Modeling and prediction of 2009 pandemic H1N1 influenza

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In the paper (Towers and Feng, 2009) we use a simple mathematical model to forecast the course of the 2009 H1N1 pandemic. We fit the model to the CDC influenza data collected during early months of the year, optimizing the model parameters associated with the time-dependent transmission, and the time at which the initial case was introduced. The optimized model was then used to forecast the timing of the autumn wave of infection.

The work received widespread national attention upon its release on October 15, 2009, with several national news agencies covering the story or referring to the study including Washington times, CNN, Los Angeles Times, and Chicago Tribune. Our published predictions were also discussed during the October 21, 2009 hearing of the U.S. Senate Committee on Homeland Security and Government Affairs, entitled “H1N1 Flu: Monitoring the Nation’s Response”. The most striking feature of the model is that it accurately predicted the peak time of the pandemic. According to CDC 2009 H1N1 confirmed case count data (see CDC, 2010), the peak of the fall wave was reached at the end of October (which is between weeks 42 and 43, see the left hand plot in Figure 1), which is consistent with our model result. It is worth noting that the model used in the analysis is a simple SIR model with a seasonally forced infection rate. Although further examinations are certainly needed to study the applicability of the modeling approach to general scenarios, the model results in this analysis demonstrated clearly the advantage and capability of mathematical models in understanding disease dynamics.

Figure 1: The left figure illustrates the CDC 2009 confirmed H1N1 count data (the error bars represent variations calculated by the proposers that account for U.S. regional variability in the timing of the pandemic). The right figure shows predictions by our model in Towers and Feng (2009).
References

