	451	0.33
Metropolitan	21.3	170	0.27	2.3	29	0.43	2.5	22	0.30	1.2	24	0.67	27.3	245	0.30
Noncore	15.2	148	0.32	1.7	18	0.35	1.2	14	0.40	0.7	26	1.24	18.8	206	0.36
Overall	201.3	1420	0.24	42.2	715	0.57	54.7	511	0.31	25.2	299	0.40	323.4	2945	0.30

^a Population based on CDC population estimates.

^b Rate per 100,000 person-years.

kills a civilian. It does not track deaths of people in police custody, fatal shootings by off-duty officers or non-firearm deaths (Tate et al., 2016).

In this paper, the outcome of interest is the location of the shooting, not the location of the decedent's residence or the location of the death. We use Census population estimates for 2015–2017 as denominators.

There is no generally accepted way of dividing the US into urban/suburban/rural areas (Hart et al., 2005; Grubestic and Matisziw, 2006; Hall et al., 2006). However, almost all methods use either counties or zip codes as the base. Here we use five different ways of defining urbanicity/rurality, two using counties, and three using zip codes.

By county, we use the:

- (a) six categories from the 2013 National Center for Health Statistics (NCHS) Urban Rural Classification Scheme Codes (National Center for Health Statistics (NCHS) Urban-Rural Classification Scheme for Counties, 2013), and
- (b) nine categories from the 2013 Rural-Urban Continuum (RUC) Codes of the US Department of Agriculture (United States Department of Agriculture (USDA), 2013).

By Zip code, we use the:

- (c) twelve categories from the 2006 National Center for Education Statistics (NCES) urban-centric locale categories (National Center for Education Statistics, 2006),
- (d) three categories from the 2010 US Census Bureau Urban and Rural Classification and Urban Area Criteria (US Census Bureau, 2010), and
- (e) three categories from the website “FiveThirtyEight” (Kolkko, 2015). The 538 classification scheme is the only one of these five not created by a federal agency and the only one that directly focuses on how residents classify their own neighborhoods. Using the on-line real estate site Trulia, they surveyed 2008 adults from across the U.S. and after ascertaining their zip code asked them to describe where they live as either urban, suburban or rural. FiveThirtyEight did not define these terms for respondents. Then they created three categories of zip codes arranged by household density to maximize the number of “correct” responses (urban ≥ 2213 households per square mile; suburbs = 102 to 2213 households per square mile; rural ≤ 102 households per square mile).

We overlay the three years of Washington Post data on all five classification schemes to examine the rates of fatal police shootings by levels of urbanicity. We stratify the results by race/ethnicity (White non-Hispanic, Black non-Hispanic, Hispanic, Other).

The population denominators for the county-based classification schemes come from Census population estimates recorded by the

Centers for Disease Control and Prevention (CDC). Population estimates for the ZIP Code based Urban-Rural classification schemes were obtained using the Census Fact Finder population estimates for ZIP Code Tabulation Areas (ZCTAs). Estimates may vary slightly across different classification schemes due to rounding error.

We also examine whether the *Washington Post* (WaPo) data might disproportionately miss either rural or urban fatal police shootings and whether rates in the counties in which the twenty most populous cities are located are higher compared to other urban settings and compared to the rest of the nation.

This study received Human Subjects Approval from the Harvard TH Chan School of Public Health IRB.

3. Results

WaPo reported 2945 fatal police shootings in the three-year period, just under 1000 per year, a rate of 0.31 per 100,000 population. There were 995 fatal police shootings in 2015, 963 in 2016, and 987 in 2017.

There are large differences in the proportion of the U.S. public that is categorized as rural across these five ways of classifying urbanicity. For example, using the first two (county-based) measures, fewer than 15% of the population live in non-metropolitan (rural) areas. By contrast, the zip code measures indicate that between 25%–46% of the population live in rural areas.

Yet even with these major differences in the ways of classifying urbanicity, a largely consistent finding is there is little difference in rates of fatal police shootings between urban and rural areas. In addition, for all five classification schemes, areas considered suburban have somewhat lower rates of fatal police shootings than either the more urban or more rural areas.

