

ISYE 4510 PUBLIC HEALTH SYSTEMS

Concentration Breadth Elective

Prepared Profs. Serban, Spring 2026

Credit: 3-0-3

Prerequisite(s): ISyE 3030 or BMED 2400 or ISYE 3770 or MATH 3670

Texts:

None

Referenced

Course slides, reading and data available on Canvas

Catalog Description:

This course provides an overview of health systems and public health to explore their positive impact on well-being of individuals and effectiveness of health systems.

Course Description

Health systems, public health, and medicine have evolved rapidly over the past several decades, driven by advances in data availability, analytics, and technology. These developments create substantial opportunities to improve public health outcomes, support disease prevention, early detection, and treatment, and promote healthier lifestyles at both individual and population levels. Quantitative methods play an increasingly important role in informing complex decision-making in public health and healthcare systems, particularly when resources are limited and trade-offs must be carefully evaluated. However, many decisions in practice continue to rely on experience- or case-based approaches, without fully leveraging modern quantitative decision-making tools. This course provides an overview of key components of health systems and public health, with an emphasis on how quantitative and analytical methods can improve decision quality, enhance efficiency and effectiveness, and ultimately support better health outcomes.

Topical Outline

The topical outline is shown in the table below. The table has 2 columns. The first column lists the topics to be covered. The second column lists the number of weeks these topics will be covered.

Topics	Weeks
Health Systems, overview, US health systems, healthcare complexity, healthcare cost, the 3E's framework: Equity, Efficiency and Effectiveness	4
Healthcare access and equity, measurement and inference, equity and disparities, geographic access, epidemiology and GIS	3
Prevention and Wellbeing, infectious diseases, non-infectious diseases	3
Data and methods, data in healthcare, modeling and engineering, case studies	4
Total	14

Course Learning Outcomes

By the end of this course, students will be able to:

1. Understand the structure and functioning of health systems and public health frameworks.
2. Recognize opportunities where quantitative and analytical methods can improve decision-making in healthcare delivery and public health.
3. Evaluate trade-offs involved in public health and health system decisions under resource constraints.
4. Apply quantitative reasoning to assess interventions related to prevention, early detection, and treatment of disease.
5. Appreciate the role of data and technology in improving the efficiency, effectiveness, and equity of healthcare delivery.
6. Develop a systems-level perspective on improving population health and overall health system performance.

The Mapping from the Course Outcomes to ABET Student Learning Outcomes

The table below shows the relationship between course outcomes and ABET student learning outcomes. The table has 8 columns. The first column lists the course learning outcomes listed above. The next 7 columns list the abbreviated ABET Student Learning Outcomes. The entry of H in a row with specific course learning outcome and column with specific ABET Student Learning Outcomes indicate the importance of attaining this outcome is high and will be assessed.

Course outcome \ Program Outcomes	1. identify, formulate solve engg prob by engg, sci & Math	2. produce solutions consider public health, safety, welfare, global, cultural, social, environ & economic	3 communicate with a range of audience	4 recognize ethical & professional responsibilities, make informed judgement consider resolutions in global, economic, environ and societal context.	5. effective on a team provide leadership, collaborative and inclusive envirm, plan tasks & meet objectives	6. develop and conduct experiment, analyze and interpret data & use engineering judgement to draw conclusions.	7. acquire and apply new knowledge using appropriate learning strategies
1. Understand the structure and functioning of health systems and public health framework							
2. Recognize opportunities where quantitative and analytical methods can improve decision making.							
3. Estimate trade-offs in public health and health system decisions							
4. Apply quantitative reasoning to assess intervention related to prevention, early detection, and treatment of disease.							
5. Appreciate the role of data and technology in improving the efficiency, effectiveness, and equity of healthcare delivery							
6. Develop a systems-level perspective on improving population health and overall		H	H	H	H		

health system performance	Course outcome \ Program Outcomes						
	1. identify, formulate solve engg prob by engg, sci & Math	2. produce solutions consider public health, safety, welfare, global, cultural, social, environ & economic	3 communicate with a range of audience	4 recognize ethical & professional responsibilities, make informed judgement consider resolutions in global, economic, environ and societal context.	5. effective on a team provide leadership, collaborative and inclusive envirm, plan tasks & meet objectives	6. develop and conduct experiment, analyze and interpret data & use engineering judgement to draw conclusions.	7. acquire and apply new knowledge using appropriate learning strategies

Evaluation of the important outcomes

Course outcomes 6 will be assessed on project assignment.