

Application of data assimilation in forecasting of influenza in the United States

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When trying to fit mathematical models to data at the onset of an epidemic, parameters are often not known and the available data are frequently noisy. While complex models are useful once their parameters are known, simple models that rely on fewer parameters can be useful to predict an outbreak early in its course. Here we describe a simple model for seasonal influenza. We use variational data assimilation (VDA) to systematically address the issue of imperfect data and fit model parameters and initial conditions. We first test the efficacy of data assimilation methods on the model near the onset of the influenza season using so-called “synthetic data experiments.” We then apply these techniques to CDC data from recent influenza seasons. In particular, we use these methods to forecast targets during the 2017-18 influenza season as though we were forecasting in real-time, and we compare these results to those obtained during the season.