Using the NCHS county-based coding (Table 1), almost 86% of the US population resides in metropolitan areas. In metropolitan areas, the rate of fatal police shooting is 0.30. Within the metropolitan area, the rate in the large central metro is 0.34; the rate in the large fringe metro (which might be considered to be suburbs) is 0.20. The highest rate is in the small metropolitan area, 0.37. In non-metropolitan areas, the rate is 0.33.

Using the USDA RUC codes (Table 2), the metropolitan area rate of fatal police shootings is 0.30, the rate in non-metropolitan urban adjacent to metro areas (which might be considered suburbs) is 0.30, and the rates both in the non-metropolitan urban not adjacent to a metropolitan area and in completely rural areas are 0.37.

Using zip codes, the NCES coding scheme (Table 3) is the only one that shows fatal police shootings having higher rates in cities (overall) compared to rural areas (overall). For cities (with 26% of the US population) the rate is 0.38. For suburbs (with 29% of the US population) it is 0.23. For rural areas (with 45% of the population), it is 0.32. Yet

Table 2
Rate of fatal police shootings homicide per 100,000 person-years by race based on the USDA RUC Urban-Rural Classification Scheme, 2015–2017.

RUC code	Victim race												Total		
	White, non-Hispanic			Black, non-Hispanic			Hispanic			Other/Unknown			Population ^a	Deaths	Rate ^b
	Population ^a	Deaths	Rate ^b	Population ^a	Deaths	Rate ^b	Population ^a	Deaths	Rate ^b	Population ^a	Deaths	Rate ^b			
Metro	164.5	1102	0.22	38.2	668	0.58	53.6	475	0.30	20.5	249	0.40	276.8	2494	0.30
1	97.2	560	0.19	27.4	493	0.60	38.5	301	0.26	15.8	143	0.30	178.9	1497	0.34
2	45.5	342	0.25	7.8	131	0.56	11.9	134	0.38	3.6	59	0.55	68.8	666	0.20
3	21.8	200	0.31	2.9	44	0.50	3.3	40	0.41	1.1	47	1.41	29.1	331	0.32
Non-Metro Urban	22.4	181	0.27	2.6	28	0.36	2.3	21	0.30	0.8	21	0.85	28.1	251	0.30
Adjacent to Metro															
4	10.8	74	0.23	1.1	13	0.38	1.2	7	0.20	0.4	9	0.72	13.5	103	0.25
6	11.6	107	0.31	1.4	15	0.35	1.2	14	0.41	0.4	12	0.99	14.6	148	0.34
Non-Metro Urban Not Adjacent to Metro	10.2	93	0.30	1.0	16	0.54	1.3	15	0.37	0.6	22	1.14	13.1	146	0.37
5	3.6	31	0.28	0.4	11	0.94	0.7	8	0.41	0.3	10	0.97	5.0	60	0.40
7	6.6	62	0.31	0.6	5	0.28	0.7	7	0.34	0.3	12	1.32	8.2	86	0.35
Completely Rural	4.0	44	0.37	0.4	3	0.26	0.2	0	0.00	0.2	6	1.04	4.8	53	0.37
8	1.8	19	0.35	0.2	1	0.14	0.1	0	0.00	0.1	1	0.53	2.2	21	0.31
9	2.1	25	0.39	0.1	2	0.45	0.1	0	0.00	0.1	5	1.28	2.4	32	0.42
Overall	201.1	1420	0.24	42.1	715	0.57	57.5	511	0.31	24.1	298	0.22	324.8	2944	0.30

^a Population based on CDC population estimates.

^b Rate per 100,000 person-years.

among all the categories with > 1 million inhabitants, the most remote of the rural categories have the highest rate of any of the classifications (0.46).

Using Census Bureau classifications (Table 4), for urban areas (54% of the population), the fatal police shooting rate is 0.31. For urban clusters, which might be considered suburbs (10% of the US population), it is 0.27. For rural areas (36% of the population) it is 0.32.

Using the FiveThirtyEight definition (Table 5), in urban areas (16% of the population) the fatal police shooting rate is 0.33. For suburbs (58% of the US population) it is 0.29. For rural areas (25% of the US population) it is 0.33.

By race, Blacks have the highest rates of fatal police shooting victimization (0.57 deaths per 100,000 population) followed by Hispanics (0.31) and then Whites (0.24).

