

Graduate School of Public Health

Department of Infectious Diseases and Microbiology

PUBHLT2015 Public Health Biology

Fall term 2020 - COVID-19 edition

Mondays, 2:20 – 4:15PM

Instruction will be by Zoom calls or online lectures during Pitt's elevated posture; in-person classes may be added once the posture is lowered to guarded. In-person classes will be held in 121 Lawrence Hall. There will be a mixture of pre-recorded content made available to view on-demand, and discussion via Zoom or in-person in the class session times.

Credit Hours: 2

Logistics/Contact Information

- Course director and Primary Instructor: Jeremy Martinson; (412) 624-5646, email jmartins@pitt.edu, office 2134 Public Health. Office hours by arrangement - email to set up a meeting.
- Co-Instructor: Candy Kammerer; (412) 624-7265, email cmk3@pitt.edu, office 3120 Public Health. Office hours by arrangement - email to set up a meeting.

Course Description

Official description from University course catalog: This core course will provide an introduction to the biological foundations of many systems that are important in public health. The major determinants of human disease will be considered from an integrated ecological perspective that brings together molecular and population-based approaches to the study of infectious disease (with particular focus on HIV/AIDS, polio, emerging infections (such as COVID-19), and disease outbreaks following natural disasters) and genetically-determined diseases including “simple” genetic diseases such as cystic fibrosis and “complex” diseases such as hypertension). The host response to infection will be considered, as will the disorders that result from defects in this system, including allergy and asthma. Current developments in genomic science will be covered, including the ethical, legal and social implications of the increased capability to detect and predict disease outcome in individuals and populations. On completion of this course, students will have an understanding of the biological bases of many conditions that are important to public health, and that they will encounter as public health students and practitioners.

CEPH competencies: Pitt Public Health is accredited by the Council on Education in Public Health (CEPH) as a school authorized to offer the Master of Public Health (MPH) degree. Part of that accreditation requires us to provide instruction in a variety of core public health competencies to all our students. CEPH has identified a variety of competencies, which it expects all MPH graduates to demonstrate. This course most directly addresses

CEPH competency **K8 Explain biological and genetic factors that affect a population's health**, although several other competencies will also be partially addressed (*K4 List major causes and trends of morbidity and mortality in the US or other community relevant to the school or program; K6 Explain the critical importance of evidence in advancing public health knowledge; K11 Explain how globalization affects global burdens of disease; and K12 Explain an ecological perspective on the connections among human health, animal health and ecosystem health (eg, One Health)*).

Learning Objectives

Upon completion of this course, students will be able to:

1. Explain the role of biology in the ecological model of Public Health
2. Integrate general biological and molecular concepts into issues affecting Public Health
3. Explain how infectious agents affect the health of individuals and populations
4. Describe the role of the immune system in individual and population health
 - Explain how the immune system functions normally to protect against disease
 - Describe how this normal function is enhanced by vaccination
 - Explain the consequences of a breakdown in normal immune function
5. Explain how genetics and genomics affect disease processes and Public Health practice
6. Identify the ethical, legal and social issues arising from Public Health biology
7. Understand the role of evidence-based biological concepts in the broader Public Health arena.

Textbooks, readings, and technology

Required Textbooks/Articles/Readings

There is no required text for this class. Reading material will be drawn from the primary research literature and other in-depth articles, and will be posted on the course Canvas site.

Supplemental Readings/Bibliography Schneider's *Introduction to Public Health* provides a good introduction to much of the material presented here. Rather than purchasing a specific text, students are encouraged to use online resources, such as the textbook library available at the National Library of Medicine website <http://www.ncbi.nlm.nih.gov/books>. The following texts are particularly relevant to the course, and are present on that site:

- **Immunobiology, 5th ed** by Janeway *et al* provides a good overview of the nature of the host response to infection.
- **An Introduction to Genetic Analysis** by Griffiths *et al*, and
- **Modern Genetic Analysis** by the same authors are both extremely good texts that provide a thorough introduction to genetics.
- **Genomes, 2nd ed** by Brown is an excellent introduction to genomic science.
- **Introduction to Genes and Disease** is a collection of online articles covering many genetic disorders, with links to key websites relevant to each disease.

Canvas Instruction

This course will extensively use the University's Canvas site. Each lecture will be accompanied by supporting material and further reading, all of which will be made available around the time of the lecture. It is the student's responsibility to check for, and read, this material. Each lecture will be accompanied by a quiz, which students are required to take. Discussion topics related to the course will also be posted on Canvas, and, for the purpose of determining a student's grade, participation in these discussions will be considered as equivalent to participation in class discussion. The instructors will use the Canvas site and Pitt email as the primary means of communicating with the students, who are expected to check these on a regular basis throughout the semester.

Required or Recommended Software

There is no required software package for this course.

