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<https://nyutandon.photoshelter.com/galleries/C0000U9BGHBrH3Gc/G0000PeW.oyxb7Ss/Porfiri-Firearms-8-11-20-PR>

Immediate Release

Statistical study tying gun purchases to fear of firearm regulations kicks off major research project

A new firearm study led by NYU Tandon Institute Professor Maurizio Porfiri reveals why people buy guns after a mass shooting. Porfiri kicks off a much larger study — the first of its kind — on individual, state, and national drivers of firearm behavior.

BROOKLYN, New York, Tuesday, August 11, 2020 – Surges in firearm acquisition after mass shootings is a well-documented phenomenon, but analytic research into the causes of this behavior — be it driven by a desire for self-protection, or a fear that access to firearms will be curtailed — is sparse.

A new study applying a data science methodology of state-by-state data to infer causal relationships finds that the decision to purchase a gun is driven by the latter concern — stricter regulations on gun purchase and ownership — more than by a desire to protect oneself after a mass shooting. The study, led by [Maurizio Porfiri](#), Institute professor at NYU Tandon, is his second in a year to examine causative factors driving consumer firearm-purchase behavior.

It also presages a much more comprehensive effort backed by a \$2 million grant from the National Science Foundation (NSF). The project, funded under the NSF's [LEAP HI program](#) (Leading Engineering for America's Prosperity, Health and Infrastructure), will examine causal relationships between potentially contributing factors as firearm prevalence, state legislation, media exposure, and people's opinion on firearm-related harms, at the individual, state, and nation levels.

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This will be the **first research of its kind** to unfold the firearm ecosystem simultaneously on three levels:

- Macroscale: causality between firearm prevalence and firearm-related harms at the national level
- Mesoscale: policy diffusion across states
- Microscale: individual opinions about firearm safety

“By cogently linking these scales, we will lay the foundation for analysis, diagnostics, and prediction of firearm-related harms,” said Porfiri.

The research effort, “[Understanding and Engineering the Ecosystem of Firearms: Prevalence, Safety, and Firearm-Related Harms](#),” will be orchestrated by a multidisciplinary team comprising co-principal investigators [Oded Nov](#), a professor of Technology Management and Innovation at NYU Tandon; Igor Belykh, a professor of Mathematics and Statistics at Georgia State University; James Macinko, a professor of Health Policy and Management at the University of California Los Angeles; and Rifat Sipahi, a professor of Mechanical and Industrial Engineering at Northeastern University. Also involved are Shinnosuke Nakayama, formerly a post-doctoral associate in Porfiri’s lab at NYU Tandon and now a data research scientist at the Center for Ocean Solutions at Stanford University; and [Maria Grillo](#), a project associate in the Institute for Invention, Innovation, and Entrepreneurship at NYU Tandon.

New research comprises three studies focused on state-level data

The newly-published research, “[Self-protection versus fear of stricter firearm regulations: examining the drivers of firearm acquisitions in the aftermath of a mass shooting](#),” appears in the Cell Press journal *Patterns*. It comprises three studies based on data the team collected on mass shootings, federal background checks related to firearm purchases, media output on firearm control and shootings from several media outlets in the country, and firearm safety laws from 1999 to 2017.

The authors of the new study, including Roni Barak-Ventura, research assistant in Porfiri’s [Dynamical Systems Laboratory](#) and Manuel Ruiz Marín of the Technical University of Cartagena, Spain, puts forward a data science framework, based on the mathematical construct of *transfer entropy* to discover causal links between multiple variables by examining the degree to which one variable influences another. In these analyses, influence is defined as an improved ability to make predictions about the future status of a variable (in this case, background checks) based on present knowledge of another variable (for example, media stories about gun control policy).

The team first conducted a cluster analysis to partition states according to the restrictiveness of their firearm-related legal environment. That was followed by a *transfer entropy* analysis to unveil causal relationships at the state-level between mass shootings, media coverage of gun violence, media coverage of firearm regulations, and background checks.

- The first study examined how the occurrence of mass shootings in the nation, media reports about shootings, and media reports on firearm control influence the number of background checks in firearm restrictive and firearm permissive states. The researchers found that increased media coverage of firearm control influenced background checks in permissive states.

- The second study tested whether the location of a mass shooting had a potential influence on the number of background checks across the country. The researchers found that the number of background checks in one state was not significantly affected by mass shootings in another, irrespective of their location or the state’s restrictiveness.
- The third study looked at the influence on the number of background checks in a given state of background checks in geographically neighboring states. The team found a strong interaction among states, whether they are permissive or restrictive, so that firearm purchases in a state determine purchases in neighboring state.

“The analysis suggests that fear of stricter firearm regulations is a stronger driver than the desire of self-protection for firearm acquisitions,” said Porfiri, who is on a research sabbatical at the Technical University of Cartagena, Spain. “This fear is likely to cross states’ borders, thereby shaping a collective pattern of firearm acquisition throughout the nation.”

Ruiz Marín added that “This research brings forward an alternative data science methodology to examine causal links in spatio-temporal data, with potential application to the study of a number of problems in economics and social sciences.”

Porfiri’s first study of this kind, published in [Nature Human Behavior](#) in September, 2019, similarly applied entropy transfer techniques to mass shootings and the publicity around them, and demonstrated the potential of quantitative methods, grounded in engineering principles, to elucidate key aspects of the firearm ecosystem.

“Engineering, by definition, applies mathematical tools and scientific principles to real-world challenges. Porfiri’s work — the importance of which is reflected in the generosity of the NSF LEAP HI award — is proof positive that engineering offers solutions beyond hardware, software, chemical innovations, and physical structures,” said [Jelena Kovačević](#), Dean of the NYU Tandon School of Engineering. “Indeed, Porfiri’s research brings hard data and rigorous analytics to bear on the sometimes amorphous patterns and influences that drive our society and, ultimately, shine a light on the machinery of our democracy.”

The research was supported by an internal grant from New York University, the Fundación Séneca of the Region of Murcia, Spain, and the Mitsui USA foundation.

About the New York University Tandon School of Engineering

The NYU Tandon School of Engineering dates to 1854, the founding date for both the New York University School of Civil Engineering and Architecture and the Brooklyn Collegiate and Polytechnic Institute (widely known as Brooklyn Poly). A January 2014 merger created a comprehensive school of education and research in engineering and applied sciences, rooted in a tradition of invention and entrepreneurship and dedicated to furthering technology in service to society. In addition to its main location in Brooklyn, NYU Tandon collaborates with other schools within NYU, one of the country’s foremost private research universities, and is closely connected to engineering programs at NYU Abu Dhabi and NYU Shanghai. It operates Future Labs focused on start-up businesses in downtown

Manhattan and Brooklyn and an award-winning online graduate program. For more information, visit engineering.nyu.edu.

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