Using the NCHS county-based coding, whites have lower rates of fatal police shooting victimization in metropolitan areas (0.22) than in non-metropolitan areas (0.29) (Table 1). Blacks have higher rates of

fatal police homicide victimization than Whites, and in contrast to Whites, their victimization rates are higher in metropolitan areas (0.58) than in non-metropolitan areas (0.39). Over 93% of Blacks live in metropolitan areas. The Hispanic rate in non-metropolitan areas is 0.33; it is 0.31 in metropolitan areas (Table 1).

For all five classification schemes, the White fatal police shooting victimization rate is higher or equal in rural compared to urban areas. The opposite is true for Blacks: their fatal police shooting victimization rate is higher in urban compared to rural areas.

We examined cases in the 2015–2017 WaPo data that occurred in the counties in which the nation's 20 most populous cities are located. These counties had somewhat higher than average rates of fatal police shootings. Using the NCHS Urban-Rural Classification scheme (Table 1), for these counties: (a) as part of all Large Central Metros, they contain 53% of the population and 72% of the fatal police shooting victims; and (b) as a percentage of the total US population, they contain 16% of the population, and 25% of fatal police shooting victims (not

Table 3
Rate of fatal police shootings homicide per 100,000 person-years by race based on the NCES Urban-Rural Classification Scheme 2015–2017.

NCES code	Victim race												Total		
	White, non-Hispanic			Black, non-Hispanic			Hispanic			Other/Unknown			Population ^a	Deaths	Rate
	Population ^a	Deaths	Rate ^b	Population	Deaths	Rate	Population	Deaths	Rate	Population	Deaths	Rate			
City	36.6	297	0.27	15.8	360	0.76	20.2	206	0.34	9.7	78	0.27	82.3	941	0.38
City-Large	20.6	172	0.28	11.1	270	0.81	14.8	153	0.34	6.4	50	0.26	52.9	645	0.41
City-Midsize	8.4	68	0.27	3.0	61	0.67	3.3	36	0.37	1.8	16	0.30	16.5	181	0.37
City-Small	7.6	57	0.25	1.7	29	0.58	2.1	17	0.27	1.5	12	0.27	12.9	115	0.30
Suburban	53.9	259	0.16	11.3	183	0.54	17.5	128	0.24	9.2	63	0.23	91.9	633	0.23
Suburb-Large	49.4	219	0.15	10.8	176	0.55	16.8	123	0.24	8.7	59	0.23	85.7	577	0.22
Suburb-Midsize	3.6	32	0.30	0.4	7	0.54	0.6	5	0.27	0.4	4	0.39	5.0	48	0.32
Suburb-Small	0.9	8	0.28	0.1	0	0.00	0.1	0	0.00	0.1	0	0.00	1.2	8	0.22
Rural	106.3	859	0.27	11.9	172	0.48	17.4	175	0.33	8.2	158	0.65	143.8	1364	0.32
Rural-Fringe	60.8	446	0.24	7.2	109	0.50	11.0	96	0.29	5.2	81	0.51	84.2	732	0.29
Rural-Distant	38.2	327	0.29	4.2	55	0.44	5.2	61	0.39	2.1	53	0.86	49.7	496	0.33
Rural-Remote	7.3	86	0.40	0.5	8	0.59	1.2	18	0.49	0.9	24	0.96	9.9	136	0.46
Town	0.6	3	0.26	0.1	0	0.00	0.1	0	0.65	0.0	0	0.00	0.9	3	0.26
Town-Fringe	0.3	1	0.13	0.0	0	0.00	0.1	0	0.00	0.0	0	0.00	0.4	1	0.09
Town-Remote	0.2	2	0.28	0.1	0	0.00	0.0	0	0.00	0.0	0	0.00	0.3	2	0.19
Town-Distant	0.1	0	0.46	0.0	0	0.00	0.0	0	3.17	0.0	0	0.00	0.2	0	0.66
Overall	197.4	1418	0.24	39.1	715	0.57	55.2	509	0.31	27.1	299	0.34	318.8	2941	0.31

^a Population based on US Census

^b Rate per 100,000 person-years.

Table 4
Rate of fatal police shootings homicide per 100,000 person-years by race based on Census Urban-Rural Classification Scheme 2015–2017.

