QUEEN'S PUBLIC HEALTH SCIENCES, EPID 828: INFECTIOUS DISEASES

WINTER 2023

This course provides a foundation in infectious disease epidemiology. Principles and methods related to infectious disease biology, outbreak detection and investigation, and the methodological, analytical, and diagnostic tools are covered. Specific infectious diseases that pose contemporary challenges in public health and/or have national or global public health impact are discussed. We will also revisit some key concepts and principles of epidemiology, deepen your understanding of these concepts and principles, and apply these to the study of infectious diseases.

Queen's PHS EPID 801, Introduction to Epidemiology or permission of instructor (typically an equivalent epidemiology course from another institution) is a prerequisite for EPID 828.

INSTRUCTOR: Dr. Susan Brogly, Associate Professor, Department of Surgery (Queen's), Adjunct Faculty Public Health Sciences (Queen's), susan.brogly@queensu.ca, 613.549.6666 ext. 8227

CLASS SESSIONS: Monday 2:15-5:15pm; Carruthers Hall, Room 102

ASSIGNMENTS: Assignments are to be handed in at the start of class. Assignments will be graded and returned a week later. You may work in groups on your assignments, but each student must turn in their own work for grading.

CLASS PARTICIPATION & STUDENT: Attendance at class sessions and participation in discussions is expected. Students are encouraged to add to the learning of the class by discussing newspaper articles, web posts or other infectious disease related stories from the media.

READINGS: For assignment or course readings students required to obtain articles through Queen's PubMed or on OnQ.

STUDENT ASSESSMENT:

Assignments	20%
In Class Participation	10%
Midterm	30%
Final Exam	40%

CLASS SESSION DETAILS:

Date	Topic	Learning Objectives	Reading	Due
9-Jan	General Infectious Disease Concepts In Class Exercise	• Understand the host-agent-environment model • Describe methods of transmission and relevant means of prevention • Calculate attack rate, secondary attack rate, and case fatality rate	Reading for In-Class Exercise Optional: Chapter 27, Infectious Disease Epidemiology, in Modern Epidemiology, 3rd Ed. Rothman, Greenland & Lash; to the top of page 561.	
16-Jan	Pathogens Transmission Probability, Incidence & R_0	• Identify and describe the different types of pathogens • Define characteristics of the infectious agent • Describe modes of transmission of particular pathogens • Describe pathogens associated with particular diseases • Use the binomial probability and exponential model to calculate the probability of infection • Describe the formula and estimate the incidence rate in changing (non-steady state) conditions • Define the reproductive number (R_0) and effective reproductive number (R) and be able to calculate the two given their various components • Describe the relationship between R_0 and an epidemic	Concepts of Transmission & Dynamics, E Halloran (p. 56-66 to Herd Immunity)	Assignment 1 Due
23-Jan	Guest Lecture: Dr. Santiago Pérez-Patrigeon, ID Physician, Queen's The Immune System HIV/AIDS	• Describe the components of innate and adaptive immunity and how they protect against infection and/or severe disease • Describe the effects of HIV on our immune response • Describe the HIV virus and modes of HIV transmission • Apply epidemiologic principles to evaluate landmark studies in HIV prevention and treatment • Apply infectious disease principles in a study of HIV infection or prevention • Understand the concepts of error (bias and random error), risk and comparative measures of effect as discussed in class	Gottlieb MS et al. N Engl J Med 1981;305(24):1425-31. Fischl MA et al. The efficacy of azidothymidine (AZT) in the treatment of patients with AIDS and AIDS-related complex. A double-blind, placebo-controlled	

Date	Topic	Learning Objectives	Reading	Due
		• Draw a DAG showing the relationship between a study determinant, outcome and confounder for an infectious disease and interpret the likely effect of confounding based on your ID knowledge	trial. N Engl J Med. 1987 23;317(4):185-91.	
30-Jan	Outbreak Investigation In Class Exercise	• Apply the steps taken in an outbreak investigation • Create a case definition and describe the use and impact of different case definitions on an outbreak investigation • Interpret epidemic curves • Understand factors that affect choice of study design in an outbreak	Dwyer and Groves, Outbreak Epidemiology	Assignment 2 Due
6-Feb	Surveillance	• Describe the purpose of public health surveillance • Identify and describe methods for surveillance • Understand differences between types of surveillance and strengths and weaknesses of each • Describe real and artificial reasons for an increase in case numbers		
13-Feb	Midterm Test	*Closed book*		
20-Feb	Reading Week	*No class*		
27-Feb	Vaccines In Class Exercise	• Define vaccine efficacy, vaccine effectiveness, herd immunity • Calculate vaccine efficacy from RCT, cohort and case-control studies • Understanding the test-negative design for estimating vaccine effectiveness and be able to estimate VE from such a study • Describe some limitations of case-control and cohort studies in estimating VE • Differentiate between the direct, indirect, total and overall effects of vaccination • Explain why the proportion of cases of a disease that was vaccinated increases as vaccine coverage increases • Describe the importance of studying vaccine safety and some challenges in epidemiologic studies that aim to do this • Describe vaccine hesitancy and its potential effects on the spread of disease		
6-Mar	Guest Lecture: Mr. Jim Gauthier, Infection Control Specialist, Diversey Hospital Acquired Infections	• Define a nosocomial infection and provide examples of common nosocomial infections • Describe how an effective infection control program can minimize the risk of nosocomial infections • Provide examples of infection control measures		Assignment 3 Due

Date	Topic	Learning Objectives	Reading	Due
		• Apply infectious disease principles in a study of nosocomial infections and prevention		
13-Mar	Compartmental Models In Class Computer Modeling Exercise	• Explain what a compartmental model is and why they are used in infectious disease epidemiology • Write the three equations for the change in the number of susceptibles, infectives and recovereds in an S-I-R (susceptible-infectious-recovered model in a closed and open population • Be comfortable identifying other types of compartmental models discussed in class • Describe the strengths and weakness of compartmental models	Concepts of Transmission & Dynamics, E Halloran (p. 63-75)	Have Berkley Madonna installed on your computer
20-Mar	Epidemiology of STIs: National, Local and Global Perspectives	• Discuss core epidemiological principles of sexually transmitted infections (STIs) • Describe fundamental aspects of STI transmission dynamics • Understand benefits and limitations of syndromic approaches for global STI prevention and control		Assignment 4 Due
27-Mar	SARS-CoV-2 In Class Exercise	• Explain facts about infection, disease and treatment of SARS-CoV-2 • Describe public health strategies to prevent SARS-CoV2 transmission and why impact has differed in different settings • Describe the role of the media on the Covid-19 pandemic • Apply infectious disease principles in a study of SARS-CoV-2 infection or prevention		
03-Apr	Zika Neglected Tropical Diseases	• Explain basic facts about infection, disease and treatment of Zika • Describe how the Zika epidemic occurred and was identified • Describe public health strategies to prevent Zika transmission • Describe the public health impact of Zika • Apply infectious disease principles in a study of Zika infection or prevention • Understand transmission cycles and hosts of NTDs and how they impact selection of control measures • Recognize short and long-term consequences of selected NTDs • Consider social and economic factors associated with NTDs • Apply infectious disease principles in a study of NTDs		
10-Apr	Final Exam	*Closed book*		