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Analytic solutions of deterministic epidemic models with time-dependent coefficients

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In the field of mathematical epidemiology, there are many, many different models of diseases. The majority of these epidemic models are in the form of an autonomous system of first order ordinary differential equations which governs the change in time of the different "metapopulations", e.g. people who are susceptible, infective, immune, etc.

However, the lack of any time dependence is quite unrepresentative of real-world epidemics, which often display some kind of seasonal behaviour. In this project, the infection rate was represented by a periodic function and analytic solutions for simpler models (susceptible-infective and susceptible-infective-susceptible) were found. From these solutions, information about the epidemic's behaviour, such as threshold conditions and endemicity were determined.

The last part of the project was to use empirically observed parameters for real world diseases and consider the cases of the infection rate with sinusoidal variation, e.g. the common cold, or step-function variation, e.g. measles within school communities.

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