UCLA FIELDING SCHOOL OF PUBLIC HEALTH

EPI 203/HPM 201: System Science for Population Health (Topics in Theoretical Epidemiology)
Term: Fall 2020
Credits: 2

COURSE SYLLABUS

A. Overview

Course Description	This course introduces systems science methods and their uses for promoting health in populations, where many factors interact to shape environments, behaviors, and outcomes. Students will appreciate the challenges of studying complex systems and the value of a systems lens for developing insight into their inner workings. The interdisciplinary faculty involved in the course will introduce the intellectual and practical challenges of intervening in complex systems. We explore how to characterize the human-centered problems that arise and how to handle complexity as a core design and development challenge, particularly when working with stakeholders to address a population health problem. The course does not intend to develop modeling skills in students. The focus is developing a basic facility with the concepts and methods.
Prerequisites	By permission of instructor
Instructors	Onyebuchi Arah, DSc, PhD, MPH Professor, Department of Epidemiology arah@ucla.edu Moira Inkelas, PhD, MPH Department of Health Policy & Management minkelas@ucla.edu Tony Kuo, MD, MSHS Department of Epidemiology and Department of Family Medicine tkuo@mednet.ucla.edu
Contributing instructors	Roch Nianogo, MD, MPH Department of Epidemiology niaroch@ucla.edu Vladimir Manuel, MD, MS Department of Family Medicine vmanuel@mednet.ucla.edu Louis Gomez, PhD Department of Education, School of Education & Information Studies lmgomez@ucla.edu

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Class Days, Times, Location	Thursday 10:00 – 11:50 am Zoom information is available in CCLE
Office Hours	Please contact instructor by email for an appointment
Course Texts and Required Readings	The course text is El-Sayed & Galea (editors), Systems Science and Population Health, 2017. We will provide copies of relevant chapters on CCLE. Additional required readings and supplemental resources are listed on the syllabus and posted on CCLE. Readings for a particular class should be completed before coming to class. Please be prepared to refer to details of the readings. Concrete discussion of the concepts and their relevance to population health will aid our learning. For application papers, please focus primarily on the methods rather than the subject matter and findings. Please consider some of the following questions as you read the papers: Why/how is the problem complex? How did the authors approach the problem, methodologically? What if anything was not clear to you about the methods/learning process? How did the authors present their theory(ies)? What is one new concept or insight that you take away from the paper? What could you see applying to your work?
Course Format	This is a seminar-style course that emphasizes discussion, with minimal lecture.
Course Methodology	The course emphasizes not only the analytic tools but also the ways in which we assist stakeholders to use systems thinking to understand the context they are working in. A number of the examples that we will discuss in the course involve multiple sectors (such as health care, public health, social services). The course has ten (10) two-hour sessions. Class time is spent in discussion and occasional hands-on activities with selected methods. Multiple faculty will contribute to course sessions to expose students to the range of disciplines and methods in system science. Each session will address similar questions: What problem does the specific method solve, or what insights does it offer? How is the method situated with other methods? How does it apply to specific cases/problems? How does the method apply to the student's own professional goals? What are its uses for population health? What are barriers to its use?

Classroom Participation & Attendance	Student participation is essential and will be assessed based on contribution, which includes offering thoughtful reflections on the readings, sharing insights about applicability to real-world problems, and answering and posting questions.
UCLA ADA Policy	If you are already registered with the Center for Accessible Education (CAE), please request your Letter of Accommodation in the Student Portal. If you are seeking registration with the CAE, please submit your request for accommodations via the CAE website. Students with disabilities requiring academic accommodations should submit their request for accommodations as soon as possible, as it may take up to two weeks to review the request. For more information, please visit the CAE website (www.cae.ucla.edu), visit the CAE at A255 Murphy Hall, or contact us by phone at (310) 825-1501.
ADA Contact	Nickey Woods Center for Accessible Education A255 Murphy Hall Phone: (310) 825-1501 TTY / TTD: (310) 206-6083 Fax: (310) 825-9656
Inclusivity	UCLA's Office for Equity, Diversity, and Inclusion provides resources, events, and information about current initiatives at UCLA to support equality for all members of the UCLA community. I hope that you will communicate with me or your TA if you experience anything in this course that does not support an inclusive environment, and you can also report any incidents you may witness or experience on campus to the Office of Equity, Diversity, and Inclusion on their website (https://equity.ucla.edu/).

B. Learning Objectives

The following concentration competencies are addressed in this course using the course objectives along with the assessment that will evaluate students' attainment of these objectives.

