

Contribution ID: 326

Type: **Oral Presentation**

## Corrections to predictions of the basic reproduction number

*Wednesday, 11 July 2018 10:30 am (30 minutes)*

The basic reproduction number,  $R_0$ , derived from ordinary differential equation models is a powerful predictor of the severity of an infection and can help inform prevention and mitigation strategies. Many of the parameters used in ODE models are mean values of time-dependent distributions. Here, we show how we can incorporate properties of these distributions to refine estimates of  $R_0$  for a series of ubiquitous models used in epidemiology. These corrections are applied to the  $R_0$  estimate as opposed to the model itself, allowing simple models to be used, and better predictions to be made post-hoc as more data becomes available. Moreover, we address some difficulties in trying to extend these corrections to more complex models.

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**Session Classification:** Reproduction numbers

**Track Classification:** Minisymposium: Reproduction Numbers