Upcoming flu season will likely be severe

August 31 2021

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The 2021-22 influenza season is likely to be more severe than average—and hit young children particularly hard—due to waning population-level immunity from the near-lack of a flu season during last winter's COVID-19 surge, two new analyses led by scientists at the University of Pittsburgh Graduate School of Public Health revealed.

Both studies suggest that increased flu-related hospitalizations and deaths can be mitigated if vaccination rates are between 20% and 50% higher than those in recent flu seasons.

To quickly inform public health and clinical decisions, the scientists published the findings of both studies in medRxiv, a preprint website, and announced their results today, ahead of peer-reviewed publication.

"As COVID-19 containment measures—such as masking, distancing and school closures—are relaxed around the world, we're seeing a fierce resurgence of other respiratory viruses, which does not bode well for the coming flu season," said Mark Roberts, M.D., M.P.P., director of the Public Health Dynamics Laboratory at Pitt Public Health and senior author on both studies. "In a worst-case situation with a highly transmissible flu strain dominating and low influenza vaccination uptake, our predictive models indicate the potential for up to nearly half a million more flu hospitalizations this winter, compared to a normal flu season. Vaccinating as many people against flu as possible will be key to avoiding this scenario."

Roberts and his colleagues performed two independent analyses, using different mathematical modeling platforms and publishing the results separately. Both models produced consistent, complementary results.

Using the Framework for Reconstructing Epidemiologic Dynamics (FRED) simulation platform, Pitt Public Health research assistant professor Mary Krauland, Ph.D., led a team that found the 2021-22 flu season could have around 20% more flu cases than normal, though there is the potential for as high as double the typical caseload, which is between 9 million and 45 million illnesses in the U.S.

In the 2019-20 flu season, about half of Americans got vaccinated against the flu. FRED showed that increasing that vaccination rate by as

little as 10% resulted in a 6% to 46% predicted decrease in hospitalizations, depending on the transmissibility of the dominant flu virus this season.

With a Susceptible-Exposed-Infected-Recovered (SEIR) model, Pitt Public Health postdoctoral associate Kyueun Lee, Ph.D., led a team that found the coming influenza season will likely bring about 600,000 hospitalizations, at least 100,000 more than would happen in a normal season. In a worst-case scenario where vaccine uptake is low, there would be more than 400,000 additional hospitalizations. Getting 75% of Americans vaccinated against flu, rather than the typical 50%, would be needed to avoid the additional hospitalizations, according to the model.

Lee also went a step further and examined what would happen in future years if COVID-19 precautions persist and this flu season also is blunted. As would be expected, natural immunity against flu continues to plummet, further increasing the odds of an ever-larger flu outbreak with high hospitalization rates whenever social activity returns to normal.

"This is not to suggest that we should stop COVID-19 mitigation efforts to avoid a severe future flu season," said Roberts, who also is a distinguished professor of health policy and management at Pitt Public Health. "Instead, it shows that more of us—particularly young children—will be susceptible to the flu and that vaccination is absolutely essential to avoiding bad outcomes.

"The 'twindemic'—a coinciding flu and COVID-19 epidemic—overwhelming our hospitals was thankfully avoided last year. But that does not mean it is no longer possible," he continued. "If anything, our models show that we should be more concerned this year about the possibility of a surge in COVID-19 hitting at the same time as a massive flu outbreak in areas of the country with low vaccination rates against both diseases."

More information: Kyueun Lee et al, Predicting the impact of low influenza activity in 2020 on population immunity and future influenza season in the United States, (2021). DOI: 10.1101/2021.08.29.21262803

Mary G Krauland et al, Agent-based Investigation of the Impact of Low Rates of Influenza on Next Season Influenza Infections, (2021). DOI: 10.1101/2021.08.18.21262185

Provided by University of Pittsburgh