Census Urbanicity	Victim race												Total		
	White, non-Hispanic			Black, non-Hispanic			Hispanic			Other/Unknown					
	Population ^a	Deaths	Rate ^b	Population ^a	Deaths	Rate ^b	Population ^a	Deaths	Rate ^b	Population ^a	Deaths	Rate ^b	Population ^a	Deaths	Rate ^b
Urban area	87.6	560	0.21	27.0	541	0.67	39.3	343	0.29	19.3	150	0.26	173.2	1594	0.31
Urban cluster	23.0	141	0.20	3.4	55	0.54	4.3	44	0.34	2.2	27	0.39	32.9	267	0.27
Rural	86.2	717	0.28	8.8	119	0.45	11.7	122	0.35	5.4	122	0.75	112.1	1080	0.32
Overall	196.8	1418	0.24	39.2	715	0.57	55.3	509	0.31	26.9	299	0.31	318.2	2941	0.31

^a Population based on US census.
^b Rate per 100,000 person-years.

shown).

4. Discussion

While violent crime, firearm violence and homicides in the US are disproportionately an urban rather than a rural phenomenon, the same cannot be said of fatal police shootings. By most measures of rurality, police are shooting and killing civilians in rural areas at equal rates as in urban areas. Rates of fatal police shootings are lowest in suburban places by all five classification schemes, but not always markedly lower.

We find that rates of fatal police shootings across urbanicity vary by race of the victim. While Whites have equal or higher rates of victimization in rural compared to more urban areas, the opposite is true for Blacks. Given that rates of violent crime are higher in urban areas, the results suggest that fatal police shootings per violent crime or per police contact (rather than per population) may actually be higher in rural compared to more urban areas.

It is uncertain which is the most appropriate definition of urbanicity for fatal police shootings. Counties are important administrative and political subdivisions in most states, with county party organizations the bedrock of state political parties (Benton et al., 2007). Individual zip codes are smaller units than counties and thus generally less heterogeneous in character, but they are not true political identities. It is sometimes said that counties are better local descriptors of “place” while zip codes are better descriptors of “space”—having the look of what people generally mean when they say “urban,” “suburban” and “rural.”

The five methods used in this paper give very different estimates of the proportion of people living in urban, suburban and rural areas of the US. For example, the non-metro estimates from the two county measures suggest that fewer than 15% of Americans live in rural areas. By contrast, the zip code measures estimate that 26% (FiveThirtyEight), 36% (Census) and 46% (Education) of the population live in rural zip codes.

Most health journal articles use county measures, either the NCHS or the related USDA, without discussion that there are other ways to measure urbanicity (Branas et al., 2004; Jarman et al., 2016; Qin et al.,

2017; Edwards et al., 2018). A benefit of the FiveThirtyEight measure is that it appears to measure more closely what residents mean when they talk about urban, suburban and rural locations.

The fact that our results are remarkably consistent across all classifications gives us confidence in our findings. An important general area for future research and recommendations would be to explain which of these classifications are most appropriate for which type of issues. Currently, we would not have known which of the classifications we should have used had our results been inconsistent. We did not need to try to make that determination, but for many questions, researchers may not be so fortunate.

We identified only one other article that examined police involved homicides along the rural-urban spectrum (Edwards et al 2018). In that paper, the authors used only the NCHS six categories of rurality, examined police homicides from all methods rather than solely from shootings, focused solely on adult male victims rather than all victims, with data from January 1, 2012-February 12, 2018. The overall rates per 100,000 they present were 1.02 for large central metro, 0.59 for large fringe, 0.99 for medium metro, 0.93 for small metro, 0.81 for micropolitan and 0.86 for noncore. Our results suggest a relatively more “rural” problem than do their findings, though we both agree that “the risk of police homicide is significant in smaller and rural metropolitan areas, which have received scant attention from researchers” (Edwards et al., 2018, p. 1241).

Although the Black fatal victimization rate from fatal police shootings is much higher than the White rate, the overall firearm homicide victimization rate for Blacks (from killings by civilians) is so much higher for Blacks, the percentage of Black firearm homicide victims who are killed by police (2.9%) is much lower than the percentage of White firearm homicide victims who are killed by police (14.2%); the corresponding percentage for Hispanic homicide victims is 7.9% (not shown).

Many scholars have examined the issue of racism in police interactions with and killings of civilians (Klinger et al., 2016; Nix et al., 2017; Gray and Parker, 2019). Our study provides no information on that topic or about whether the fatal police shootings were either avoidable or justifiable.

