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*Nonidentifiability in Parameter Estimation of Simple and Complex Epidemic Models*

Nonidentifiability in parameter estimation from data refers to the situation when multiple values of a set of parameters can produce the same best fit between the model and data (e.g. positive case reports of COVID-19), but different best-fit parameter values lead to significantly different predictions on un-observed quantities (e.g. number hidden infections or total infections). A root cause of nonidentifiability in parameter estimation for diseases of viral infections (e.g. COVID-19, influenza, and HIV) is that the positive case report data only represents a fraction of all infections in a day (or week, year), and that fraction is also unknown and high variable during different phases of the epidemic. I will explain using examples of COVID-19 how nonidentifiability occurs in a simple and a more complex model, and potentially how we can resolve it.