Problems in estimating infectious disease transmission rates from data

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In epidemiology, data are often collected and presented as the number of new cases observed each day (i.e. the incidence rate). When plotted, these data give the traditional epidemic curve (see e.g. [**?**]). However, using such data to estimate the transmission rate is not straightforward [**?**]. Knowledge of the transmission rate is vital in trying to understand how an infectious disease progresses in a population.

There are many methods at our disposal to try to estimate the transmission rate such as (weighted) least squares regression [**?**], maximum likelihood techniques and Markov chain Monte Carlo methods [**?**]. Here, we present equine influenza data and a variety of models and methods to illustrate how elusive the transmission rate can be. Particularly, different methods often give very different parameter estimates from the same data. Moreover, certain techniques fail to recover the transmission rate from data simulated from models (where all the parameters are defined).

We aim to stimulate discussion in this important area particularly because as mathematical and computing techniques become more sophisticated it is vital to keep the dialogue going between those at the cutting edge of parameter estimation and applied researchers in epidemiology.

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