Syllabus Module 223 Major A: Concepts, methods and design in Epidemiology

N°223	Concepts, methods and design in Epidemiology
Coordinator	TBC
Dates	From October 22nd to 26th 2018
Credits/ECTS	3 ECTS
Duration or Course Format	30 hours
Location	EHESP 20 Avenue George Sand 93210 LA PLAINE ST DENIS
Description	As a basic science of public health, epidemiology is responsible for the identification of causes of disease that can guide the development of rational public health policies. The accuracy of the information provided by epidemiologic studies is therefore of central concern. Epidemiologic methods are the tools we use to make valid causal arguments. The primary objective is to provide students with the basic tools necessary to design, carry out, and interpret the results from observational epidemiologic studies.
Prerequisites	Students entering this course are assumed to be are able to: • Calculate basic measures of association between exposures and disease • Interpret data in 2 by 2 tables • Identify major epidemiologic study designs • Define confounding, selection bias and misclassification Explain the concept of causality in epidemiology
Course learning objectives	Students who successfully complete this course will be able to: • Develop testable research hypotheses • Write a principled argument supporting research hypotheses • Operationalize hypotheses into statistically testable statements • Articulate the principles of basic observational study designs • Choose study designs that can test research hypotheses • Recognize and explain the effects of confounding and bias Conduct basic sample size and power calculations
Structure (details of sessions title/speaker/date /duration)	
Resources	The textbook for the course is: Szklo , M and Nieto J. Epidemiology: beyond the basics, 3rd ed. Jones & Bartlett Learning 2013 OR Susser, Schwartz, Morabia and Bromet: Psychiatric Epidemiology: Searching for the Causes of Mental Disorders. Oxford: New York 2006.
Course requirement	Students are expected to attend all lectures and seminars. Class attendance will be checked accordingly. Students are expected to read and analyse selected papers for the group work before the courses.
Grading and assessment	Each session will be accompanied by a lab exercise to reinforce the concepts discussed during the lecture. The grade for the course is based on a homework assignment and a final exam which covers all the material covered in the course. Note also that students will complete a questionnaire that assesses their own and their teammates' contributions to group work. All team members will receive the same grade except if it is clear that a student has not participated effectively (attended and contributed to meetings; made timely, helpful

	contributions; been constructive, etc.). In that case, the student's grade will be lowered accordingly.
Course policy	**Attendance & punctuality** **Regular and punctual class attendance is a prerequisite for receiving credit in a course.** Students are expected to attend each class. Attendance will be taken at each class. The obligations of attendance and punctuality cover every aspect of the course: - lectures, conferences, group projects, assessments, examinations, as described in EHESP Academic Regulations http://mph.ehesp.fr EHESP Academic Regulation Article. 3). If students are not able to make it to class, they are required to send an email to the instructor and to the MPH program coordinating team explaining their absence prior to the scheduled class date. All supporting documents are provided to the end-of-year panel. . Students who miss class are responsible for content. Any student who misses a class has the responsibility for obtaining copies of notes, handouts and assignments. If additional assistance is still necessary, an appointment should be scheduled with the instructor. Class time is not to be used to go over material with students who have missed class. **Lateness**: Students who are more than 10 minutes late may be denied access to a class. Repeated late arrivals may be counted as absences (See http://mph.ehesp.fr EHESP Academic Regulation Article. 3 Attendance & Punctuality) **Maximum absences authorized & penalty otherwise** Above 20% of absences will be designated a fail for a given class. The students will be entitled to be reassessed in any failed component(s). If they undertake a reassessment or they retake a module this means that they cannot normally obtain more than the minimum pass mark (i.e. 10 out of 20) **Exceptional circumstances** Absence from any examination or test, or late submission of assignments due to illness, psychological problems, or exceptional personal reasons must be justified; otherwise, students will be penalized, as above mentioned. Students must directly notify their professor or the MPH academic secretariat before the exam or before the assignment deadline. Before accepting the student's justification, the professor or the MPH academic secretariat has the right to request either a certificate from the attending physician or from a psychologist, or from any other relevant person (See http://mph.ehesp.fr EHESP Academic Regulation Article 4 Examinations). **Courtesy**: <u>All cell phones/pages MUST be turned off during class time</u>. Students are required to conduct themselves according to professional standards, eating during class time is not permitted during class time, such as course or group work.
Valuing diversity	Diversity enriches learning. It requires an atmosphere of inclusion and tolerance, which oftentimes challenges our own closely-held ideas, as well as our personal comfort zones. The results, however, create a sense of community and promote excellence in the learning environment. This class will follow principles of inclusion, respect, tolerance, and acceptance that support the values of diversity. Diversity includes consideration of: (1) life experiences, including type, variety, uniqueness, duration, personal values, political viewpoints, and intensity; and (2) factors related to "diversity of presence," including, among others, age, economic circumstances, ethnic identification, family educational attainment, disability, gender, geographic origin, maturity, race, religion, sexual orientation and social position.
Course evaluation	EHESP requests that you complete a course evaluation at the end of the school year. Your responses will be anonymous, with feedback provided in the aggregate. Open-ended comments will be shared with instructors, but not identified with individual students. Your participation in course evaluation is an expectation, since providing constructive feedback is a professional obligation. Feedback is critical, moreover, to improving the quality of our courses, as well as for instructor assessment.

