

# Geospatial, racial, and educational variation in firearm mortality in the USA, Mexico, Brazil, and Colombia, 1990–2015

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UNIVERSITY OF TORONTO  
DALLA LANA SCHOOL OF PUBLIC HEALTH

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# Background

- Firearms have been a persistent cause of death in the Americas for the past 25 years
- Firearm mortality in the USA is much higher than in any other high-income country, and even higher in several Central and South American countries
- The epidemiological and demographic determinants, and subnational variations of firearm deaths in the Americas are poorly documented
- Identifying high-risk population groups and localities can lead to appropriate planning and targeting of interventions

# Key messages

- There were **2.5 million firearm deaths** in the USA, Mexico, Brazil, and Colombia from 1990-2015, with **1.4 million** of the deaths in **men aged 15-34**
- Firearm **homicides** accounted for **73% of all firearm deaths**
- US black men aged 25-34 had the overall **highest risk of firearm homicide of any demographic group** in the study: with high school or less education, the risk was **14x higher** than for comparably educated US white men, and with post-secondary education, the risk was **30x higher**
- **1.8 million firearm deaths**, 1 million in men aged 15-34, **could have been avoided** if the 4 countries could achieve the same firearm mortality rates as their lowest-burden states

# Choice of countries



**USA**

*321.5 million*

**Mexico**

*120.8 million*

**Colombia**

*48.2 million*

**Brazil**

*201.2 million*

2015 total  
population:

