

Researchers identify lesser-known factors associated with firearm violence

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An analysis of more than 71,000 shooting incidents in five major U.S. cities has identified lesser-known factors, such as lack of access to a vehicle, that are associated with increased firearm assaults. These

factors, in addition to more well-known ones—low per capita income and a high proportion of adults with no high school diploma—can help provide a new and more effective way to direct anti-violence efforts, according to researchers whose findings are published in the *Journal of the American College of Surgeons*.

The study found that fatal and non-fatal [firearm](#) assaults were clustered in neighborhoods with high levels of social stressors measured with the 2018 version of the Centers for Disease Control and Prevention's (CDC) Social Vulnerability Index (SVI), which used 15 U.S. census variables categorized under four themes to help local policymakers identify communities that may need support before, during, or after disasters. (The current CDC SVI uses 16 variables.)

The four themes are [socioeconomic status](#), household composition and disability, [minority status](#) and language, and housing type and transportation.

"We wanted to explore not necessarily how firearm laws might affect change in these communities, which is what is often talked about in the media, but how the social determinants of health might actually have a bigger impact on the everyday firearm violence that we see," said lead study author Ann Polcari, MD, MPH, MSGH, a general surgery resident at University of Chicago Medicine.

"We also wanted to better describe firearm assaults in these communities by using much more granular data, particularly geographically. We often talk about racial disparities and firearm violence, but in reality, it's more about the community that you live in and how, historically, these communities have been marginalized."

The strongest factor associated with increased

firearm violence

Of the four broad SVI themes, socioeconomic status was most strongly associated with an increase in shooting incidents, with an incidence rate ratio of 45%, followed by household composition and disability at 7%, and housing type and transportation at 3%. Minority status and language had a reverse effect, showing an 18% lower incidence rate ratio.

The authors stressed that racial disparities in firearm injury reflect the enduring legacy of structural racism in the United States, including historic redlining practices that exacerbated inequality and continue to impact communities today.

"We feel it important to stress that minority populations experience more firearm violence secondary to these longstanding structural inequities rather than an inherent or independent risk," the authors wrote.

When the researchers drilled down into each of the 15 social factors categorized under the four SVI themes, two factors were most associated with an increase in shooting incidents: higher proportion of the population living below the poverty line or low per-capita income, both of which fall under the socioeconomic status theme.

Other factors associated with higher rates of firearm violence were areas with higher populations of people with a disability or single-parent households, and people who lacked access to a vehicle, reflecting the need to focus on strategies that increase economic opportunity, education, and access to social support services in socially vulnerable neighborhoods.

Factors associated with fewer shooting incidents included a higher percentage of inhabitants ages 65 or older or age 17 or younger, and a

high density of multi-unit structures.

How to better direct anti-violence initiatives

This study shows the potential of the CDC's SVI to serve as a tool to help policymakers target neighborhoods most vulnerable to firearm violence, Dr. Polcari said. "Firearm violence in the U.S. is a really complex issue, and there's not going to be one answer to solve it," she said.

"We are going to have to approach this from many different aspects, but I do think that it's important for us to think about what we call the public health approach to prevention—meaning you identify where the problem is, identify the risks and protective factors, and then define your strategies for prevention."

"I'm not sure that, on a broad scale, we've really been doing that in the U.S., and I think a study like ours gives us the ability to do that," Dr. Polcari added. "We need to start looking at the upstream underlying causes of firearm violence in the communities where it's occurring, mostly so that we can scale up the local strategies that have been working and expand them to other communities."

Study design and results

The cross-sectional study merged 2018 SVI data on census tracts with shooting incidents from 2015 to 2021 in Baltimore, Chicago, Los Angeles, New York City, and Philadelphia. The analysis evaluated 71,296 shooting incidents across 4,415 census tracts.

- More than half of the incidents (55%) occurred in fewer than one-tenth (9.4%) of census tracts.
- In all five cities combined, each decile rise in the SVI resulted in

a 37% increase in shooting incidents.

- In two cities, the increases were more pronounced: 50% in Chicago and 41% in Philadelphia.

Looking beyond the impact of firearm laws

Notably, the five cities studied have some of the strictest local firearm laws in the U.S., Dr. Polcari said, "but they still have high rates of firearm violence."

The five cities were chosen because they made their shooting incident data sets available via open access. The U.S. does not have a comprehensive national database on firearm injuries that's updated in real time, Dr. Polcari said. "In reality, these are some of the [largest cities](#) in the U.S. that cover a wide population, and many of these cities do have a high rate of firearm violence," she said. "We felt that the data were representative of what urban environments in the U.S. look like."

The study was presented at the American College of Surgeons Committee on Trauma Annual Meeting, Chicago, in March 2023, and placed second in the National Resident and Fellow Clinical Trauma Paper Competition.

More information: Ann M Polcari et al, Social Vulnerability and Firearm Violence: Geospatial Analysis of 5 US Cities, *Journal of the American College of Surgeons* (2023). [DOI: 10.1097/XCS.0000000000000845](#)

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