

PUBH 6343 SECTION 001

Epidemiologic Methods III
Fall 2019

COURSE & CONTACT INFORMATION

Credits:	4
Meeting Day(s):	Mondays and Wednesdays
Meeting Time:	1:25 - 3:20 p.m.
Meeting Place:	MoosT 1-450
Instructor:	Pamela Schreiner, PhD, Professor
Email:	schre012@umn.edu
Office Phone:	612-626-9097
Fax:	612-624-0315
Office Hours:	Mondays, 12-1 p.m., A310 Mayo (Collaboratorium)
Office Location:	Room 490 WBOB
TA:	Shuo Wang, wang8310@umn.edu

COURSE DESCRIPTION

This course provides instruction in the analysis and interpretation of data from various epidemiological study designs. SAS is used to demonstrate epidemiological and statistical concepts in data analysis, but programming is not a requirement.

Acknowledgments

The contents of PubH 6343 have been developed with the contributions of numerous instructors. Dr. Schreiner, the current instructor, has been involved with the majority of recent content and modifications. Former faculty/instructors, including Drs. Paul McGovern, Eyal Shahar, David Murray, Mike Miller, and Sue Duval, all had roles in either the conceptual development or actual content of the current course, and are acknowledged for their contributions.

COURSE PREREQUISITES

The course is required for all M.P.H. students in Epidemiology. Prerequisites include PubH 6342 (Epidemiologic Methods II) and PubH 6451 (Biostatistics II). Permission of the instructor is needed for substitutions or exemptions.

COURSE GOALS & OBJECTIVES

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

- Describe the research hypotheses that are appropriate for cross-sectional studies, case-control studies, and cohort studies
- Describe the rationale underlying the major techniques used to analyze data from epidemiological studies
- Know how to interpret data from various analyses of epidemiological data
- Explain how interactions, confounders and dose-response relations among variables are examined
- Understand basic SAS output used to analyze data from epidemiological studies

METHODS OF INSTRUCTION AND WORK EXPECTATIONS

Epidemiologic Methods III is a 4-credit course. New material will be presented primarily in lectures, using a detailed course packet. Some classes (or portions of a class) will be devoted to reviewing homework

assignments (in large group discussion format). Students are expected to remain current in their readings and homework assignments throughout the course in order to contribute to the discussions or present their homework results.

Like other work in the course, all student to student communication is covered by the Student Conduct Code (<https://z.umn.edu/studentconduct>).

COURSE TEXT & READINGS

Course packet. Available at the Coffman Union bookstore prior to the first class meeting

Textbooks (optional). All readings are optional and intended to augment the materials presented in class and in the coursepack. We have placed all readings on the password-protected class website, where homework solutions, practice exams from previous years, answer keys to current exams, and grades will also appear. Information on access will be discussed in class, and the URL is <https://canvas.umn.edu/courses/137204>. Please try to access these materials as soon as possible to identify any problems with the accounts or your password.

The following textbooks may be useful and are on e-reserve at the library.

*Szklo M and Nieto FJ. Epidemiology: Beyond the Basics, 3rd edition. Jones & Bartlett Learning, 2012.

*Kleinbaum, D.G. and Klein M. Logistic Regression: A Self-Learning Text, 3rd edition. Springer, New York, 2012.

*Kleinbaum, D.G. and Klein M. Survival Analysis: A Self-Learning Text. 3rd edition. Springer, New York, 2012.

Other books that may be of interest to students in PubH 6343 are listed below. Your instructor has copies of these texts and you may want to review them before purchasing. Note that relevant excerpts from the following texts have been posted on the Moodle website for this course.

*Schlesselman, J. Case Control Studies. New York: Oxford University Press, 1982.

*Allison P.D. Logistic Regression Using the SAS System: Theory and Application. SAS Institute, Inc., Cary, NC, 1999.

*Allison P.D. Survival Analysis Using the SAS System: A Practical Guide. SAS Institute, Inc., Cary, NC, 1995.

*Kleinbaum, D.G., L.L. Kupper and K.E. Muller. Applied Regression Analysis and Other Multivariable Methods, 2nd edition. PWS-Kent Publishing Company, Boston, 1988.