**691.8 million**

# Mortality & population data sources

## USA

***Mortality:*** National Center for Health Statistics

***Population:*** National Cancer Institute's Surveillance, Epidemiology, and End Results database

## Mexico

***Mortality:*** Instituto Nacional de Estadística y Geografía

***Population:*** Mexican Population Council

## Brazil

***Mortality:*** Sistema de Informação sobre Mortalidade

***Population:*** Instituto Brasileiro de Geografia e Estatística

## Colombia

***Mortality & population:*** Departamento Administrativo Nacional de Estadística

## 2.5M firearm deaths in the USA, Mexico, Brazil, and Colombia from 1990-2015

**USA**      **851,000** deaths (**56%** suicide)

**Mexico**      **272,000** deaths (**83%** homicide)

**Brazil**      **855,000** deaths (**90%** homicide)

**Colombia**      **494,000** deaths (**94%** homicide)

# In each country, there was substantial subnational variation in firearm mortality risk for men aged 15-34 years

1990-94

2000-04

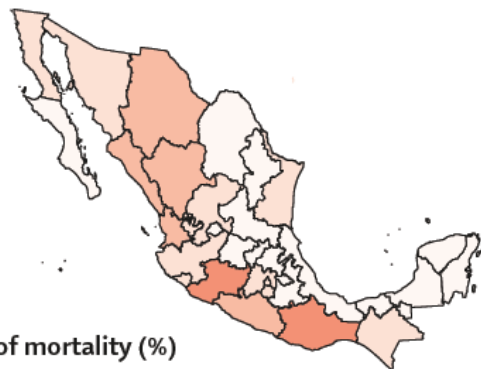
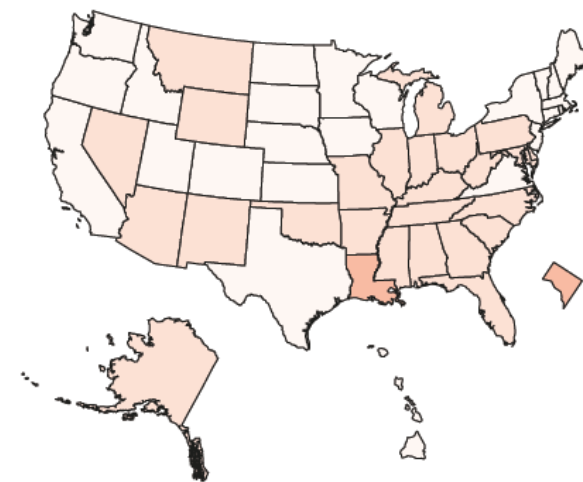
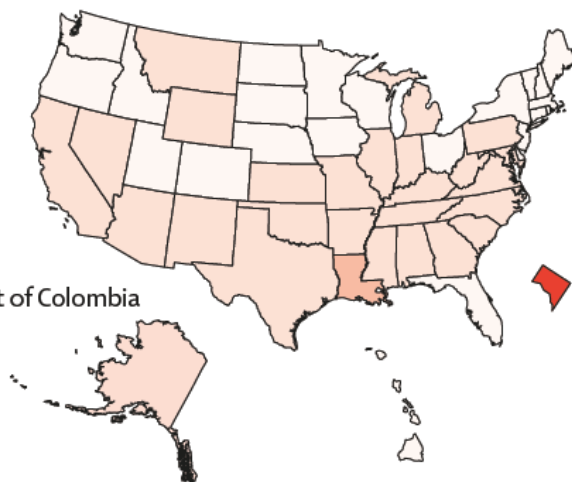
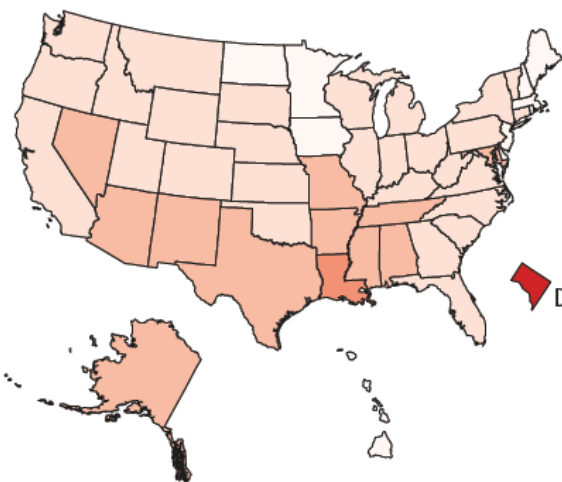
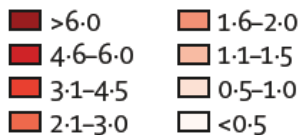
2010-15

USA

Mexico

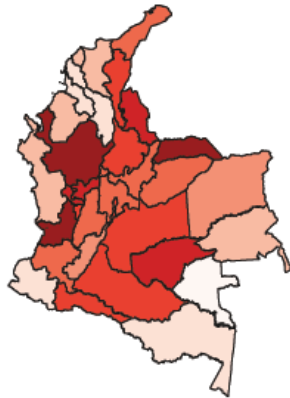
District of Columbia

Risk of mortality (%)