Session 1	**Causal inference in epidemiology and measures of effect**
Speakers	
Session Outline	
Learning Objectives	By the end of this section students should be able to: - Define a cause from a counterfactual perspective - Explain the sources of non-comparability in epidemiologic studies - Articulate the basic principles of the scientific method - Define and calculate a risk, odds and rate - Describe the relationship among these three measures of effect
Duration	3 hours
Training methods	Basic concepts in causal inference will be introduced as a framework for understanding the design and execution of epidemiologic studies. Confounding and bias will be discussed from this perspective. Since the scientific method requires the quantification of phenomena, we will review basic epidemiologic measures of disease frequency (risk, rates, and odds) and disease associations (risk ratios, rate ratios and odds ratios, risk differences) their interrelationships and relationships to causal inference. All design, analysis and measurement issues that form the bulk of this course will be discussed in the context of this conceptual framework;
Readings	Text chapters: Susser 4, 8 (to p. 84), Supplement 1

Session 2	**Developing principled arguments**
Speakers	
Session Outline	
Learning Objectives	By the end of this section students should be able to: - Recognize the components of a grant proposal - Describe how each component is related to the process of causal inference - Develop research hypotheses - Write a principled argument
Duration	3 hours
Training methods	With the framework of causal inference in mind, we will review the components of a research proposal and how each component is related to the process of causal inference. Each session of the course will relate to sequential components of the grant proposal. After examining the framework, this session will focus on the Specific Aims, and Background and Significance Sections. We will discuss how to review the literature, develop hypotheses and operationalize them. The roles of confounding, bias and interaction in hypothesis development will be discussed.

Readings	Text Chapters Susser 5,6,7

Session 3	**Designs: Experimental, cohort, case-control, cross-sectional, ecologic : Introduction to design**
Speakers	
Session Outline	
Learning Objectives	By the end of this section students should be able to: - Define the basic study designs used in epidemiologic research - Describe the relationships among the study designs - Select study designs appropriate to specific study hypotheses - Compare the roles of confounding and bias in each type of design - Critically assess the choice of study designs in research articles - Operationalize hypotheses to be tested in the context of these designs
Duration	3 hours
Training methods	The next three sessions introduce the issues involved in the choice of study design. The benefits and limitations of each design will be discussed in the context of causal inference. We will compare and contrast the problems of confounding and bias posed by each design and the methods for dealing with them.
Readings	Text Chapters Susser 9 – 12 Szklo and Nieto Chapter 1-3

Session 4	**Designs : Experimental and Cohort**
Speakers	
Session Outline	
Learning Objectives	See session 3
Duration	3 hours
Readings	Text Chapters Susser 9 – 12 Szklo and Nieto Chapter 1-3

Session 5	**Designs : Case-control and cohort**
Speakers	
Session Outline	
Learning Objectives	Learning Objectives: • Age, birth cohort and period effects • Describe the relationship between cohort and case control designs • Relate valid selection of controls in a case control design to the impact of attrition in a cohort study • Compare the sources of bias in the two designs

Duration	3 hours
Readings	Text Chapters Susser 15 – 17, 18 (p. 217-222) Szklo and Nieto Chapter 1-3

Session 6	**Confounding**
Speakers	
Session Outline	
Learning Objectives	- Assess the presence of confounding - Use graphical aids to understand confounding - Understand adjustment and stratification methods to disentangle confounding - Define residual confounding
Duration	3 hours
Readings	Text Chapters Susser 15 – 17, 18 (p. 217-222) Szklo and Nieto Chapter 5

Session 7	**Graphical Representation of Causal Effects- DAGs**
Speakers	
Session Outline	
Learning Objectives	By the end of this section students should be able to: - Draw DAGs to represent causal ideas - Define a DAG - Understand colliders - Draw a causal DAG - Deduce associations implied by the DAG
Duration	3 hours
Readings	Supplement: Greenland, Pearl and Robins Causal Diagrams Epidemiological Research, Epidemiology 1999; 10:37-38

Session 8	**Effect modification and Mediation**
Speakers	
Session Outline	
Learning Objectives	- Define and estimate effect measure modification - Evaluate effect measure modification using stratified analyses - Interpret the results of stratified analyses - Additive vs Multiplicative Interaction - Define mediation and mediators - Articulate distinction between confounding and mediators - Estimate the effects of mediation

Duration	3 hours
Readings	Text Chapters Susser 27 (to p. 326), 25 (to p. 297)

Session 9	**Testing our causal hypotheses : causal identification through stratification**
Speakers	
Session Outline	
Learning Objectives	By the end of this section students should be able to: - Describe the relationship between stratified analysis and mathematical modeling - Select analytic approaches appropriate for the study design - Interpret results of output from stratified analyses, linear regression, logistic regression and survival analyses
Duration	3 hours
Training methods	These four sessions provide an introduction to the basic analytic approaches to examining data from cohort, case control and cross-sectional studies. The goal is to translate causal ideas into statements that can be tested with data. We will examine simple bivariate methods for analyzing unmatched and matched data and multivariate extensions of these methods. We will cover stratified analyses, linear regression, logistic regression and survival analytic techniques. The goal will be to understand the basic concepts and the situations in which each technique is appropriate, to be able to read and interpret computer printouts and to understand how to evaluate confounding, mediation and effect modification.
Readings	Text Chapters Susser 12, 18 (p. 212-217), 25 (to p. 297)

Session 10	**Consequences of measurement error**
Speakers	
Session Outline	
Learning Objectives	By the end of this section students should be able to: - Calculate and interpret sensitivity, specificity, predictive power and Kappa - Describe the consequences of different types of measurement error - Identify sources of potential bias in the way information is obtained - Implement strategies to avoid bias in obtaining information
Duration	3 hours
Training methods	This session provides an introduction to the problem of measurement error and its implications for causal inference. We will examine the effects of measurement error in independent and dependent variables of interest as well as confounders and covariates. Sensitivity and specificity will be covered. We will also describe the sources of measurement error and various techniques to avoid it and tame its consequences.
Readings	Text Chapter Susser 14, Supplement 11 Szklo and Nieto Chapter 4