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Peer-reviewed / Observational study / People

***The Lancet Public Health*: Firearm mortality highest in young men, and is associated with race and education**

****State level data available on request and via links at the end of press release****

- ***There were almost 2.5 million firearm deaths in 4 high-burden countries (USA, Mexico, Brazil, and Colombia) between 1990-2015. During this time, the risk of premature death by firearm increased in Mexico and Brazil, and decreased in the USA and Colombia, however firearms remain a leading cause of death in men aged 15-34 years – accounting for 1.4 million deaths.***
- ***Looking at firearm homicides only, which accounted for 73% of all firearm deaths, location, education, and race affected risk. Young men with low education were at highest risk in all 4 countries, and in the USA the risk of firearm homicide was 14 times higher in black men aged 25-34 with low education than in comparably educated white men (1.52% vs 0.11%). For US men with post-secondary education, black men were 30 times more likely to die by firearm homicide than comparably educated white men (0.30% vs 0.01%). In all countries, there were distinct high- and low-risk locations, which changed – sometimes rapidly – over time.***
- ***If countries could achieve the same firearm mortality rates nationally as in their lowest-burden states, 1.8 million firearm deaths in men and women of all ages could be avoided, including 1 million deaths in men aged 15-34 years.***

Firearms are a leading contributor to mortality in men aged 15-34 years in the USA, Mexico, Brazil, and Colombia, according to an observational study using national data for 106.3 million deaths, including 2.5 million firearm deaths in these 4 countries, published in [*The Lancet Public Health*](#) journal.

Firearms have remained a persistent cause of premature death in the Americas for the past 25 years. Firearm mortality in the USA is markedly higher than in any other high-income country, and in several Central and South American countries rates are even higher than those in the USA.

Although the number of firearm deaths has been reported at the national level for countries in the Americas previously, the variations in firearm mortality at the state level, by race or ethnicity, and by education level have not been examined before. In addition, the impact of these deaths on life expectancy among subpopulations has not been assessed.

The authors say that the variation in risk of firearm deaths in different populations and the changing patterns they have observed provide strong evidence that most firearm deaths could have been avoided, and highlights the important role of education level and race.

“Firearms are not only a leading and persistent cause of mortality in the USA, Mexico, Colombia, and Brazil – and as such must be considered a major public health concern – but the extreme variations in firearm mortality among subpopulations represent a societal challenge,” says senior author Professor Prabhat Jha, Dalla Lana School of Public Health, University of Toronto, and St. Michael’s Hospital, Canada. “Changes in firearm mortality explain most of the variation in overall mortality among young men in these 4 countries over the past 25 years, and in the USA, firearm homicides account for three-quarters of the marked differences in overall mortality observed between young white and black men, regardless of educational level.” [1]

In the study, the authors collected national data on individual deaths between 1990-2015 in the USA, Mexico, Brazil, and Colombia (which have high quality cause of death data and high firearm mortality) and, using information from death certificates, they compared overall and firearm mortality at the country and state levels. In addition, the authors analysed these deaths by intent (homicide, suicide, unintentional, or undetermined), and they also stratified cause of death data by age, gender, and education level.

Looking at homicides only – as they were most common intent overall – in men at the highest risk of homicide (ages 25-34 years), the authors stratified data by education in all 4 countries and by race in the USA and Brazil.

Brazil had the highest number of firearm deaths in all ages and genders between 1990-2015 (855,000 deaths), followed by the USA (851,000), Colombia (494,000), and Mexico (272,000). Homicide was the most common intent of firearm death in Brazil, Colombia, and Mexico (accounting for 90%, 94%, and 83% of cases, respectively), while suicide was the most common intent in the USA – accounting for more than half of all firearm deaths (56%) (table 1).

From 1990-2015, firearm mortality risks in men aged 15-34 years increased in Mexico and Brazil (from 0.7% between 1990-4 to 0.9% between 2010-5 in Mexico, and from 1% to 1.6% in Brazil), but decreased in the USA and Colombia (from 0.9% to 0.5%, and from 4.7% to 1.9%, respectively) (figure 4).

