

## PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (<http://bmjopen.bmj.com/site/about/resources/checklist.pdf>) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below. Some articles will have been accepted based in part or entirely on reviews undertaken for other BMJ Group journals. These will be reproduced where possible.

### ARTICLE DETAILS

<b>TITLE (PROVISIONAL)</b>	State-specific, racial and ethnic heterogeneity in trends of firearm-related fatality rates in the United States from 2000-2010
<b>AUTHORS</b>	Kalesan, Bindu; Vasan, Sowmya; Mobily, Matthew; Villarreal, Marcos; Hlavacek, Patrick; Teperman, Sheldon; Fagan, Jeffrey; Galea, Sandro

### VERSION 1 - REVIEW

<b>REVIEWER</b>	David Hemenway Harvard School of Public Health USA
<b>REVIEW RETURNED</b>	22-May-2014

<b>GENERAL COMMENTS</b>	<p>I see two main problems with this paper.</p> <p>(1) This is more of a report or a MMWR paper than a journal article. It aptly summarizes the death certificate data from the National Vital Statistics System. But, and most importantly, it is not clear what the major point, or lesson, or theory one can derive from the article. The reader does not know what to make of any of the major findings--e.g., such as that in the two states with increasing trends, whites and non-Hispanics drove the rise, and in six states with decreasing trends, Hispanics and blacks drove the fall. I put a N/A to one of the questions above because I don't think there really is a "research question"</p> <p>In addition, these data on firearm deaths are readily available to everyone in an interactive format from the WISQARS system. Even as a reference article, it is not a crucial one since the data are so available and easy to manipulate. If one were interested in comparing the changes in firearm deaths 2000-2010 between North Carolina and Massachusetts, it would only take a few seconds to do so. One wouldn't need to find and read this report. Pages 9-11 are deathly dull. They contain information that might be interesting to specific state groups—though not to the general reader—but anyone interested in Georgia or Ohio would be better off just using WISQARS.</p> <p>(2) The second problem is that the paper attempts to "explain" what trends it does find, but does so in a superficial and somewhat questionable way. For example, there are statements that state-specific declines in firearm death may be due in part to low firearm ownership (p. 13, 15), and that the stringency of state firearm laws may be related to firearm death trends (p. 14). But the authors provide no theory why either low firearm ownership or strong gun laws should result in decreasing firearm death TRENDS. The usual</p>
-------------------------	--

	<p>claim is that these should result in low RATES of firearm death, not decreasing rates of firearm death over time—unless perhaps there were recent changes in levels of firearm ownership or firearm laws were recently enacted (and the authors provide no evidence of major law changes in most of the states—e.g., AZ, DC, NV, IL or NY--which they discuss). Thus for the conclusion (p. 17) “While some of the states with the most stringent gun laws showed an EXPECTED decrease in firearm death rates...” I don’t understand why the authors expected this unless they expect that firearm laws passed 30 years ago will have an ADDITIONAL effect this year.</p> <p>The last full sentence on page 12 beginning with “Taken at face value...” is awkward and needs to be rewritten.</p>
--	---

<b>REVIEWER</b>	Doug Wiebe University of Pennsylvania, USA
<b>REVIEW RETURNED</b>	12-Jun-2014

<b>GENERAL COMMENTS</b>	<p>I enjoyed the chance to read this interesting and through paper. I believe it makes a nice contribution to the literature by revealing heterogeneity in firearm fatality rates over time, and identifying that increases occurred in some sub groups/areas.</p> <p>Abstract, line 25. Would it be more accurate to say that the “AVERAGE national RFR was 10.21.” And to also say the word “average” in line 30 to report on the average fatality rates over the study period, and over the different states, among blacks and separately among white? I understand the need to be concise. But without saying average I believe the results are not technically correct and also, to help get the reader oriented, saying “average” would be helpful simply by being explicit.</p> <p>Abstract, line 57. Does it need another word at the end to say “....FRF-rates that remain HIGH.” ? The rates do remain among all sub-groups, even if they are relatively low rates.</p> <p>Introduction – interesting and compelling.</p> <p>Methods – in the Abstract you report that the “population” is all people in the US; on page 6 line 40 you describe the data you accessed are aggregate counts of decedents. Simply reconcile these and decide how to communicate that the subjects in your dataset were decedent counts but the denominator is all people in the US (so both of your statements are correct).</p> <p>Page 7 – the lives lost or saved is a meaningful addition.</p> <p>Page 7, second last sentence says “The difference between 11-year national....” Can you describe this more transparently? Is the 11-year national rate actually the average of all the rates that you observed (ie, in each state over each of the 11 years so the average of about 550 rates)?</p> <p>Results – page 8 – you say that the “overall mortality rate” was 10.21 per 100,000. Is that the average of the annual mortality rates across all states in general, or with age adjustment? Or did you count up all deaths over 11 years and sum up the years lived by the</p>
-------------------------	---

