NUTR 305: NUTRITIONAL EPIDEMIOLOGY
Fall 2013
Course Syllabus

Time and location of the course:
Tuesday 9:00-10:30AM
Friday 12:00-1:30PM
Location: Jaharis 155

Instructor: Fang Fang Zhang, MD, PhD
Assistant Professor, Friedman School of Nutrition School and Policy
150 Harrison Ave, Boston, MA 02111
Email: fang_fang.zhang@tufts.edu | Phone: 617-636-3704

Guest Lecturers:
Shilpa Bhupathiraju, Andrea Chomistek, Silvana Choumenkovich, Sai Das, Frank Hu, Paul Jacques, Vasanti Malik, Josiema Mattei, Kelsey Mangano, Nicola McKeown, Martha Morris, Jennifer Sacheck, Shivani Sahni, Caren Smith

Office Hours: Email anytime to set up an appointment
Virtual Office Hours: Arrange anytime with instructor.

Tufts Graduate Credit: 1.0

Prerequisites for taking this course:
Required prerequisites for this course are the following:
1) Introductory Human Nutrition (e.g., NUTR 201 or 202)
2) Introductory Epidemiology (e.g., NUTR 204 or MPH 201)
3) Biostatistics (e.g., NUTR 209/309 A&B or MPH 205)

Course Description: This course is designed for graduate students who are interested in conducting or better interpreting epidemiological studies relating diet and nutritional status to disease and health. There is an increasing awareness that various aspects of diet and nutrition may be important contributing factors in chronic disease. There are many important problems, however, in the implementation and interpretation of these studies. The purpose of this course is to examine methodologies used in nutritional epidemiological studies, and to review the current state of knowledge regarding diet and other nutritional indicators as etiologic factors in disease.

Course Objectives: At the conclusion of the course, students should be able to:
1. Describe the utility and limitations of different epidemiological study designs for research in nutritional epidemiology.
2. Describe the strengths and limitations of different methods of measuring diet and identify when specific dietary methods may be most appropriate.
3. Explain the statistical methods commonly used in nutritional epidemiology.
to analyze diet-disease associations.
4. Describe strategies that can be used to evaluate or adjust for other dietary and lifestyle factors that may explain or influence relationships of diet and disease.
5. Describe the current state of epidemiological evidence for relationships of diet to the development of selected diseases.
6. Describe the issues in studying gene-nutrient interactions and discuss the influence of genetics on data collected in nutritional epidemiological studies.
7. Critically evaluate nutritional epidemiology research publications.

Course texts and Materials (for the course as a whole):

Additional Readings: To further understand the material, a selection of classic and contemporary research articles are assigned, the majority of which are required reading. Recommended reading is also provided to enhance learning. All additional readings are posted online on TRUNK.

Please note that all students are responsible for doing the readings. Your participation in class discussions related to the topic and readings count toward 5% of your final course grade.

Practica: There will be two practica during the semester. These classes are intended to reinforce important concepts covered in the lectures and are designed to help students critically evaluate and interpret the findings from nutritional epidemiological studies. The two practica will be instructor-led and will require students to interpret SAS statistical output and published data.

Student-Led Article Discussions: Each student will be required to lead a class discussion on one paper. Students and readings will be assigned by the instructor. The student should read the paper at least one week prior to the class to give themselves sufficient time to prepare for the discussion and ask critical questions on the article (ask the instructors/lecturers if you need feedback or assistance in developing questions). The student leading the class discussion will provide these 4 to 6 questions to their fellow students to help foster conversation.

Again, all students are responsible for doing the readings, even if they are not leading the discussion. Note that no handouts or slides are necessary for leading the discussion. The allotted time for each article discussion is approximately 20 minutes. Leading an article discussion counts toward 5% of your final course grade and, as mentioned, participating in class discussions is an additional 5% of your final course grade.
**Assignments:** There will be three assignments based on practica and lectures for students to work on **independently.** Your grades on Assignments 1 and 2 account for 15% and 10% of your final course grade, respectively. Assignment 3, a Brief Critical Review, is outlined later in the semester, and contributes to 30% of your final course grade.

