Department Colloquium

Speaker: Felicia Magpantay, University of Manitoba
Time: 3:30 p.m.
Place: Jeffery 234
Title: Mathematics of imperfect vaccines

Abstract: The dynamics of vaccine-preventable diseases depend on the underlying disease process and the nature of the vaccine. In this talk I will present a general model of an imperfect vaccine and the epidemiological consequences of different modes of vaccine failure. In particular, these can have contrasting effects on disease prevalence and transient solutions, especially after the start of mass vaccination programs. I will also present an application to pertussis, a childhood disease that was once considered a candidate for eradication. This highly infectious disease is still a significant cause of child mortality in the world, and has been reemerging in some countries that maintain high vaccination coverage (e.g. USA, UK). Recent events have highlighted how much we still do not know about the mechanics of this disease and the type of immunity rendered by infection and vaccination. I will discuss the theoretical analysis that led us to a general stochastic model of pertussis, and the ideas behind the likelihood-based statistical inference methods (trajectory matching and iterated filtering) used to efficiently estimate the parameters of the model. The methods used can be extended to study and fit mechanistic models of complex phenomenon beyond those in disease ecology.