Distinguishing Between Reservoir Exposure and Human-to-Human Transmission for Emerging Pathogens Using Case Onset Data

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Abstract

Pathogens such as MERS-CoV, influenza A/H5N1 and influenza A/H7N9 are currently generating sporadic clusters of spillover human cases from animal reservoirs.

Introduction

Methods

Epidemic model

Statistical inference

Results

Estimating basic reproduction number and spillover hazard

Fig. 1. Simulation results under mean serial interval infit days and H5N1A.

Fig. 2. Simulation results when mean serial interval is 6.

Fig. 3. Sensitivity to mis-specification of offspring distribution.

Fig. 4. Sensitivity to mis-specification of hazard function.

Fig. 5. Comparison of proportion of human-human transmission.

Influenza A/H7N9 in China

Table 1. Comparison of different models of spillover hazard

Table 2. Estimates of R₀ in different regions, 90% credible interval is given in parentheses.

Fig. 6. Estimates for R₀ and spillover hazard for A/H7N9 in China

Table 3. Estimated number of cases resulting from human-to-human transmission in different regions

Fig. 7. Sensitivity to under-reporting when drop in hazard known

Fig. 8. Sensitivity to under-reporting when shape of hazard known

Emergence of a human transmissible strain

Fig. 9. Estimation of R₀ in real time

Discussion

References