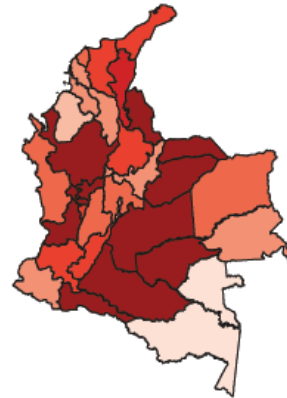


# In each country, there was substantial subnational variation in firearm mortality risk for men aged 15-34 years

1990-94

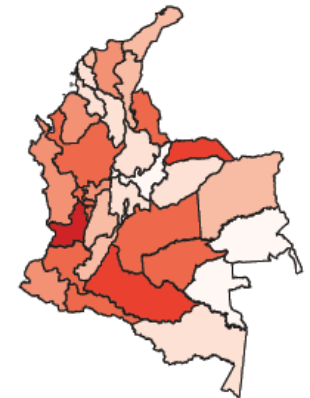


2000-04

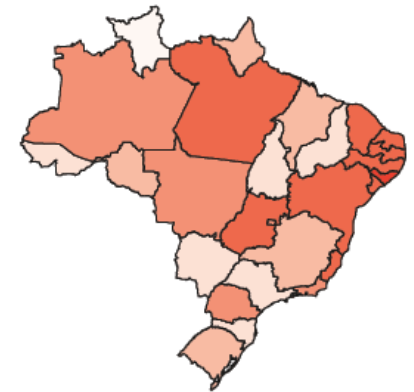


Colombia

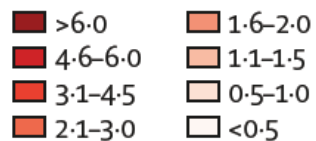
2010-15



Brazil

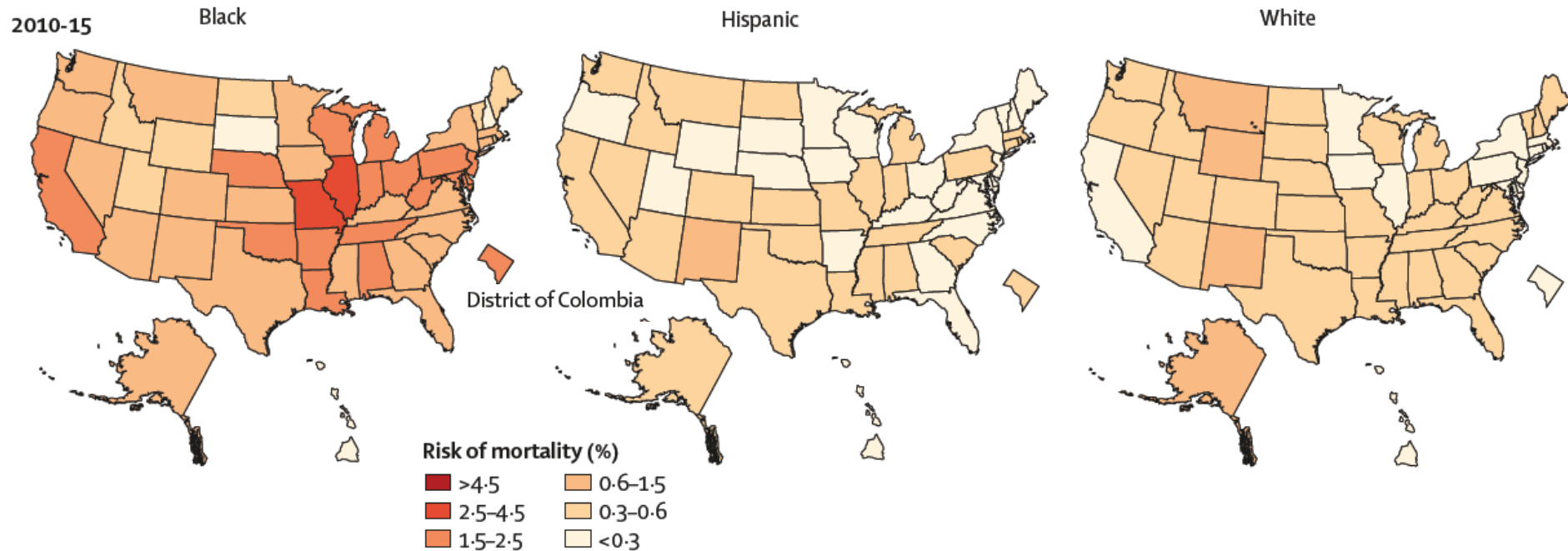


Risk of mortality (%)