Table 5
Rate of fatal police shootings homicide per 100,000 person-years by race based on 538 Urban-Rural Classification Scheme 2015–2017.

538 urbanicity	Victim race												Total		
	White, non-Hispanic			Black, non-Hispanic			Hispanic			Other/Unknown					
	Population ^a	Deaths	Rate ^b	Population ^a	Deaths	Rate ^b	Population ^a	Deaths	Rate ^b	Population ^a	Deaths	Rate ^b	Population ^a	Deaths	Rate ^b
Urban	19.7	110	0.19	10.0	209	0.69	15.7	146	0.31	6.9	46	0.22	52.3	511	0.33
Suburban	115.5	776	0.22	22.8	423	0.62	31.1	269	0.29	16.2	153	0.31	185.6	1621	0.29
Rural	62.1	532	0.29	6.2	83	0.44	8.5	94	0.37	3.7	100	0.89	80.5	809	0.33
Overall	197.3	1418	0.24	39.0	715	0.57	55.3	509	0.31	26.8	299	0.57	318.4	2941	0.31

^a Population based on US Census
^b Rate per 100,000 person-years.

Our analysis has various limitations. It examines only police shootings rather than all legal intervention homicides, though these firearm deaths represent well over 90% of all killings by police (Conner et al., 2019). It does not investigate potential explanations for the results because, unlike the overall numbers and demographics of the victims, coded descriptions of each event by the Washington Post have not been validated.

Although a previous study (Conner et al., 2019) indicated the WaPo captured 98% of fatal police shootings, a potential limitation of the data is that the missing cases may concentrate in either urban or rural counties, and therefore affect the findings. We examined the 7 cases in the validation study that were reported by the NVDRS and not by WaPo. Using the NCHS classification system, 5 occurred in metropolitan and 2 in non-metropolitan counties, a distribution similar to that of the 386 cases captured by both NVDRS and WaPo. There is little suggestion from this limited data that the few cases missed by WaPo fall disproportionately into urban or rural counties. It is, of course, possible that all sources of fatal police shootings are incomplete and miss the same cases.

Our finding that rates of fatal police shootings in rural areas are at least as great as in urban areas challenges conventional understanding. Since homicide and other forms of violent crime disproportionately occur in urban areas, like Zimring (2017), we suspected that fatal police shootings would disproportionately occur in urban areas. On the other hand, people are more likely to own guns in rural areas, and a variable explaining the differences in fatal police shootings across states is levels of household gun ownership (Hemenway et al., 2019; Nagin, 2020). Given that studies of police killings of civilians have overwhelmingly focused on cities, we believe our findings reinforce a conclusion by Edwards et al. (2018) that researchers should begin to pay more attention to police killings of civilians in non-urban areas.

Not nearly enough is currently known about fatal police shootings. Foundational knowledge such as presented in this paper is crucial for understanding the problem, for targeting interventions, and for evaluating those interventions. For example, the realization that fatal police shootings in the United States are a rural and suburban problem as well as an urban one, suggests a need for improvement nationally in police training rather than one focused only on urban police. Recommendations for improving policing often apply equally to urban, suburban and rural areas (Lum and Nagin, 2017; Zimring, 2020). However, a common conundrum in public health is that, with limited resources, should a focus be on places with high rates or on places with more total people being affected? Our analysis of the twenty most populous cities suggests it may be efficient to target those urban areas due to the relatively large number of fatal police shootings and the small number of police departments involved.

Our overall finding is that, unlike civilian-on-civilian firearm homicide, rates of fatal police shootings are as high in rural as in urban areas, and for Whites they are higher in rural compared to urban settings. Our results suggest a need to understand the circumstances of these shootings and whether they differ in major ways between urban and rural areas.

CRediT statement

David Hemenway: Methodology, Writing (original draft), Supervision, Project Administration, Funding Acquisition.

John Berrigan: Investigation, Data Curation, Writing (review and editing).

Deborah Azrael: Conceptualization, Methodology, Writing (review and editing), Supervision, Funding Acquisition.

Catherine Barber: Conceptualization, Writing (review and editing), Funding Acquisition.

Matthew Miller: Methodology, Writing (review and editing), Funding Acquisition.

Declaration of competing interest

The authors have no conflicts of interest to disclose.

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