Severity of H1N1 flu in US during current flu season may be less than feared

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A new study from researchers at the UK Medical Research Council and the Harvard School of Public Health (HSPH) projects that the severity of the H1N1 flu during the autumn-winter flu season in the U.S. will likely be less than previously feared. The estimates of hospitalizations and life-threatening events in the study are the most accurate to date of the H1N1 pandemic's impact in the U.S. The study appears online on December 7, 2009 in the journal *PLoS Medicine*.

"As more detailed data have become available, we have been able to improve our estimates of how severe this disease is. Early on, it was difficult to measure the flu's impact and it was crucial to plan for the full range of possible outcomes. Fortunately, the virus now appears to be near the milder end," said Marc Lipsitch, professor of epidemiology at HSPH and the study's senior author. Lipsitch heads the Center for Communicable Disease Dynamics at HSPH, which focuses on mathematical modeling and analysis of data on pandemic influenza, drug resistant infections, seasonal infectious diseases, and intervention allocation. The Center is funded through the National Institutes of Health's Models of Infectious Disease Agent Study (MIDAS), which is aiming to increase capacity to model disease spread, evaluate different intervention strategies, and help inform public health officials and policymakers.

While the news is better than was thought at the start of the pandemic, Lipsitch emphasizes that it remains important to continue to vaccinate against pandemic H1N1 and to remain vigilant about disease in groups at

risk of complications. "This is a serious disease," said Lipsitch. "The U.S. Centers for Disease Control (CDC) and others have shown that certain high-risk groups, including pregnant women, people with asthma, and people with compromised immune systems, should be vaccinated and should seek prompt treatment if they suspect they are sick with H1N1. Even for people outside these high-risk groups, vaccination is an important way to reduce the risk of what can be a serious illness."

Estimates of the H1N1 flu's severity are important because they help public health officials plan for the types of interventions that are needed to treat symptoms, including life-threatening respiratory situations, and help officials project the possible burden on the health care system.

"Providing unbiased estimates to gauge the severity of the flu pandemic is crucial in order for local health services to be able to plan their resources properly and deliver the best level of care possible. Our study was careful to account for uncertainty in the evidence and analyse the different ways severity of the illness is being measured," said first author Anne Presanis of the Medical Research Council Biostatistics Unit in Cambridge, UK.

Up until this point, the severity of H1N1 flu among the U.S. population had been hard to measure, partly due to the difficulties of counting the large numbers of cases that overwhelmed health authorities and of testing the large numbers of people that had symptoms. The World Health Organization counts 209,000 laboratory-confirmed cases and more than 3,205 deaths worldwide as of September 11, 2009, but health authorities worldwide believe that these are substantial underestimates.

The researchers, led by Presanis and Lipsitch, measured the severity of the pandemic by analyzing what fraction of people in the study population that were sick with H1N1 flu were (1) hospitalized, (2) in an intensive-care unit (ICU) or on a ventilator or (3) had died. They

analyzed data from the CDC and from New York and Milwaukee, two cities where health officials collected particularly high-quality surveillance data during the wave of infections from April to July 2009. The researchers then combined all the evidence using a statistical approach called Bayesian evidence synthesis to estimate the probability of the three outcomes above for individuals who fell ill with H1N1 in the overall U.S. population and by age group.

The researchers used two different approaches to estimate these risks. One approach led to an estimate that approximately 1.44% of patients with symptoms of H1N1 flu during the April-July time period were hospitalized, 0.239% required intensive care or mechanical ventilation and 0.048% died. The other estimate found probabilities 7 to 9 times lower, due to the use of different data to estimate how many individuals were sick. Based on these findings and assuming that the virus doesn't change its characteristics, the researchers estimate that the severity of the autumn-winter pandemic wave of H1N1 flu could have a death toll in a range from considerably below the estimated 36,000 associated with an average flu season in the U.S. to slightly higher. Also, unlike seasonal flu, which kills mainly elderly adults, the H1N1 flu could have the greatest impact in children aged 0-4 and especially adults 18-64, a shift toward nonelderly persons that has been seen in prior flu pandemics.

"The good news is that, along with previous work by the CDC and others, our work shows that the severity of the H1N1 flu may be less than initially feared," said Lipsitch. However, he adds that between 1 in 70 and 1 in 600 people who are sick with the illness will be hospitalized, and a fraction of those will die.

A preliminary version of this article was posted on PLoS Currents (September 25th 2009), a new forum for rapid publication of results designed to aid timely dissemination of important information during the pandemic.

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More information: Presanis AM, De Angelis D, The New York City Swine Flu Investigation Team, Hagy A, Reed C, et al. (2009) The Severity of Pandemic H1N1 Influenza in the United States, from April to July 2009: A Bayesian Analysis. *PLoS Med* 6(12): e1000207. doi:10.1371/journal.pmed.1000207

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