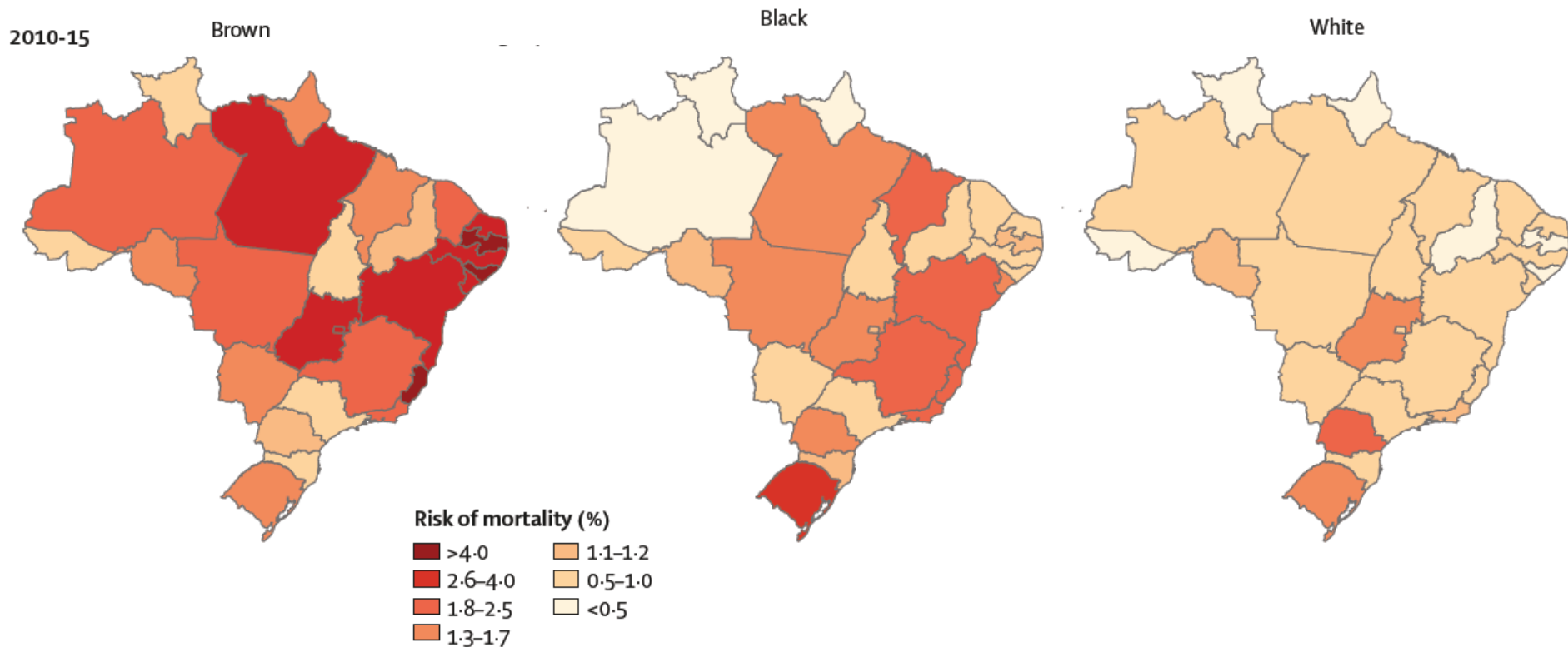


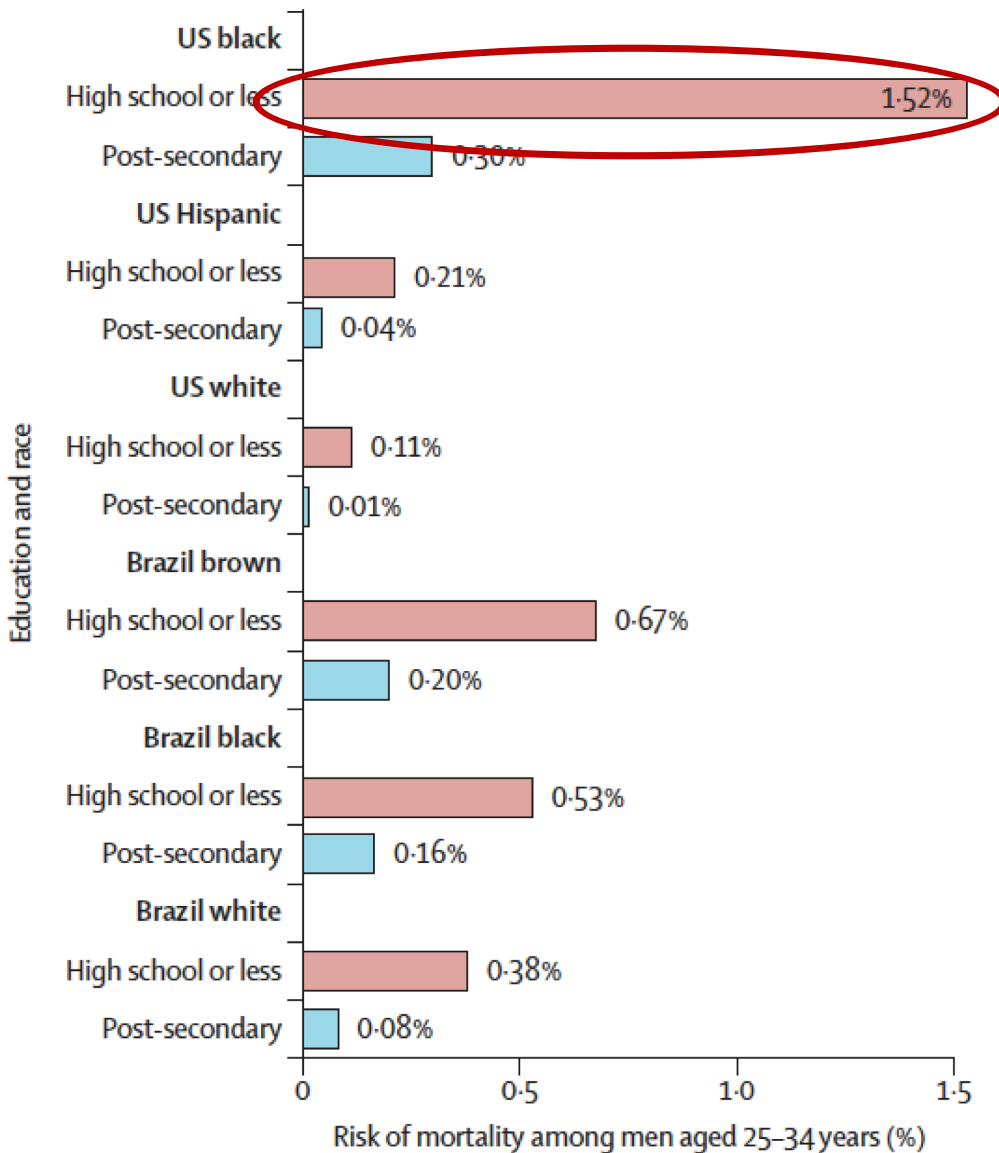


# In the US, black men aged 15-34 years