BIOS 524: Analytical Methods for Infectious Diseases

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Course Objectives: To familiarize students with (a) basic concepts of transmission of infectious diseases, (b) simple models of transmission, (c) statistical methods for estimation of transmission parameters and effects of interventions, (d) design and analysis of studies to evaluate effects of vaccines and vaccination programs. Examples based on influenza, measles, HIV and other infectious diseases will be used as illustrations.

Evaluation will be based on class attendance, homework, an in-class final exam and a written report.

Textbook:


More advanced books:


Articles:


Course Outline

Infectious disease data

Basic concepts; natural history of an infectious disease

Transmission probabilities

A simple model for transmission in partnerships

Transmission in households

Transmission in large populations; the SIR model

The basic reproduction number

Heterogeneous populations

Time to infection data

Vaccine efficacy (VE) – various definitions

VE in a homogeneous, randomly mixing population

VE in a heterogeneous population

VE in partnerships and households

VE from time-to-infection data

Effectiveness of vaccination programs

Direct and indirect effectiveness, herd immunity

Interventions against an influenza pandemic