*Kirkwood B.R. and J.A.C. Sterne. Essential Medical Statistics. Blackwell Science Inc., Malden, MA, 2003.

COURSE OUTLINE/WEEKLY SCHEDULE

Week	Topic	Readings	Activities/Assignments
Week 1: Wednesday, 4 Sept	INTRODUCTION <ul style="list-style-type: none"> • Introduction to applied epidemiologic methods • Linear regression (Part 1) 	<ul style="list-style-type: none"> • Review Methods 1 and 2 (PubH 6341 and PubH 6342 notes) 	
Week 2: Monday, 9 Sept	CROSS-SECTIONAL STUDIES <ul style="list-style-type: none"> • Linear regression (Part 2) 	<ul style="list-style-type: none"> • Kahn and Sempos, pp. 137-147 • Kleinbaum, Kupper and Muller, pp. 41-49; 102-110 	<ul style="list-style-type: none"> • Homework #1 assigned
Wednesday, 11 Sept	CROSS-SECTIONAL STUDIES <ul style="list-style-type: none"> • Tabular methods: Basics 	<ul style="list-style-type: none"> • Schlesselman, pp. 171-181 • Kahn and Sempos, pp. 51-56 	
Week 3: Monday, 16 Sept	CROSS-SECTIONAL STUDIES <ul style="list-style-type: none"> • Tabular methods: Adjustment for confounding 	<ul style="list-style-type: none"> • Schlesselman, pp. 181-195 • Kahn and Sempos, pp. 113-123 • Kirkwood Chapter 17 • Kirkwood Chapter 18 • Szklo pp. 435-440 	
Wednesday, 18 Sept	CROSS-SECTIONAL STUDIES <ul style="list-style-type: none"> • Unconditional logistic regression: Basics 	<ul style="list-style-type: none"> • Schlesselman, pp. 227-235 • Kahn and Sempos, pp. 148-157 • Allison (Logistic Regression), pp. 13-21 • Kirkwood Chapter 19 	
Week 4: Monday, 23 Sept	REVIEW HOMEWORK #1		<ul style="list-style-type: none"> • Homework #1 due
Wednesday, 25 Sept	CROSS-SECTIONAL STUDIES <ul style="list-style-type: none"> • Unconditional logistic regression: Indicator variables 	<ul style="list-style-type: none"> • Schlesselman, pp. 241-244 • Szklo pp. 275-279 	
Week 5: Monday, 30 Sept	CROSS-SECTIONAL STUDIES <ul style="list-style-type: none"> • Unconditional logistic regression: Additional computations • Confounders 	<ul style="list-style-type: none"> • Kleinbaum (Logistic Regression), pp. 167-168; 199-203 • Schlesselman, pp. 238-240 • Kirkwood Chapter 20 	<ul style="list-style-type: none"> • Homework #2 assigned
Wednesday, 2 Oct	CROSS-SECTIONAL STUDIES <ul style="list-style-type: none"> • Unconditional logistic regression: Statistical hypothesis testing 	<ul style="list-style-type: none"> • Allison (Logistic Regression), pp. 143-146 • Kirkwood pp. 309-314 	
Week 6: Monday, 7 Oct	CROSS-SECTIONAL STUDIES <ul style="list-style-type: none"> • Unconditional logistic regression: Interactions • Choosing the "best" model 	<ul style="list-style-type: none"> • Kleinbaum (Logistic Regression), pp. 46-61; 164-166; 203-211 • Szklo Chapter 6 	<ul style="list-style-type: none"> • Homework #2 due
Wednesday, 9 Oct	REVIEW HOMEWORK #2		
Week 7: Monday, 14 Oct	EXAM 1		<ul style="list-style-type: none"> • Homework #3 assigned
Wednesday, 16 Oct	CASE-CONTROL STUDIES <ul style="list-style-type: none"> • Classical tabular methods • Unconditional logistic regression • dose-response relation 	<ul style="list-style-type: none"> • Kleinbaum (Logistic Regression), pp. 4-28 	