**Summary of Assignments and Grade Contribution:**

1) Assignment 1: Dietary Assessment Methods 15%
2) Assignment 2: Energy Adjustment & Measurement Error 10%
3) Midterm Exam (in-class, closed book exam) 35%
4) Leading Class Discussion 5%
5) Participation 5%
6) Assignment 3: Brief Critical Review 30%

**Class Policies and Expectations:** Students will be expected to complete all required readings (textbook and assigned research articles) **prior** to each lecture. All students will be required to read the articles before class in order to be able to participate in the discussion. All students are expected to contribute equally toward preparing and leading the group discussion.

Students will have only **one** opportunity to complete each assignment, and all assignments are due on the date/time specified. There will be no exceptions unless permission has been granted by the instructor. Students will have only **one** opportunity to complete the midterm exam. The exam must be completed and successfully submitted within the specified time period. There will be no exceptions unless permission is granted by the instructor.

If students anticipate arriving late to lecture, or need to leave early, they must notify the instructor beforehand. It is preferable for students who arrive more than 10 minutes late to not disrupt the class or disrespect the lecturer and fellow students by entering the classroom.

**Academic Conduct**

Academic integrity, including avoiding plagiarism, is critically important. Each student is responsible for being familiar with the standards and policies outlined in the Friedman School’s *Policies and Procedures* manual (http://nutrition.tufts.edu/student/documents). It is the responsibility of the student to be aware of, and comply with, these policies and standards. In accordance with Tufts University’s policy on academic misconduct, violations of standards of academic conduct will be sanctioned by penalties ranging from grade reduction or failure on an assignment; grade reduction or failure of a course; up to dismissal from the school, depending on the nature and context of any infraction (http://uss.tufts.edu/studentaffairs/judicialaffairs/Academic%20Integrity.pdf).
<table>
<thead>
<tr>
<th>#</th>
<th>Day and Date</th>
<th>Time</th>
<th>Lecture Topic</th>
<th>Lecturer</th>
<th>Assignments</th>
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<tbody>
<tr>
<td>1</td>
<td>Tuesday, Sept 3</td>
<td>9-10:30 AM</td>
<td>Overview of Nutritional Epidemiology</td>
<td>Zhang</td>
<td>Assignment 1 assigned</td>
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<tr>
<td>2</td>
<td>Friday, Sept 6</td>
<td>12-1:30 PM</td>
<td>Dietary Assessment Methods: FFQ</td>
<td>Zhang</td>
<td>Return completed FFQ</td>
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<td>3</td>
<td>Tuesday, Sept 10</td>
<td>9-10:30 AM</td>
<td>Dietary Assessment Methods: Records and Recalls Energy Intake Validation</td>
<td>Gilhooly</td>
<td>Complete 24HR</td>
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<td>and Dietary Under- and Over-reporting</td>
<td>Das</td>
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<td>4</td>
<td>Friday, Sept 13</td>
<td>12-1:30 PM</td>
<td>Biomarkers in Nutritional Epidemiology</td>
<td>McKeown</td>
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<td>5</td>
<td>Tuesday, Sept 17</td>
<td>9-10:30 AM</td>
<td>Measurement of physical activity in Nutritional Epidemiology</td>
<td>Chomistek</td>
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<td>6</td>
<td>Friday, Sept 20</td>
<td>12-1:30 PM</td>
<td>Measurement error: Effects and Remedies</td>
<td>Jacques</td>
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<td>7</td>
<td>Tuesday, Sept 24</td>
<td>9-10:30 AM</td>
<td>Energy adjustment</td>
<td>Jacques</td>
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<td>8</td>
<td>Friday, Sept 27</td>
<td>12-1:30 PM</td>
<td>Practicum 1: Energy adjustment</td>
<td>Sacheck</td>
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<td>9</td>
<td>Tuesday, Oct 1</td>
<td>9-10:30 AM</td>
<td>Epidemiology of Obesity</td>
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<td>10</td>