Required or Recommended Equipment

No equipment is required for this course. Computers and a/v equipment will be provided for students' use in the end-of-semester presentations (*not applicable in fall 2020*).

Expectations, ground rules, and grading

Class Expectations/ Behavior and Ground Rules

To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion and/or activities without the advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the student's own private use.

Grading Scale

This course is letter graded, and grades will be assigned as follows:

- 90–92.5% A-; 92.5%–97.5% A; 97.5%–100% A+
- 80–82.5% B-; 82.5%–87.5% B; 87.5%–89.9% B+
- 70–79% C
- 60–69% D
- < 60% F

Student Performance Evaluation (Assessments and Weights)

Grades will be assigned on the basis of:

- Class participation (15%). Please join in the discussions in class or on the Courseweb site. If I don't know who you are by the end of the course, it will be hard to give you a grade for this!
- Online module quizzes (20%). Each module will be accompanied by material presented on the Courseweb site. There will be a short (typically 20 multiple-choice questions) online quiz posted to accompany each module. The quizzes will remain

available for the whole of the semester and can be taken at any time, not just in the week of the particular class.

- Midterm exam (30%). There will be one midterm exam. It will be a take-home written paper that will be made available after class on Monday September 28th, and answers will be due by the start of class on Monday October 5th.
- Final student presentations (35%). The grade for this will be determined by a combination of the written and in-class parts of your presentation.

Assignments and Descriptions

Each student will work collaboratively with other students (groups of 2-3 students at most) to prepare and present a project on the Public Health significance of a particular disease, genetic trait, or other biological system. The project should be designed to explain the basic biology and the Public Health significance of the chosen topic to a lay audience. Each student group will produce a piece of work (a paper, a poster, a leaflet, or some other piece approved by the instructors) and then describe this piece in a brief in-class presentation (5-10 minutes at most, plus time for questions) at the end of the semester.

Schedule of Sessions and Assignments

Module 1-Introduction: The Ecological Model of Public Health (Monday August 24th 2020)

This class will introduce students to the course itself, and will cover the major historical advances in disease treatment and prevention. It will also compare and contrast patterns of health and disease between the modern and historical US population, and between the developed and developing worlds. If they wish, students should read chapters 9-12 of Schneider's *An Introduction to Public Health* to gain the necessary background to the course.

Module 2-The Host Response to Infectious Disease (Monday August 31st 2020)

This class will review the role of the immune system in host defense. The different strategies used to defend the host against the wide variety of pathogens we all face will be covered, and this class will also consider the disease states that arise when the normal function of the immune system is impaired.

Module 3-Vaccination and Public Health importance of smallpox and polio (Monday September 7th 2020)

This class will cover the ways in which the normal immune response can be augmented by vaccination strategies. The Public Health significance of this approach to disease prevention will be discussed in class, including concepts like herd immunity, opposition to vaccination, and compulsory vaccination laws. Smallpox and polio highlight the successes and challenges of mass vaccination campaigns. The successful eradication of smallpox will be compared with the challenges remaining in the eradication of polio. In each case the biology of the disease, the basis of their vaccination campaigns, and the Public Health implications will be discussed.

Module 4-Emerging Infectious Diseases I: HIV/AIDS (Monday September 14th 2020)

Although many advances have been made in the treatment of infectious diseases, the pathogens themselves are able to respond to these and are still able to pose a threat to the health of the public. HIV is one of the most successful of these, and achieves its devastating effect on the host by attacking the immune response itself. The biology of HIV disease and AIDS will be covered, as will the changing demographics of HIV/AIDS in the USA and the impact of this disease in developing nations.

Students' presentation topic choices must be made by midnight on September 18th at the latest.

Module 5-Emerging Infectious Diseases II (Monday September 21st 2020)

This class will review many other types of emerging threats, including drug resistance, re-emergence of "classic" infections, and the introduction of disease agents, such as West Nile Virus, into new environments.

Module 6-Bioterrorism: Public Health in reverse (Monday September 28th 2020)

This module will consider the intentional use of infectious diseases as agents of warfare and terrorism, a phenomenon that has been called "Public Health in Reverse". The historical use of biological agents in warfare will be covered, as will their more recent use in the 20th and 21st centuries. The CDC classification of bioterrorism agents will be presented as well.

The take-home midterm exam will be made available after class on September 28th. Answers are to be returned by the start of class on Monday October 5th.

Module 7-Genetic Diseases: From the Simple to the Complex (Monday October 5th 2020)

This class will cover the basic inheritance patterns shown by simple Mendelian disorders. The concepts of modifier genes, gene-gene and gene-environment interactions will be introduced, and extended to consider the complex nature of multifactorial diseases. The additional challenges of discovering, diagnosing and preventing these disorders will be considered.