Week 8: Monday, 21 Oct	CASE-CONTROL STUDIES <ul style="list-style-type: none"> Unconditional logistic regression: Goodness-of-fit and c-statistic 	<ul style="list-style-type: none"> Allison (Logistic Regression), pp. 48-56 Kirkwood pp. 115-117 	
Wednesday, 23 Oct	REVIEW HOMEWORK #3		<ul style="list-style-type: none"> Homework #3 due Homework #4 assigned
Week 9: Monday, 28 Oct	MULTINOMIAL REGRESSION <ul style="list-style-type: none"> Ordinal and polytomous logistic regression 		
Wednesday, 30 Oct	MATCHED CASE-CONTROL STUDIES <ul style="list-style-type: none"> Classical tabular methods and conditional logistic regression 	<ul style="list-style-type: none"> Kleinbaum (Logistic Regression), pp. 61-64; 230-235; 235-242 Kirkwood Chapter 21 Allison (Logistic Regression), pp. 202-206 	
Week 10: Monday, 4 Nov	REVIEW HOMEWORK #4		<ul style="list-style-type: none"> Homework #4 due
Wednesday, 6 Nov	EXAM 2		
Week 11: Monday, 11 Nov	COHORT STUDIES <ul style="list-style-type: none"> Survival analysis 	<ul style="list-style-type: none"> Kleinbaum (Survival Analysis), pp. 45-68 Log Rank Statistics 	
Wednesday, 13 Nov	COHORT STUDIES <ul style="list-style-type: none"> Cox regression I 	<ul style="list-style-type: none"> Allison (Survival Analysis), pp. 111-122; pp. 122-137 	<ul style="list-style-type: none"> Homework #5 assigned
Week 12: Monday, 18 Nov	COHORT STUDIES <ul style="list-style-type: none"> Cox regression II 	<ul style="list-style-type: none"> Kleinbaum (Survival Analysis), pp. 94-104 	
Wednesday, 20 Nov	COHORT STUDIES <ul style="list-style-type: none"> Cumulative incidence Relative risk regression 	<ul style="list-style-type: none"> See Class 13 (16 Oct) Robbins et al McNutt et al Zhang and Yu 	
Week 13: Monday, 25 Nov	REVIEW HOMEWORK #5		<ul style="list-style-type: none"> Homework #5 due
Wednesday, 27 Nov	<ul style="list-style-type: none"> Administrative datasets: NHANES example Significant figures review 	<ul style="list-style-type: none"> Articles provided 	
Week 14: Monday, 2 Dec	COHORT STUDIES <ul style="list-style-type: none"> Tabular methods for incidence density Poisson regression I 	<ul style="list-style-type: none"> Allison (Logistic Regression), pp. 217-231 	<ul style="list-style-type: none"> Homework #6 assigned
Wednesday, 4 Dec	COHORT STUDIES <ul style="list-style-type: none"> Poisson regression II Searching for the "best" model 		
Week 15: Monday, 9 Dec	REVIEW HOMEWORK #6		<ul style="list-style-type: none"> Homework #6 due
Wednesday, 11 Dec	Final exam review session and practice with concepts		
Saturday, 14 Dec 10:30 am - 12:30 pm	FINAL EXAM		

SPH AND UNIVERSITY POLICIES & RESOURCES

The School of Public Health maintains up-to-date information about resources available to students, as well as formal course policies, on our website at www.sph.umn.edu/student-policies/. Students are expected to read and understand all policy information available at this link and are encouraged to make use of the resources available.

The University of Minnesota has official policies, including but not limited to the following:

- Grade definitions
- Scholastic dishonesty
- Makeup work for legitimate absences
- Student conduct code
- Sexual harassment, sexual assault, stalking and relationship violence
- Equity, diversity, equal employment opportunity, and affirmative action
- Disability services
- Academic freedom and responsibility

Resources available for students include:

- Confidential mental health services
- Disability accommodations
- Housing and financial instability resources
- Technology help
- Academic support