	<p>US population over the 11 years and report that average? As you see throughout the paper I am not certain how these basic rate values were calculated. I understand that it could get wordy to fully describe it in each instance but somewhere, and as is warranted throughout the manuscript, please do make it clear.</p> <p>Page 9, line 11. DC has the “largest significant annual reduction at -1.067.” Is that the average annual reduction over the 11 years, ie, is that the slope? As noted above, somewhere please indicate clearly what is being presented. For example, in the Methods where you indicate that you calculated trends, just make it clear how that was calculated so that when readers see values like this on page 11 they will know it is the average annual reduction ie slope.</p> <p>Page 9. I have not yet fully digested Figure 1 and Supp Table 1 but if some states were at the extreme in have a declining trend and some were at the extreme of increasing trend consider pointing that out of the way that you report on select states on Page 9. At present the reason you chose to refer to a few select states is not clear. Perhaps you are referring to only those states where the reduction or increase was statistically significant?</p> <p>Page 12 – nice opening to the Discussion: nice concise synthesis.</p> <p>Page 12 – long sentence starting on line 45 with “Taken at face value...” Do you mean to say that this may seem reassuring, BUT THAT in reality is conceals a substantial public health problem? The meaning of that sentence could be made more clear.</p>
--	--

## VERSION 1 – AUTHOR RESPONSE

Reviewer Name David Hemenway

Institution and Country Harvard School of Public Health

USA

Please state any competing interests or state ‘None declared’: None declared

I see two main problems with this paper.

**Hemenway comment 1:** (1) This is more of a report or a MMWR paper than a journal article. It aptly summarizes the death certificate data from the National Vital Statistics System.

**Reply to Hemenway’s comment 1:** Our manuscript, for the first time, documents the spatio-temporal trends in firearm fatality rates across the country. We see this work as foundational to studies that aim to understand *why* such differences exist. We aimed this work at a peer-reviewed journal specifically because the work is intended to engage and motivate further research.

**Hemenway comment 2:** But, and most importantly, it is not clear what the major point, or lesson, or theory one can derive from the article. The reader does not know what to make of any of the major findings--e.g., such as that in the two states with increasing trends, whites and non-Hispanics drove

the rise, and in six states with decreasing trends, Hispanics and blacks drove the fall. I put a N/A to one of the questions above because I don't think there really is a "research question"

**Reply to Hemenway's comment 2:** Our central objective was to document the spatio-temporal patterns in firearm fatality rates across the US from 2000 to 2010. Additionally we determined the temporal changes by race, ethnicity and intent of the injury. We suggest that there exists a large body of descriptive epidemiologic work that does not neatly fall under the rubric of a "research question". For example, the formative work in psychiatric epidemiology, documenting the burden of psychiatric disorders across the country is some of the most cited, and most important work in the field. This work serves a similar purpose, one that has not yet been done in the area, and one that we feel has held the field back.

**Hemenway comment 3:** In addition, these data on firearm deaths are readily available to everyone in an interactive format from the WISQARS system. Even as a reference article, it is not a crucial one since the data are so available and easy to manipulate. If one were interested in comparing the changes in firearm deaths 2000-2010 between North Carolina and Massachusetts, it would only take a few seconds to do so. One wouldn't need to find and read this report. Pages 9-11 are deathly dull. They contain information that might be interesting to specific state groups—though not to the general reader—but anyone interested in Georgia or Ohio would be better off just using WISQARS.

