

## **Comparative epidemiology of human infections with avian influenza A(H7N9) and A(H5N1) viruses in China**

*B Cowling<sup>1\*</sup>, L Jin<sup>2</sup>, E Lau<sup>1</sup>, Q Liao<sup>3</sup>, P Wu<sup>1</sup>, H Jiang<sup>3</sup>, T Tsang<sup>1</sup>, J Zheng<sup>3</sup>, V Fang<sup>1</sup>, Z Chang<sup>3</sup>, M Ni<sup>1</sup>, Q Zhang<sup>3</sup>, D Ip<sup>1</sup>, J Yu<sup>3</sup>, Y Li<sup>3</sup>, L Wang<sup>3</sup>, W Tu<sup>2</sup>, L Meng<sup>2</sup>, J Wu<sup>1</sup>, H Luo<sup>4</sup>, Q Li<sup>2</sup>, Y Shu<sup>5</sup>, Z Li<sup>3</sup>, Z Feng<sup>2</sup>, W Yang<sup>6</sup>, Y Wang<sup>6</sup>, G Leung<sup>1</sup>, H Yu<sup>3</sup>*

<sup>1</sup>Infectious Disease Epidemiology Group, School of Public Health, Li Ka Shing Faculty of Medicine, The University of Hong Kong, Hong Kong Special Administrative Region, China; <sup>2</sup>Public Health Emergency Center, Chinese Center for Disease Control and Prevention, Beijing, China;

<sup>3</sup>Division of Infectious Disease, Key Laboratory of Surveillance and Early-Warning on Infectious Disease, Chinese Center for Disease Control and Prevention, Beijing, China;

<sup>4</sup>National Immunization Program, Chinese Center for Disease Control and Prevention Beijing, China;

<sup>5</sup>National Institute for Viral Disease Control and Prevention, Chinese Center for Disease Control and Prevention, Key Laboratory for Medical Virology, National Health and Family Planning Commission, Beijing, China;

<sup>6</sup>Office of the Director, Chinese Center for Disease Control and Prevention, Beijing, China

**BACKGROUND:** The novel influenza A(H7N9) virus recently emerged, while influenza A(H5N1) virus has infected humans since 2003 in mainland China. A striking feature of A(H7N9) is the relatively rapid accumulation of laboratory-confirmed cases in humans, even though phylogenetic and epidemiologic evidence points to predominantly zoonotic transmission. In contrast A(H5N1), similarly an exclusive zoonosis with very few exceptions, has caused only 43 laboratory-confirmed cases in China since 2003. We compared the epidemiologic characteristics of the complete series of laboratory-confirmed cases of both viruses in mainland China to date.

**MATERIALS AND METHODS:** An integrated database was constructed with information on demographic, epidemiologic, and clinical variables of laboratory confirmed A(H7N9) and A(H5N1) cases that were reported to the Chinese Center for Disease Control and Prevention up to May 24, 2013. We described disease occurrence by age, sex and geography and estimated key epidemiologic parameters including the incubation period, onset to admission interval, onset to laboratory confirmation interval, and admission to death and discharge intervals using survival analysis.

**RESULTS:** Among 130 and 43 patients with confirmed A(H7N9) and A(H5N1), respectively, the median ages were 62 y and 26 y. Thirty three (77%) of the A(H5N1) cases occurred in the winter months November through February. In urban areas, 74% of cases of both viruses were male whereas in rural areas the proportions were 62% for A(H7N9) and 33% for A(H5N1). Among cases of A(H7N9) and A(H5N1), 75% and 71% reported recent exposure to poultry. Symptoms at illness onset were relatively similar between the two viruses, with fever and cough being the most frequently reported symptoms, but less frequently so for A(H5N1). The mean incubation periods of A(H7N9) and A(H5N1) were 3.1 and 3.3 days, respectively. On average, 21 and 18 contacts were traced for each A(H7N9) case in urban and rural areas, respectively; compared with 90 and 63 for A(H5N1). The hospitalization fatality risk was 35% (95% CI: 25%, 44%) for A(H7N9) and 70% (95% CI: 56%, 83%) for A(H5N1).

**CONCLUSIONS:** The sex ratios in urban compared with rural cases are consistent with poultry exposure driving the risk of infection. However the difference in susceptibility to serious illness with the two different viruses remains unexplained, given that most A(H7N9) cases were in older adults while most A(H5N1) cases were in younger individuals. Our estimates of biological parameters, such as the incubation period and to some extent the hospitalization fatality risk, should generalize to other countries. If A(H7N9) follows a similar pattern to A(H5N1), it is possible that the A(H7N9) epidemic may reappear in the fall. This potential lull should be an opportunity for discussion of definitive preventive public health measures and optimization of clinical management, as well as capacity building in the region, given the possibility that A(H7N9) may spread outside China's borders.