EVALUATION & GRADING

Evaluation will be based on homework assignments (20%), exam 1 (25%), exam 2 (25%) and a final exam (30%). Evaluation of homework assignments will be based on their clarity, accuracy, documentation and timeliness of submission. Assignments will be penalized for lateness unless the student has notified the instructor in advance with a justification. Although allowances will be made for exceptional circumstances, in general, make-up exams are not available. Students who miss an exam will have their remaining exams weighted more heavily. Epidemiology majors must take this course A/F; in order to enroll in this course, a minimum grade of B- must have been earned in PubH 6432 (Epidemiologic Methods II) and in PubH 6452 (Biostatistics II). Nonmajors may choose to take the course S/N. Those choosing to take the course S/N must notify the instructors of that decision by the end of the second week of the course. A grade of C- or higher must be obtained in order to receive an S under the S/N system. Final grades will be assigned as shown below, based on the University of Minnesota Uniform Grading and Grading Rubric Resource at <https://z.umn.edu/gradingpolicy>

Grading Scale

The University uses plus and minus grading on a 4.000 cumulative grade point scale in accordance with the following, and you can expect the grade lines to be drawn as follows:

% In Class	Grade	GPA
92.5 - 100%	A	4.000
90.0 - 92.4%	A-	3.667
87.5 - 89.9%	B+	3.333
82.5 - 87.4%	B	3.000
80.0 - 82.4%	B-	2.667
77.5 - 79.9%	C+	2.333

72.5 - 77.4%	C	2.000
70.0 - 72.4%	C-	1.667
67.5 - 69.9%	D+	1.333
62.5 - 67.4%	D	1.000

- A = achievement that is outstanding relative to the level necessary to meet course requirements.
- B = achievement that is significantly above the level necessary to meet course requirements.
- C = achievement that meets the course requirements in every respect.
- D = achievement that is worthy of credit even though it fails to meet fully the course requirements.
- F = failure because work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an I (Incomplete).
- S = achievement that is satisfactory, which is equivalent to a C- or better
- N = achievement that is not satisfactory and signifies that the work was either 1) completed but at a level that is not worthy of credit, or 2) not completed and there was no agreement between the instructor and student that the student would receive an I (Incomplete).

Evaluation/Grading Policy	Evaluation/Grading Policy Description
<p>Scholastic Dishonesty, Plagiarism, Cheating, etc.</p>	<p>You are expected to do your own academic work and cite sources as necessary. Failing to do so is scholastic dishonesty. Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis (As defined in the Student Conduct Code). For additional information, please see https://z.umn.edu/dishonesty</p> <p>The Office for Student Conduct and Academic Integrity has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty: https://z.umn.edu/integrity.</p> <p>If you have additional questions, please clarify with your instructor. Your instructor can respond to your specific questions regarding what would constitute scholastic dishonesty in the context of a particular class-e.g., whether collaboration on assignments is permitted, requirements and methods for citing sources, if electronic aids are permitted or prohibited during an exam.</p> <p>Indiana University offers a clear description of plagiarism and an online quiz to check your understanding (http://z.umn.edu/iuplagiarism).</p>
<p>Late Assignments</p>	<p>Please contact instructor as early as possible for accommodations</p>

Course Evaluation

The SPH will collect student course evaluations electronically using a software system called CoursEval: www.sph.umn.edu/courseval. The system will send email notifications to students when they can access and complete their course evaluations. Students who complete their course evaluations promptly will be able to access their final grades just as soon as the faculty member renders the grade in SPHGrades: www.sph.umn.edu/grades. All students will have access to their final grades through OneStop two weeks after

the last day of the semester regardless of whether they completed their course evaluation or not. Student feedback on course content and faculty teaching skills are an important means for improving our work. Please take the time to complete a course evaluation for each of the courses for which you are registered.

Incomplete Contracts

A grade of incomplete "I" shall be assigned at the discretion of the instructor when, due to extraordinary circumstances (e.g., documented illness or hospitalization, death in family, etc.), the student was prevented from completing the work of the course on time. The assignment of an "I" requires that a contract be initiated and completed by the student before the last official day of class, and signed by both the student and instructor. If an incomplete is deemed appropriate by the instructor, the student in consultation with the instructor, will specify the time and manner in which the student will complete course requirements. Extension for completion of the work will not exceed one year (or earlier if designated by the student's college). For more information and to initiate an incomplete contract, students should go to SPHGrades at:

www.sph.umn.edu/grades.