**Reply to Hemenway's comment 3:** The availability of data does not, in and of itself, mean that a thorough and comprehensive analysis does not make a contribution. One could apply such an argument to papers that use all publically available datasets, including for example, NHANES data. A search on PubMed on June 25, 2014 for "NHANES" yielded 3,846 manuscripts. It does not seem to us right to suggest that these papers are not making a contribution because anyone else could have also carried out these analyses. Anyone could, in theory certainly, but fields in science are driven by work that *is* done, and documented in peer-reviewed journals.

**Hemenway comment 4:** (2) The second problem is that the paper attempts to "explain" what trends it does find, but does so in a superficial and somewhat questionable way. For example, there are statements that state-specific declines in firearm death may be due in part to low firearm ownership (p. 13, 15), and that the stringency of state firearm laws may be related to firearm death trends (p. 14). But the authors provide no theory why either low firearm ownership or strong gun laws should result in decreasing firearm death TRENDS. The usual claim is that these should result in low RATES of firearm death, not decreasing rates of firearm death over time—unless perhaps there were recent changes in levels of firearm ownership or firearm laws were recently enacted (and the authors provide no evidence of major law changes in most of the states—e.g., AZ, DC, NV, IL or NY--which they discuss). Thus for the conclusion (p. 17) "While some of the states with the most stringent gun laws showed an EXPECTED decrease in firearm death rates..." I don't understand why the authors expected this unless they expect that firearm laws passed 30 years ago will have an ADDITIONAL effect this year.

**Reply to Hemenway's comment 4:** We agree with the reviewer that the extent to which we can explain that trends we document in this paper is limited; such work awaits more comprehensive analyses that take state-specific factors into account. We have now toned down our explanations in the conclusions.

**Hemenway comment 5:** The last full sentence on page 12 beginning with "Taken at face value..." is awkward and needs to be rewritten.

**Reply to Hemenway's comment 5:** We have now rewritten this sentence as follows:

"It is important to bear in mind that these endemic conditions are associated with substantial, long-term cumulative health burden associated with firearm death throughout the US."

Reviewer Name Doug Wiebe

Institution and Country University of Pennsylvania, USA

Please state any competing interests or state 'None declared': None declared

For authors:

**Wiebe comment 1:** I enjoyed the chance to read this interesting and thorough paper. I believe it makes a nice contribution to the literature by revealing heterogeneity in firearm fatality rates over time, and identifying that increases occurred in some sub groups/areas.

**Reply to Wiebe's comment 1:** Thank you.

**Wiebe comment 2:** Abstract, line 25. Would it be more accurate to say that the "AVERAGE national RFR was 10.21." And to also say the word "average" in line 30 to report on the average fatality rates over the study period, and over the different states, among blacks and separately among white? I understand the need to be concise. But without saying average I believe the results are not technically correct and also, to help get the reader oriented, saying "average" would be helpful simply by being explicit.

**Reply to Wiebe's comment 2:** We agree with the reviewer's suggestion and have incorporated this into the revised manuscript.

**Wiebe comment 3:** Abstract, line 57. Does it need another word at the end to say "...FRF-rates that remain HIGH." ? The rates do remain among all sub-groups, even if they are relatively low rates.

**Reply to Wiebe's comment 3:** We agree with the reviewer's suggestion and have added "high" to the end of the last sentence in the abstract in the revised manuscript.

**Wiebe comment 4:** Introduction – interesting and compelling.

**Reply to Wiebe's comment 4:** Thank you.

**Wiebe comment 5:** Methods – in the Abstract you report that the "population" is all people in the US; on page 6 line 40 you describe the data you accessed are aggregate counts of decedents. Simply reconcile these and decide how to communicate that the subjects in your dataset were decedent counts but the denominator is all people in the US (so both of your statements are correct).

**Reply to Wiebe's comment 5:** We have reconciled and changed the abstract as follows.  
*"Participants: Aggregate count of all people in the US from 2000 to 2010."*

**Wiebe comment 6:** Page 7 – the lives lost or saved is a meaningful addition.

**Reply to Wiebe's comment 6:** Thank you.

**Wiebe comment 7:** Page 7, second last sentence says “The difference between 11-year national....” Can you describe this more transparently? Is the 11-year national rate actually the average of all the rates that you observed (ie, in each state over each of the 11 years so the average of about 550 rates)?