<td>Friday, Oct 4</td>
<td>12-1:30 PM</td>
<td>Physical activity and health</td>
<td>Zhang</td>
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<td>11</td>
<td>Tuesday, Oct 8</td>
<td>No class</td>
<td>No class (Substitute Monday's schedule on Tuesday)</td>
<td>Jacques</td>
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<td>12</td>
<td>Friday, Oct 11</td>
<td>12-1:30 PM</td>
<td>Methodological considerations in study design</td>
<td>Faldeisen</td>
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<td>13</td>
<td>Tuesday, Oct 15</td>
<td>9-10:30 AM</td>
<td>Dietary Patterns: Theoretical</td>
<td>Bhupathiraju</td>
<td>Class discussion</td>
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<td>14</td>
<td>Tuesday, Oct 22</td>
<td>9-10:30 AM</td>
<td>Dietary Patterns: Empirical</td>
<td>Choumenkovitch</td>
<td>Assignment 2 due</td>
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<td>15</td>
<td>Friday, Oct 25</td>
<td>12-1:30 PM</td>
<td>Practicum 2: Cluster/Factor Analysis</td>
<td>Morris</td>
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<td>16</td>
<td>Tuesday, Oct 29</td>
<td>9-10:30 AM</td>
<td>Controversies in Epidemiology 1: Folate</td>
<td>Malik</td>
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<tr>
<td>17</td>
<td>Friday, Nov 1</td>
<td>12-1:30 PM</td>
<td>Nutrition monitoring and surveillance</td>
<td>Smith</td>
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<tr>
<td>18</td>
<td>Tuesday, Nov 5</td>
<td>9-10:30 AM</td>
<td>Midterm Examination</td>
<td>Hu</td>
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<tr>
<td>19</td>
<td>Friday, Nov 8</td>
<td>12-1:30 PM</td>
<td>The role of meta-analysis in Nutritional Epidemiology</td>
<td>Jacques</td>
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<tr>
<td>20</td>
<td>Tuesday, Nov 12</td>
<td>9-10:30 AM</td>
<td>Nuts and Bolts of Nutrigenetics</td>
<td>Smith</td>
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<td>21</td>
<td>Friday, Nov 15</td>
<td>12-1:30 PM</td>
<td>Nutrition and Diabetes</td>
<td>Hu</td>
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<td>22</td>
<td>Tuesday, Nov 19</td>
<td>9-10:30 AM</td>
<td>Controversies in Epidemiology 2: Observational</td>
<td>Jacques</td>
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<td>Friday, Nov 22</td>
<td>12-1:30 PM</td>
<td>Nutrition and Skeletal Health</td>
<td>Sahni &amp; Mangano</td>
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<td>Tuesday, Nov 26</td>
<td>9-10:30 AM</td>
<td>Nutrition and Cardiovascular Disease</td>
<td>McKeown</td>
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<td>Friday, Nov 29</td>
<td>No class</td>
<td>Thanksgiving Holiday</td>
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<td>Tuesday, Dec 3</td>
<td>9-10:30 AM</td>
<td>Diet-Disease Relationship in Ethnic Populations</td>
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<td>dietary guidelines and health policy</td>
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<td>Tuesday, Dec 6</td>
<td>12-1:30 PM</td>
<td>Translation of nutritional epi findings into</td>
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<td>Tuesday, Dec 10</td>
<td>No class</td>
<td>Reading period</td>
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<td>Tuesday, Dec 17</td>
<td>No class</td>
<td>Final critique due</td>
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This schedule is subject to modifications at the discretion of the instructor.
Course Schedule
(Weekly Readings, Learning Objectives and Assignments)

Class 1: Overview of Nutritional Epidemiology

**Learning Objectives for class 1:** Upon completion of this class, students will be able to understand:

1. What is the definition/ objective of nutritional epidemiology research?
2. What are some of the historical developments in nutritional epidemiology?
3. What types of study designs are used in nutritional epidemiological research?
4. What are the types of measures of exposure and outcome?
5. What are measures of disease occurrence?
6. What are measures of effect?
7. What are the criteria for causality?
8. What are some of the key issues in nutritional epidemiology?