University of Minnesota Uniform Grading and Transcript Policy

A link to the policy can be found at onestop.umn.edu.

Other Course Information and Policies

Grade Option Change (if applicable):

For full-semester courses, students may change their grade option, if applicable, through the second week of the semester. Grade option change deadlines for other terms (i.e. summer and half-semester courses) can be found at onestop.umn.edu.

Course Withdrawal:

Students should refer to the Refund and Drop/Add Deadlines for the particular term at onestop.umn.edu for information and deadlines for withdrawing from a course. As a courtesy, students should notify their instructor and, if applicable, advisor of their intent to withdraw.

Students wishing to withdraw from a course after the noted final deadline for a particular term must contact the School of Public Health Office of Admissions and Student Resources at sph-ssc@umn.edu for further information.

Student Conduct Code:

The University seeks an environment that promotes academic achievement and integrity, that is protective of free inquiry, and that serves the educational mission of the University. Similarly, the University seeks a community that is free from violence, threats, and intimidation; that is respectful of the rights, opportunities, and welfare of students, faculty, staff, and guests of the University; and that does not threaten the physical or mental health or safety of members of the University community.

As a student at the University you are expected adhere to Board of Regents Policy: *Student Conduct Code*. To review the Student Conduct Code, please see:

http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf.

Note that the conduct code specifically addresses disruptive classroom conduct, which means "engaging in behavior that substantially or repeatedly interrupts either the instructor's ability to teach or student learning."

The classroom extends to any setting where a student is engaged in work toward academic credit or satisfaction of program-based requirements or related activities."

Use of Personal Electronic Devices in the Classroom:

Using personal electronic devices in the classroom setting can hinder instruction and learning, not only for the student using the device but also for other students in the class. To this end, the University establishes the right of each faculty member to determine if and how personal electronic devices are allowed to be used in the classroom. For complete information, please reference:

<http://policy.umn.edu/Policies/Education/Education/STUDENTRESP.html>.

Scholastic Dishonesty:

You are expected to do your own academic work and cite sources as necessary. Failing to do so is scholastic dishonesty. Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis. (Student Conduct Code:

http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf) If it is determined that a student has cheated, he or she may be given an "F" or an "N" for the course, and may face additional sanctions from the University. For additional information, please see:

<http://policy.umn.edu/Policies/Education/Education/INSTRUCTORRESP.html>.

The Office for Community Standards has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty: <https://communitystandards.umn.edu>. If you have additional questions, please clarify with your instructor for the course. Your instructor can respond to your specific questions regarding what would constitute scholastic dishonesty in the context of a particular class (e.g., whether collaboration on assignments is permitted, requirements and methods for citing sources, if electronic aids are permitted or prohibited during an exam).

Makeup Work for Legitimate Absences:

Students will not be penalized for absence during the semester due to unavoidable or legitimate circumstances. Such circumstances include verified illness, participation in intercollegiate athletic events, subpoenas, jury duty, military service, bereavement, and religious observances. Such circumstances do not include voting in local, state, or national elections. For complete information, please see:

<http://policy.umn.edu/Policies/Education/Education/MAKEUPWORK.html>.

Appropriate Student Use of Class Notes and Course Materials:

Taking notes is a means of recording information but more importantly of personally absorbing and integrating the educational experience. However, broadly disseminating class notes beyond the classroom community or accepting compensation for taking and distributing classroom notes undermines instructor interests in their intellectual work product while not substantially furthering instructor and student interests in effective learning. Such actions violate shared norms and standards of the academic community. For additional information, please see: <http://policy.umn.edu/Policies/Education/Education/STUDENTRESP.html>.

Sexual Harassment:

"Sexual harassment" means unwelcome sexual advances, requests for sexual favors, and/or other verbal or physical conduct of a sexual nature. Such conduct has the purpose or effect of unreasonably interfering with an individual's work or academic performance or creating an intimidating, hostile, or offensive working or academic environment in any University activity or program. Such behavior is not acceptable in the University setting. For additional information, please consult Board of Regents Policy:

https://regents.umn.edu/sites/regents.umn.edu/files/policies/Sexual_Harassment_Sexual_Assault_Stalking_Relationship_Violence.pdf

Equity, Diversity, Equal Opportunity, and Affirmative Action:

The University will provide equal access to and opportunity in its programs and facilities, without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity, or gender expression. For more information, please consult Board of Regents Policy: http://regents.umn.edu/sites/default/files/policies/Equity_Diversity_EO_AA.pdf.