had higher firearm mortality risks than Hispanic and white men of the same age



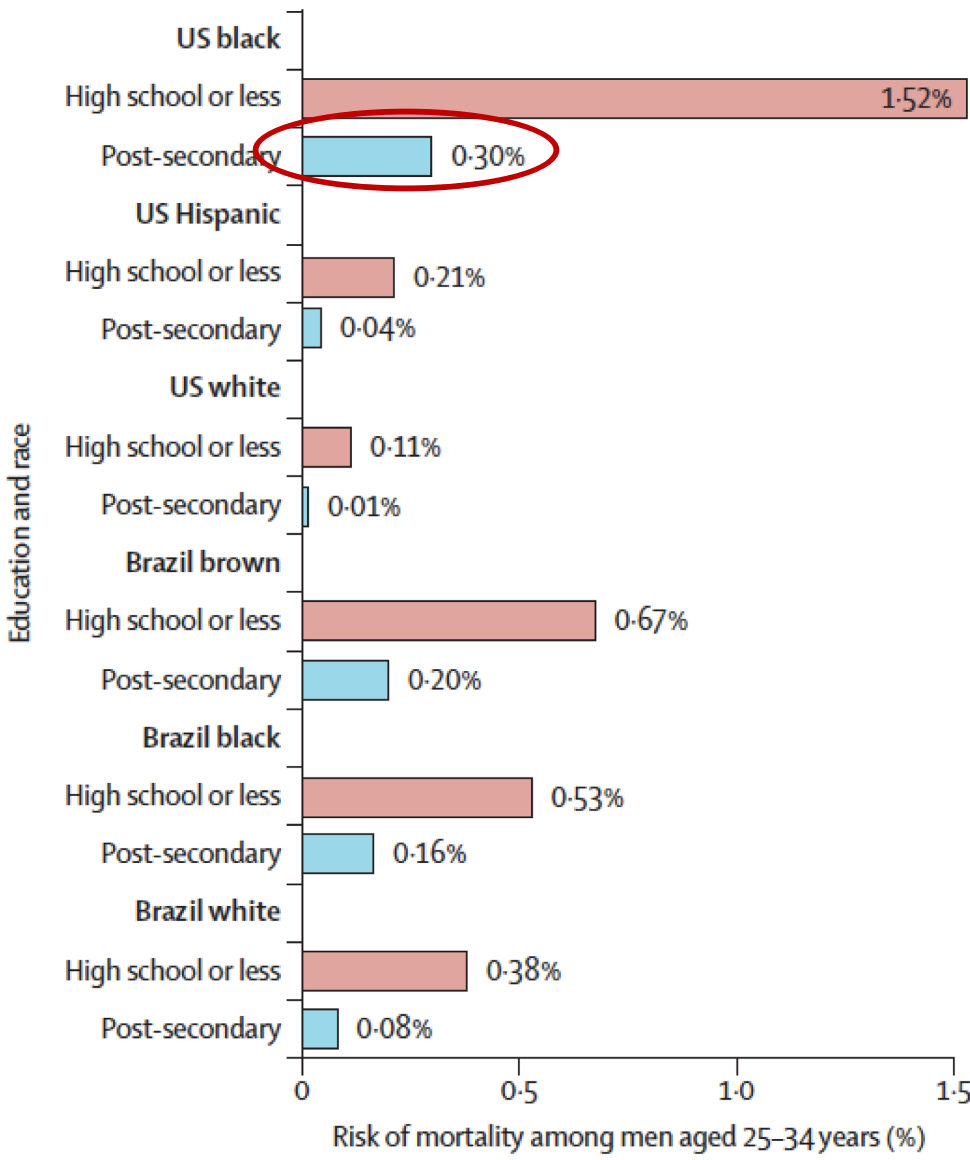
# In Brazil, brown\* men aged 15-34 years had the highest firearm mortality risks compared to black and white men of the same age





