

Scientists use new method to calculate the annual probability of a mass shooting

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With mass shootings happening randomly every year in the United States, it may seem that there is no way to predict where the next horrific event is most likely to occur. In a new study published by the

journal *Risk Analysis*, scientists at Iowa State University calculate the annual probability of a mass shooting in every state and at public places such as shopping malls and schools.

Their new method for quantifying the risk of a mass shooting in specific places could help security officials make informed decisions when planning for emergency events.

For their analysis, Iowa State associate professor Cameron MacKenzie and his doctoral student Xue Lei applied [statistical methods](#) and [computer simulations](#) to a database of mass shootings recorded from 1966 to 2020 by the Violence Project. The Violence Project defines a mass shooting as an incident with four or more victims killed by a firearm in a public place.

According to the Violence Project, the U.S. has experienced 173 public mass shootings from 1966 to 2020—with at least one mass shooting every year since 1966.

After they generated a probability distribution of annual mass shootings in the U.S., the scientists used two different models to simulate the annual number of mass shootings in each state. The results were used to calculate the expected number of mass shootings and the probability that at least one mass shooting would occur in each state in one year.

The Violence Project also provides the percentage of mass shootings in different types of locations. MacKenzie and Lei used that data to calculate the probability of a mass shooting in nine different types of public locations (including a restaurant, school, workplace, or house of worship) in the states of California and Iowa and also at the two largest high schools in each of those states.

Their findings include the following:

- The states with the greatest risk of a mass shooting are the most populous states: California, Texas, Florida, New York, and Pennsylvania. Together they account for almost 50% of all mass shootings.
- Some states, such as Iowa and Delaware, have never experienced a mass shooting.
- The annual risk of a mass shooting at the largest California [high school](#) is about 10 times greater than the risk at the largest Iowa high school.
- The number of mass shootings in the U.S. has increased by about one shooting every 10 years since the 1970s.

Importantly, MacKenzie points out that the probability of a mass shooting at a specific location depends on the definition of a mass shooting. In contrast to the Violence Project, the Gun Violence Archive defines a mass shooting as four or more individuals shot, injured or killed, in any location, not necessarily a public location. As a result, The Gun Violence Archive has collected data on shootings that occur in both public and private locations as well as targeted shootings (i.e., a gang shooting).

When the researchers applied data from The Gun Violence Archive to their models, the predicted number of annual mass shootings was nearly 100 times greater than the forecast based on The Violence Project's data. The models predicted 639 mass shootings in 2022 with a 95% chance that the U.S. would experience between 567 and 722 mass shootings in that same year.

MacKenzie points out that "most media appear to use this broader definition of mass shootings." Because of this, he urges that journalists explain how they are defining a mass shooting when reporting the statistical data.

With regard to the danger posed to children at school, MacKenzie explains, that "our results show that it is very, very unlikely that a specific student will attend a K-12 school and experience a mass shooting. But to parents of a child at a school that has experienced a [mass shooting](#), explaining that the school was extremely unlucky provides no comfort."

While it is important to take precautions, he adds that "we should not live in fear that our children will experience such a horrific event. Mass shootings are very low probability but very high consequence events."

More information: Xue Lei et al, Quantifying the risk of mass shootings at specific locations, *Risk Analysis* (2023). DOI: 10.1111/risa.14197

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