

### S19 - Real-time Estimation of the Severity of Influenza Viruses

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**Introduction and Project Objectives:** Timely and reliable estimates of the seriousness of infection (severity) are essential for public health decision-making during an on-going influenza epidemic. However, methods for real-time estimation of severity remain limited, and many of the early estimates of the seriousness of influenza A(H1N1)pdm09 and A(H7N9) virus infections were problematic and misrepresented the seriousness of these infections. The objectives of our proposal study are to identify which approaches can more accurately reflect the severity of emerging and re-emerging infections.

**Methods:** We compared approaches for real-time estimation of the hospital-fatality-risk of influenza A(H1N1)pdm09 in 2009 in Hong Kong and influenza A(H7N9) in 2013 in China, allowing for right-censoring of final outcomes in patients. We evaluated a new approach for estimation of symptomatic case-fatality-risk of influenza A(H1N1)pdm09 in 2009 and 2011, and influenza A(H3N2) in 2010 in Hong Kong, based on extrapolation of local influenza-like illness surveillance and laboratory detection data.

**Results:** For the real-time estimation of HFR, models accounting for censoring and allowing for time-varying severity generated reliable estimates earlier than models without these adjustments. The risk of influenza A(H1N1)pdm09 mortality in hospitalized cases increased with age. Had serologic data been available, with 300 samples collected per week and tested in real time, we would have been able to obtain reliable estimates of the symptomatic case-fatality-risk of influenza A(H3N2) virus one week before the epidemic peak.

**Conclusions:** We identified approaches that can provide more reliable estimates of severity taking into account critical factors such as censoring of data regarding final disease outcomes of the patients. These results improve our understanding of the severity of influenza virus infections and provide a practical approach to reliably estimate the severity of emerging and re-emerging infections. Valid estimates of severity from the recommended methods in this report will inform public health decisions on appropriate control strategies.

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