**Reply to Wiebe’s comment 7:** The 11-year national rate is an overall for the entire country; which is total firearm deaths/ entire population of the country. When querying the WISQARS database, the rate for the time period of 2000 to 2010, is directly obtained. Instead of this “overall” rate we could use the state-specific rates and by meta-analysis could derive the pooled rate. However, this estimate will be different from the rates WISQARS database would produce on query. In order to avoid such a difference, we decided to use the “overall” estimate directly given by the WISQARS. We now use “overall” before 11-year rates in the statistical analysis section.

We have made the following changes in the manuscript.

*“The standard errors (SE) for national and state-specific age-adjusted FRF-rates per 100,000 persons were derived for the overall 11-year period and annually and by race, ethnicity and intent. Age-adjusted rates are obtained by direct standardization using the 2000 population. The overall 11-year rates were obtained by total firearm deaths during the 11 years over the total population during the 11-years.”*

**Wiebe comment 8:** Results – page 8 – you say that the “overall mortality rate” was 10.21 per 100,000. Is that the average of the annual mortality rates across all states in general, or with age adjustment? Or did you count up all deaths over 11 years and sum up the years lived by the US population over the 11 years and report that average? As you see throughout the paper I am not certain how these basic rate values were calculated. I understand that it could get wordy to fully describe it in each instance but somewhere, and as is warranted throughout the manuscript, please do make it clear.

**Reply to Wiebe’s comment 8:** Upon querying the WISQARS database, we obtain firearm fatality counts, population counts, crude rates and age-adjusted rates. The age-adjustment is performed using population in 2000. We used the age-adjusted rates for analysis.

We have added the following changes in the manuscript.

*“The standard errors (SE) for national and state-specific age-adjusted FRF-rates per 100,000 persons were derived for the overall 11-year period and annually and by race, ethnicity and intent. Age-adjusted rates are obtained by direct standardization using the 2000 population. The overall 11-year rates were obtained by total firearm deaths during the 11 years over the total population during the 11-years.”*

**Wiebe comment 9:** Page 9, line 11. DC has the “largest significant annual reduction at -1.067.” Is that the average annual reduction over the 11 years, ie, is that the slope? As noted above, somewhere please indicate clearly what is being presented. For example, in the Methods where you indicate that you calculated trends, just make it clear how that was calculated so that when readers see values like this on page 11 they will know it is the average annual reduction ie slope.



**Reply to Wiebe's comment 9:** We agree that explicitly mentioning slope is required. We have added the following change in the statistical analysis section.

*"In order to assess the temporal trends from 2000-2010, we assumed linear trends across 11 years and used meta-regression to calculate the change in rates (slope) and the standard deviation (SD)."*

**Wiebe comment 10:** Page 9. I have not yet fully digested Figure 1 and Supp Table 1 but if some states were at the extreme in have a declining trend and some were at the extreme of increasing trend consider pointing that out of the way that you report on select states on Page 9. At present the reason you chose to refer to a few select states is not clear. Perhaps you are referring to only those states where the reduction or increase was statistically significant?

**Reply to Wiebe's comment 10:** Of all the 50 states, we found that 41 states did not show a statistically significant trend. In Figure 1 and supplementary Figure 1, we document those 7 states and DC demonstrating declining firearm fatality rates and 2 states documenting increasing trend. We add an additional sentence in the second paragraph of the results section as follows.

*"State-specific 11-year FRF-rates are represented in **Figure 1** and **Supplementary Table 1**. Hawaii (HI) (3.02) and Massachusetts (MA) (3.24) had the lowest 11-year FRF-rates, while Louisiana (LA) had the highest at 18.62. DC and 7 states showed a significant declining trend in FRF-rate, while MA and FL documented a significant increase."*

**Wiebe comment 11:** Page 12 – nice opening to the Discussion: nice concise synthesis.

**Reply to Wiebe's comment 11:** We thank the reviewer for this comment.

**Wiebe comment 12:** Page 12 – long sentence starting on line 45 with "Taken at face value..." Do you mean to say that this may seem reassuring, BUT THAT in reality is conceals a substantial public health problem? The meaning of that sentence could be made more clear.

**Reply to Wiebe's comment 12:** This sentence is now re-written as follows.

*"It is important to bear in mind that these endemic conditions are associated with substantial, long-term cumulative health burden associated with firearm death throughout the US."*