Firearm mortality accounted for up to half of the overall risk of premature death for young men (ranging from 12.5% of overall mortality risk in Mexico, to 58% in Colombia in 2000-4), and the authors say that where firearm mortality has fallen, these reductions account for much of the improved life expectancy in young men. By 2015, Colombian men aged 15-34 years had the highest risk of firearm mortality (1.9%) (figure 4).

Place of residence, education, and race were important factors in firearm mortality risk. There was more than ten-fold variation in the risk of firearm mortality in men aged 15-34 across states in each of the 4 countries during 2010-15, ranging between levels of 1.1% in Louisiana and 0.1% in Hawaii in the USA, 4.7% in Chihuahua and 0.05% in Yucatán in Mexico, 4.4% in Alagoas and 0.5% in Roraima in Brazil, and 4.8% in Valle del Cauca and 0.2% in Guainía in Colombia (see data excel, web appendix and figure 1). Typically, deaths were concentrated in a few high-burden states, but these varied over time, particularly in Brazil and Colombia – highlighting the volatility of firearm violence and mortality, and suggesting that these deaths could be avoided.

The authors analysed firearm homicide rates between 2000-15 in men aged 25-34 years and how education and race affected this. They found that men with low educational attainment (high school or lower level of education) were at greater risk of firearm homicide than those with higher educational attainment (post-secondary education) across all 4 countries [2].

When also considering race within these populations in Brazil and the USA, the authors found that black men in the USA and brown and black men in Brazil were at the highest risk of homicide, compared to Hispanic and white men.

In particular, in the USA, black men with lower educational attainment were 14 times more likely to die due to firearm homicide than comparably educated white men (1.52% vs 0.11% firearm mortality risk), and, in these groups, firearm homicides accounted for three-quarters of the difference in overall mortality risk between black and white men (there was a 2% overall mortality difference between US black and white men).

Comparing these rates with comparably educated men of different races and in different countries, the authors found that black US men with low educational attainment were 2-4 times more likely to die by firearm homicide than Brazilian black, brown or white men, and Mexican men (1.52% homicide mortality risk rate for black men in the USA compared with, respectively, 0.53%, 0.67%, 0.38%, and 0.39% – see Figure 3).

In addition, in the USA, black men aged 25-34 years with post-secondary education levels were 30 times more likely to die by firearm homicide than comparably educated white men (0.30% vs 0.01% risk).

The effect of race on firearm homicide was much greater in the USA than in Brazil, where differences in men's risk of firearm mortality were mostly due to differences in education, and where a higher education reduced the relative risk of firearm homicide among men of all races by similar amounts.

When focussing on suicide in the USA, the pattern changed and the risk of firearm suicide was higher among young white men than black or Hispanic men. The authors note that most people who survive a suicide attempt do not try again, thus, restricting access to firearms could avert tens of thousands of suicide deaths.

Discussing the implications of the findings, co-author Dr Anna Dare, St. Michael's Hospital, Canada, explains: "Failure to address firearms as a major cause of mortality for black men in the USA will hamper efforts to reduce disparities in mortality and improve life expectancy for black men. Interventions that reduce exposures to firearms are crucial, and well supported by research and international comparisons. There is also a clear need to address the broader cultural, social, and economic factors that contribute to such marked differences in mortality. Interventions that reduce exposures to firearms must be part of any effective solution." [1]

The authors note that their state-level data may mask differences in smaller areas, including cities and other localities. They also note that their homicide estimates in Brazil may be less reliable as they were based on national level race and education data, and because the underlying state level data on homicides in Brazil is less complete.

Based on reducing firearm mortality to the same level as seen in the lowest burden states across the 4 countries, the authors estimate that 1.8 million deaths could have been avoided between 1990-2015 across all ages and genders, including 1 million deaths in men aged 15-34 years [3].