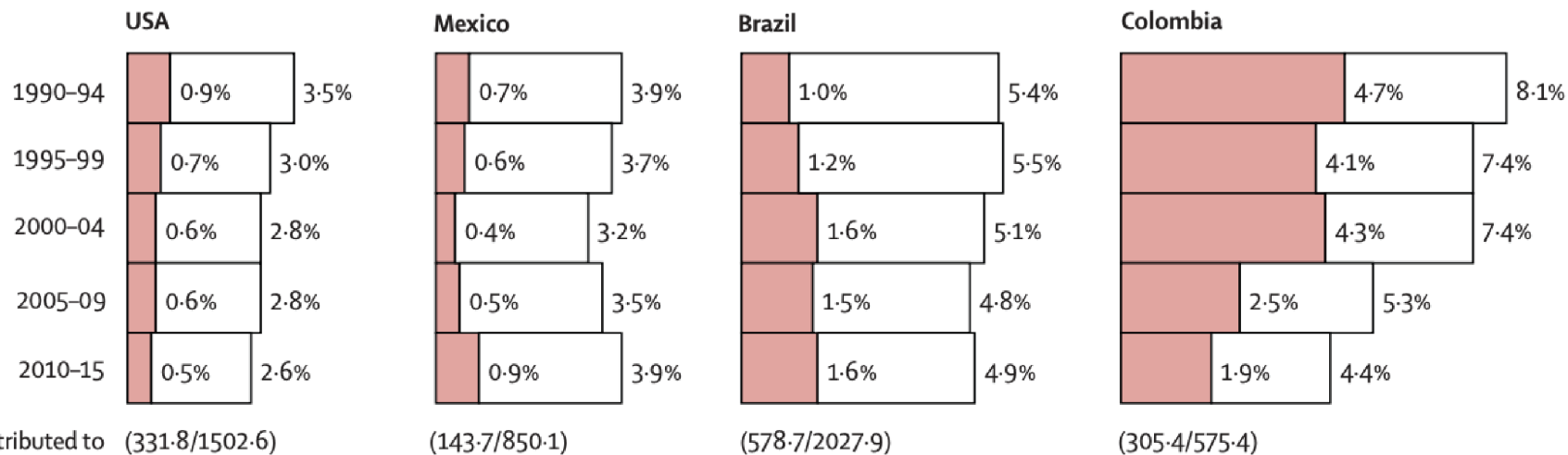
For **US black men aged 25-34 years with low education**, the risk of firearm homicide was:

- **14x higher** than for comparably educated US white men the same age
- **5x higher** than for US black men the same age with high school or less education
- **1.5-4x higher** than for comparably educated Mexican, Brazilian, or Colombian men the same age



For **US black men aged 25-34 years with post-secondary education**, the risk of firearm homicide was:

- **30x higher** than for comparably educated US white men the same age
- **7.5x higher** than for comparably educated US Hispanic men the same age
- **1.5-4x higher** than for comparably educated Brazilian or Mexican men the same age



Deaths attributed to firearm injury/total deaths (thousands), 1990-2015

(143.7/850.1)

(578.7/2027.9)

(305.4/575.4)

- Between 1990-2015, firearm mortality risks **decreased in the USA and Colombia**, and **increased in Mexico and Brazil**
- Firearm mortality accounted for **up to half of the overall risk of death** for men aged 15-34 years, ranging from **13%** in Mexico to **58%** in Colombia (both in 2000-04)

# Conservatively, 1.8 million firearm deaths could have been avoided in the four countries

Firearm deaths, 1990-2015, in thousands	USA	Mexico	Brazil	Colombia	All Countries
<b>Total firearm deaths</b>	851	272	855	494	2472
<b>Avoidable firearm deaths</b>					
Lowest local rates					
Both sexes, all ages	535	211	626	406	<b>1778</b>
Men aged 15-34 years	208	116	449	255	<b>1028</b>
Lowest female rates					
Both sexes, all ages	710	246	792	446	<b>2194</b>
Men aged 15-34 years	299	136	559	291	<b>1285</b>

- Using lowest *local* rates, **1.8 million** deaths could have been avoided, **1 million (58%)** in men aged 15-34 years
- Using lowest *female* rates, **2.2 million** deaths could have been avoided, **1.3 million (59%)** in men aged 15-34 years

# Implications

- Subnational variation in firearm mortality in the four countries is often greater than cross-national variation, and represents a societal challenge
- Education and race strongly affect an individual's risk of firearm mortality, where that information was available
- Most firearm deaths would be avoided if countries could achieve the firearm mortality rates of their lowest-burden states
- A limitation of the data is that state-level data can mask variation in even smaller areas (e.g. specific cities, demographic groups)

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## Collaborators

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- Canadian Institutes of Health Research
- University of Toronto Connaught Global Challenge



# For more information:

## [www.cghr.org/guns](http://www.cghr.org/guns)

Link to full paper and appendix (free)

Press release

PowerPoint presentation



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