

Vaccines are overwhelmingly safe but cognitive biases are holding the hesitant back, according to new paper

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Well before COVID-19 emerged, the World Health Organization identified vaccine hesitancy as one of the top threats to human health worldwide.

In a new paper published in the journal *BMC Public Health*, a group of Concordia researchers looks at both the side effects reported by

individuals who have been vaccinated—known as "adverse events" or AEs—and the cognitive biases identified among the [vaccine](#) hesitant.

"We started our work on this paper in late 2019, before we had ever heard of COVID-19," says Hossein Azarpanah, the paper's lead author and a Ph.D. student in the Department of Supply Chain and Business Technology Management at the John Molson School of Business.

"Vaccine hesitancy has been a problem for as long as we have had vaccines. But in the last 10 to 15 years, mainly thanks to social media, people have formed these integrated groups online and have had significant influence even before the pandemic."

Assistant professor Mohsen Farhadloo and professor Rustam Vahidov, both in the same department as Azarpanah, and Louise Pilote, a professor of epidemiology at McGill University, co-authored the study.

Data-driven evidence to address vaccine safety concerns

For the first part of their study, the researchers examined two public databases, the United States-based Vaccine Adverse Event Reporting System (VAERS) and the Canada Vigilance adverse reaction online database. They found that minor adverse events to vaccines were common, but that the vaccines themselves were very safe.

Between January 1, 2011 and December 31, 2018, the VAERS database received almost 295,000 reports, equal to roughly 115 reports per million people, of 87 different vaccine types. The most frequently reported vaccine types were those for chickenpox, two kinds of influenza, pneumococcal bacteria and the human papillomavirus. The median reports involved three adverse events, the most common being

rashes, fever, swelling, and local, extremity or head aches or pain. Some 5.5 percent reported serious adverse events, resulting in hospitalization, disability, threats to life and death. The top five AEs in these cases were fever, pain, vomiting, headaches and shortness of breath. Results from the Canadian database were consistent with the VAERS findings. The authors also created a dashboard that can be used to visualize the findings of the study.

The researchers note as well that the most effective way of communicating vaccine safety is with summarized reports. Overly detailed reports can lead to an increase in cognitive biases, which can negatively influence a person's decision to receive a vaccine.

15 types of cognitive biases

In the second part of the study, the researchers look at the cognitive biases underpinning vaccine hesitancy. They identified 15 possible biases and evaluated how each might lead an individual to decide against receiving a vaccine. These include, among others:

- **Availability bias:** The tendency to attribute higher weight to factors that are easier to recall, such as a vivid recollection of a rare case of someone who suffers serious adverse events.
- **Optimism bias:** Minimizing or having an unrealistically optimistic view of the health risks.
- **Shared information bias:** The tendency, often seen in social media groups, to spend more time and energy on familiar information and less on new information.

Other forms of biases include authority bias (a prominent celebrity or politician makes assertions about the validity of a certain medication or vaccine); ambiguity aversion (a known risk is better than an unknown risk); present bias (today's effects matter more than tomorrow's);

confirmation bias (preferring information that confirms one's existing beliefs) and belief [bias](#) (evaluating an argument based on the believability of the conclusion).

To Farhadloo, this framework, when coupled with the data analyzed in the VAERS and Canada Vigilance databases, provides communicators with the tools that can help counter the growing spread of disinformation.

"We have analyzed the existing reports and found no evidence linking the severity of adverse events to vaccinations," he says. "For health officials, the application of our findings and paying attention to the ways they communicate can be important tools when dealing with [misinformation](#) on [social media](#)."

More information: Hossein Azarpanah et al, Vaccine hesitancy: evidence from an adverse events following immunization database, and the role of cognitive biases, *BMC Public Health* (2021). [DOI: 10.1186/s12889-021-11745-1](#)

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