An accompanying Editorial in *The Lancet Public Health* journal acknowledges the importance of considering cultural, social, and economic factors and limiting firearm access in interventions to reduce firearm mortality. It states: "Gun ownership and exposure to gun violence are of course not only matters of law, but also cultural, social, and economic issues. Interventions that limit firearm access are important, but must be broadened to address the cultural, social, and economic factors that contribute to such striking risk differences. Dare and colleagues' findings are a stark reminder of the broader social factors at play in determining people's unequal vulnerability to gun violence. Tackling disparities, in particular addressing the underlying factors of ethnicity and education identified here, through multisectoral approaches, will be crucial. Public health researchers need to reach out to wider disciplines. Controlling the flow of weapons must be a first step, but interventions that aim to change social norms around gun use, violence, and purchasing behaviour should also be developed. Firearm-related violence is a public health issue that must be tackled urgently by legislation, adequate research funding, and evidence based prevention strategies."

Further, in a linked Comment, Dr Sandro Galea, Boston University, USA, states that the time has come for a world without civilian owned guns. He says: "A world without most handguns and military style assault weapons might be unimaginable now, but data such as these from Dare and colleagues support the argument against civilian owned firearms, and prepare for a time when the question is not whether there should be a world without most guns, but simply how can this be achieved."

NOTES TO EDITORS

This study was funded by Canadian Institutes of Health Research and the University of Toronto Connaught Global Challenge. It was conducted by researchers from University of Toronto, St Michael's Hospital, Instituto Nacional de Salud Pública, Centre for Addiction and Mental Health, and Global Health Consulting.

The labels have been added to this press release as part of a project run by the Academy of Medical Sciences seeking to improve the communication of evidence. For more information, please see: <http://www.sciencemediacentre.org/wp-content/uploads/2018/01/AMS-press-release-labelling-system-GUIDANCE.pdf> if you have any questions or feedback, please contact The Lancet press office pressoffice@lancet.com

[1] Quote direct from author and cannot be found in the text of the Article.

[2] From Figure 3A:

In the USA, risk of firearm homicide was 0.41% for men with high school or lower education, vs 0.09% in men with post-secondary education.

In Mexico, risk of firearm homicide was 0.39% for men with high school or lower education, vs 0.09% in men with post-secondary education.

In Brazil, risk of firearm homicide was 0.32% for men with high school or lower education, vs 0.09% in men with post-secondary education.

In Colombia, risk of firearm homicide was 1.05% for men with high school or lower education, vs 0.21% in men with post-secondary education.

[3] Across the 4 countries: in the USA, 535,000 deaths overall could be avoided including 208,000 deaths in young men could be avoided, in Mexico 211,000 overall deaths including 116,000 in young men, in Colombia 406,000 deaths overall including 255,000 in young men, and in Brazil 626,000 deaths overall including 449,000 in young men.

For interviews with the Article authors, Professor Prabhat Jha and Dr Anna Dare, St Michael's Hospital, University of Toronto, Canada, please contact their media team via: Michael Oliveira E) oliveiram@smh.ca T) +1 416-864-5047

For interviews with the Comment author, Dr Sandro Galea, Boston University, USA, please contact: E) sgalea@bu.edu T) +1 617-358-3301

For embargoed access to the Article and Comment, please see: www.thelancet-press.com/embargo/firearmmortality.pdf

For embargoed access to the Appendix (including state level data), please see: www.thelancet-press.com/embargo/firearmmortalityAPPX.pdf

For embargoed access to *The Lancet Public Health* Editorial, please see: www.thelancet-press.com/embargo/firearmmortalityED.pdf

For embargoed state level data, and additional Excel tables for data in figures and PowerPoint slides, please contact Professor Prabhat Jha (via contact details above) or Emily Head, The Lancet, UK: E) emily.head@lancet.com T) +44 (0) 207 424 4249 / +44 (0) 7920 530 997

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