Under the sponsorship of AcademyHealth and AHRQ, a list of core competencies for PhD training in health services research was published (Forrest CB, Martin DP, Holve E, Millman A, "Health Services Research Doctoral Core Competencies," BMC Health Services Research 2009 Jun 25;9:107). A modification of this list, regrouping the competencies from 14 areas to 11, was subsequently published on the AHRQ website. This table lists the learning objectives for the course and the related PhD/MS competencies. Added competencies are from American College of Preventive Medicine, Core Competencies and Performance Indicators for Preventive Medicine Residents

Learning Objectives At the end of the course, a student should be able to:	PhD and MS Competencies
Be able to explicate what system sciences are, and their relationship to the various social sciences.	1. Apply or develop theoretical and conceptual models relevant to health services research.
Be able to conceptualize an system science research problem in terms of questions, conceptual model, overall analytic approach, measures and data.	1. Apply or develop theoretical and conceptual models relevant to health services research. 3. Pose relevant and important research questions, evaluate them, and formulate solutions to health problems, practice and policy. 4. Use or develop a conceptual model to specify study constructs for a health services research question and developing variables that reliably and validly measure these constructs. 5. Describe the strengths and weaknesses of study designs to appropriately address specific health services research questions. 7. Execute and document procedures that ensure the reproducibility of the science, the responsible use of resources, the ethical treatment of research subjects. (Management and Administration) 1. Assess data and formulate policy for a given health issue. 3. Conduct an evaluation or quality assessment based on process and outcome performance measures. (Clinical Preventive Medicine) 3. Implement community-based interventions to modify or eliminate identified risks for disease or injury and to promote wellness. (Medical Management Competencies – Delivery of Health Care) 1. Design, manage and evaluate health service delivery programs to improve the health of a defined population
Understand how to apply	1. Apply or develop theoretical and conceptual models relevant to

system science methods to population health problems.	health services research. 3. Pose relevant and important research questions, evaluate them, and formulate solutions to health problems, practice and policy. 5. Describe the strengths and weaknesses of study designs to appropriately address specific health services research questions 8. Demonstrate proficiency in the appropriate application of analytical techniques to evaluate HSR questions. 9. Work collaboratively in teams within disciplines, across disciplines, and/or with stakeholders. 10. Effectively communicate the process, findings, and implications of health services research through multiple modalities with stakeholders. 11. Knowledge translation to policy and practice. 2. Demonstrate the ability to prioritize new or ongoing projects or programs according to their potential impact, as defined by objective, measurable criteria. 6. Identify the processes by which decisions are made within an organization or agency and their points of influence. 7. Identify and coordinate the integrated use of available resources to improve the community's health. (Biostatistics/Epidemiology) 1. Characterize the health of a community. 2. Design and conduct an epidemiologic study. 3. Design and operate a surveillance system 5. Translate epidemiologic findings into a recommendation for a specific intervention to control a public health problem.

C. Course Assignments & Exams

1. **Session 1** and **Session 2** have brief assignments. Please be sure to complete these before class so that we can have interesting and thoughtful discussions.

2. The main course deliverable is the course project. Work will begin after students form groups in **Session 2**. The course project enables students to apply the concepts and methods to a real-world problem. Working progressively on a specific topic will make it easier to apply and thereby understand the material. Each of the five topics lends itself to the methods that we cover in the course and permits a longitudinal view, which will be important for a number of the modeling approaches. Students will form groups of three to work on one of the following: (1) food insecurity, (2) COVID-19, (3) vaping, (4) climate change, (5) childhood resilience and trauma. The instructors will endeavor to assign students to their top choice. The instructors will provide further detail about each of these topics. This will not require specific content knowledge although we expect that you will do some work to familiarize yourself with the topic of your group.

Grading:

Grades will be based on class participation and performance on the following assignments:

1. Contribution to class discussion of papers, concepts, methods (50%)
2. Application of a system science method to a real-world problem (50%)

Course Exams Schedule

There are no course exams.

D. Course Outline

Session 1 – October 1
Course overview and how we approach systems science

Learning objectives
1. Why systems are important to our thinking: perspectives from our respective disciplines
2. Problems that we are trying to solve in complex systems, and for populations
3. Overview of the mindsets and methods emphasized in this course
4. Review of course expectations

Session 2 – October 8
Features of complex systems

Learning objectives:
1. Understand common dynamics of systems
2. Become familiar with several common archetypes of system phenomena (behavior)
3. Understand implications of complexity for policy and practice
4. Introduction to Vensim

Session 3 – October 15
Introduction to methods for model building

Learning objectives
1. Apply the SIMULATE checklist to determine if a system is complex
2. Understand the distinctions and contributions of common systems science modeling approaches
3. Understand the stages of the progressive modeling process

Session 4 – October 22
Design and improvement science

Learning objectives
1. Understand the principles of design
2. Appreciate the uses of design applied to systems
3. Identifying norms that underlie systems
4. Understand uses of improvement science for learning in systems

Session 5 – October 29
Network analysis

Learning objectives
1. Understand the features of networks and the points of leverage that can be the focus of interventions
2. Appreciate the kinds of questions that we can answer with network analysis

3. Become familiar with common metrics and leverage points in networks
4. Learn what kinds of intervention strategies can be used with networks

Session 6 – November 5
System dynamics and microsimulation

Learning objectives
1. Understand uses and structure of system dynamics and microsimulation models

Session 7 – November 12
Agent-based modeling

Learning objectives:
1. Understand uses and structure of agent-based models

Session 8 – November 19
Applications of machine learning/artificial intelligence (AI) to improve systems

Learning objectives:
1. Understand the contributions of machine learning
2. Consider how machine learning can be used to help solve system problems

Session 9 – December 3
Synthesis and project gallery – Part 1

Session 10 – December 10
Synthesis and project gallery – Part 2