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*Dynamic games with imitation predict vaccinating behaviour*

There exists an interplay between vaccine coverage, disease prevalence, and the vaccinating behaviour of individuals. Moreover, because of herd immunity, there is also a strategic interaction between individuals when they are deciding whether or not to vaccinate, since the probability that an individual becomes infected depends upon how many other individuals are vaccinated. To understand this potentially complex interplay, a dynamic game theory model is developed in which individuals adopt strategies according to an imitation dynamic (a learning process), and base vaccination decisions on disease prevalence and perceived risks of vaccines and disease. The model predicts that oscillations in vaccine uptake are more likely in populations where individuals imitate others more readily or where vaccinating behaviour is more sensitive to changes in disease prevalence. Oscillations are also more likely when the perceived risk of vaccines is high. The model reproduces salient features of the time evolution of vaccine uptake and disease prevalence during the whole-cell pertussis vaccine scare in England & Wales during the 1970s. This suggests that using dynamic game theoretical models to predict, and even manage, the population dynamics of vaccinating behaviour may be feasible.