Module 8-Genetic Testing: Practice and Ethics (Monday October 12th 2020)

The methods and procedures used to diagnose inherited disorders have undergone rapid development in recent years. This class will review those techniques, highlighting the range of conditions that it is now possible to detect. The far-reaching implications of such tests will be considered, both in terms of disease detection and individual rights.

Week 9-Cancer: Genes, Environment, Pathogens (Monday October 19th 2020)

Cancer at its most fundamental is a disease of gene dysregulation, but this dysregulation can be caused by environmental agents, infectious pathogens, or innate genetic defects.

This class will consider tumor-suppressor genes and oncogenes, explaining how they interact with environmental and infectious mutagens to cause disease.

Module 10-Part I: COVID-19 / Part II: Student choice (Monday October 26th 2020)

This class will be in two parts. The first part will provide an update on our current understanding of COVID-19 biology and the current pandemic in the US and worldwide. The Public Health lessons learned so far will be discussed.

The content of the second part of this lecture is determined by the students. A voting forum will be set up on Canvas for you to nominate and vote on issues of current Public Health significance that have not been covered in earlier lectures. Previous topics have included: vaccination to prevent cocaine and nicotine addiction; the genetic basis of autism and other behavioral conditions; the biological basis of cardiovascular disease; the 2009 influenza pandemic; and the rise in opioid addiction and deaths.

Module 11-Student Presentations (Monday November 2nd 2020)

Student presenters should be prepared to take questions from the audience. Please attend this session even if your group is not presenting.

Module 12-Student Presentations (Monday November 9th 2020)

Student presenters should be prepared to take questions from the audience. Please attend this session even if your group is not presenting.

Module 13-Student Presentations (Monday November 16th 2020)

Student presenters should be prepared to take questions from the audience. Please attend this session even if your group is not presenting.

Course and University policies

Accommodation for Students with Disabilities

If you have any disability for which you may require accommodation, you are encouraged to notify both your instructor and the Office of Disability Resources and Services, 140 William Pitt Union (Voice or TTD 412-648-7890) as early as possible in the term.

Academic Integrity Statement

All students are expected to adhere to the school's standards of academic honesty. Any work submitted by a student for evaluation must represent his/her own intellectual contribution and efforts. The Graduate School of Public Health's policy on academic integrity, approved by EPCC on 10/14/08, which is based on the University policy, is available online in the Pitt Public Health Academic Handbook (<https://www.publichealth.pitt.edu/home/academics/academic-requirements>). The policy includes obligations for faculty and students, procedures for adjudicating violations, and other critical information. Please take the time to read this policy.

Sexual Misconduct, Required Reporting, and Title IX

The University is committed to combatting sexual misconduct. As a result, you should know that University faculty and staff members are required to report any instances of sexual misconduct, including harassment and sexual violence, to the University's Title IX office so that the victim may be provided appropriate resources and support options. What this means is that as your professor, I am required to report any incidents of sexual misconduct that are directly reported to me, or of which I am somehow made aware.

There are two important exceptions to this requirement about which you should be aware:

A list of the designated University employees who, as counselors and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found here: <https://www.titleix.pitt.edu/report/confidentiality>.

Another important exception to the reporting requirement exists for academic work. Disclosures about sexual misconduct that are shared as part of an academic project, classroom discussion, or course assignment, are not required to be disclosed to the University's Title IX office.

If you are the victim of sexual misconduct, Pitt encourages you to reach out to these resources:

- Title IX Office: 412-648-7860
- SHARE @ the University Counseling Center: 412-648-7930 (8:30 A.M. TO 5 P.M. M-F) and 412-648-7856 (AFTER BUSINESS HOURS)

If you have a safety concern, please contact the University of Pittsburgh Police, 412-624-2121.

Other reporting information is available here: <https://www.titleix.pitt.edu/report>.

Diversity Statement

The University of Pittsburgh Graduate School of Public Health considers the diversity of its students, faculty, and staff to be a strength and critical to its educational mission. Pitt Public Health is committed to creating and fostering inclusive learning environments that value human dignity and equity. Every member of our community is expected to be respectful of the individual perspectives, experiences, behaviors, worldviews, and backgrounds of others. While intellectual disagreement may be constructive, no derogatory statements, or demeaning or discriminatory behavior will be permitted.

If you feel uncomfortable or would like to discuss a situation, please contact any of the following:

- the course instructor
- the Pitt Public Health Associate Dean for Diversity at 412-624-3506 or nam137@pitt.edu
- the University's Office of Diversity and Inclusion at 412-648-7860 or <https://www.diversity.pitt.edu/make-report/report-form> (anonymous reporting form).

Copyright Notice

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Sources: Center for Instructional Design and Distance Education (CIDDE); Syllabus Template and Syllabus Checklist; Office of Disability Resources and Services; EPCC syllabus checklist.