Disability Accommodations:

The University of Minnesota is committed to providing equitable access to learning opportunities for all students. The Disability Resource Center Student Services is the campus office that collaborates with students who have disabilities to provide and/or arrange reasonable accommodations.

If you have, or think you may have, a disability (e.g., mental health, attentional, learning, chronic health, sensory, or physical), please contact DRC at 612-626-1333 or drc@umn.edu to arrange a confidential discussion regarding equitable access and reasonable accommodations.

If you are registered with DRC and have a current letter requesting reasonable accommodations, please contact your instructor as early in the semester as possible to discuss how the accommodations will be applied in the course.

For more information, please see the DRC website, <https://disability.umn.edu/>.

Mental Health and Stress Management:

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance and may reduce your ability to participate in daily activities. University of Minnesota services are available to assist you. You can learn more about the broad range of confidential mental health services available on campus via the Student Mental Health Website: <http://www.mentalhealth.umn.edu>.

The Office of Student Affairs at the University of Minnesota:

The Office for Student Affairs provides services, programs, and facilities that advance student success, inspire students to make life-long positive contributions to society, promote an inclusive environment, and enrich the University of Minnesota community.

Units within the Office for Student Affairs include, the Aurora Center for Advocacy & Education, Boynton Health Service, Central Career Initiatives (CCE, CDes, CFANS), Leadership Education and Development – Undergraduate Programs (LEAD-UP), the Office for Fraternity and Sorority Life, the Office for Community Standards, the Office for Student Engagement, the Parent Program, Recreational Sports, Student and Community Relations, the Student Conflict Resolution Center, the Student Parent HELP Center, Student Unions & Activities, University Counseling & Consulting Services, and University Student Legal Service.

For more information, please see the Office of Student Affairs at <http://osa.umn.edu/>.

Academic Freedom and Responsibility: *for courses that do not involve students in research:*

Academic freedom is a cornerstone of the University. Within the scope and content of the course as defined by the instructor, it includes the freedom to discuss relevant matters in the classroom. Along with this freedom comes responsibility. Students are encouraged to develop the capacity for critical judgment and to engage in a sustained and independent search for truth. Students are free to take reasoned exception to the views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled.*

Reports of concerns about academic freedom are taken seriously, and there are individuals and offices available for help. Contact the instructor, the Department Chair, your adviser, the associate dean of the college (currently being recruited, SPH Dean of Student Affairs), or the Vice Provost for Faculty and Academic Affairs in the Office of the Provost.

** Language adapted from the American Association of University Professors "Joint Statement on Rights and Freedoms of Students".*

Student Academic Success Services (SASS): <http://www.sass.umn.edu>:

Students who wish to improve their academic performance may find assistance from Student Academic Support Services. While tutoring and advising are not offered, SASS provides resources such as individual consultations, workshops, and self-help materials.

CEPH COMPETENCIES (SPECIFIC TO EPIDEMIOLOGY)

Based on an *a priori* research hypothesis, design an epidemiologic study that addresses the best methods to test that hypothesis for either existing data or data to be collected. Apply considerations such as:

- (a) Temporality,
- (b) Pathophysiology of the disease, if appropriate, or best means of assessing the outcome of interest,
- (c) Whether the hypothesis to be tested will focus on etiology of the exposure or prediction of that outcome, and
- (d) Principles of ethics as they relate to data collection, reporting results, confidentiality, and use of findings in the context of public health.

Critically evaluate the published epidemiologic research with regard to:

- (a) Significance, including public health importance and contribution to the field
- (b) Study sample, including recruitment procedures, and inclusion/exclusion criteria
- (c) Internal and external validity
- (d) Potential sources of bias and residual confounding, plus other potential limitations such as sample size and statistical power
- (e) Whether conclusions are justified by the data presented