Research Proposal: Predicting Pertussis
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Background:
Pertussis, colloquially known as whooping cough, is a highly contagious respiratory disease that impedes the ability to breathe normally and can cause death. It is usually prevented by a vaccine, given in four doses over the first two years of life. Pertussis has an $R_0$, or basic reproduction number, of approximately 18, which makes it moderately contagious (higher $R_0$s mean the disease tends to spread among a population quicker). Given this higher $R_0$, community protection by vaccination is imperative - but this protection is only conferred when a certain percentage of the community, or threshold, is vaccinated. In recent years, anti-vaccination sentiment has become a familiar topic of discussion.

Goals:
The Center for Disease Control and Prevention has periodic regional data for cases of certain notifiable diseases, including pertussis. Using this data as well as vaccination coverage data I would like to assess whether there have been a recent increase in incidences, and if this increase can be attributed to a decrease in vaccine coverage over the past few years.

Furthermore, I would like to map out the cases over time. Using literature on the factors affecting the infection and spread of pertussis, in addition to other socio-demographic factors associated with disease outbreaks, I will try to estimate and create a model for pertussis outbreaks in the future.

Resources:
CDC Data:
https://wonder.cdc.gov/mmwr/mmwrmborl.asp

Literature:

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5312729/
http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0083850

Winter K, Harriman K (2016) Risk Factors for Pertussis Infection Among Infants in California