**Required Readings for class 1:**
Willett, Chapter 1: Overview of Nutritional Epidemiology
Willett, Chapter 2: Foods and Nutrients


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Class 2: Dietary Assessment Methods: FFQ

**Learning Objectives for class 2:** Upon completion of this class, students will be able to:

1. What are the new developments in the field of dietary assessment methods?
2. How would you develop a FFQ for collecting dietary intake data?
3. What is the basic assumption behind FFQ and how do you decide which foods to include?
4. What are the issues with respect to including portion sizes?
5. How would you design a relative-validity (calibration) study?
6. How would you design a validation study?
7. What reference method would you use to validate your questionnaire?
8. What factors may influence the findings of a validation study?
9. What methods are used to compare the test methods to a reference method?
Required Readings for class 2:
Chapter 5: Food Frequency Methods
Chapter 6: Reproducibility & Validity of a FFQ


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Class 3: Dietary Assessment Methods: Records and Recalls

Learning Objectives for class 2: Upon completion of this class, students will be able to understand:
1. Why measure diet?
2. What are the types of dietary assessment methods used to measure diet in epidemiological studies?
3. What are the strengths and limitations of each dietary assessment method?
4. What are the issues with measuring nutrients versus foods?
5. How would you conduct a 24-hour recall?

Required Readings for class 3:
Chapter 3: Nature of Variation in Diet
Chapter 4: 24 hour recall and Food Record Methods


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Class 4: Energy Intake Validation and Dietary Under- and Overreporting

Learning Objectives for class 4: Upon completion of this class, students will be
able to:
1. Why is validity an issue when measuring energy intake?
2. What factors affect validity of reported energy intake?
3. How is validity of energy intake assessed?
4. What is the effect of poor validity of energy intake in epidemiological studies?

**Required Readings for class 4:**

**Optional:**


[http://www.statcan.gc.ca/pub/82-003-x/2008004/article/10704/5800500-eng.htm#1](http://www.statcan.gc.ca/pub/82-003-x/2008004/article/10704/5800500-eng.htm#1)

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**Class 5: Biomarkers in Nutritional Epidemiology**

**Learning Objectives for class 5:** Upon completion of this class, students will be able to:
1. What are the advantages of using biomarkers in nutritional epidemiology?
2. What is the difference between a direct and surrogate biomarker of exposure?
3. How would you define validity, relative validity, calibration & reproducibility?
4. What is the principal behind the trial comparison methods of evaluating a FFQ?
5. How to interpret the findings from the OPEN study?
6. What are the important considerations relating to the use of nutritional biomarkers?
7. What are the common surrogate biomarkers used in epidemiological studies?
8. What are the underlying assumptions on the use of biomarkers in epidemiological studies?

**Required Readings for class 5:**
Chapter 9: Biochemical Indicators of dietary intake


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Class 6: Measurement of Physical Activity in Nutritional Epidemiology

Learning Objectives for class 5: Upon completion of this class, students will be able to:
1. What is physical activity? Distinguish between physical activity, exercise, and physical fitness.
2. What are the current physical activity guidelines?
3. How is physical activity measured? Discuss the strengths and limitations to various measures of exercise and energy expenditure.
4. What are the sources of measurement error in studies of physical activity?

Required Readings for class 6:
Obesity Epidemiology, Chapter 7, Pages 119-145

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Class 7: Measurement Error: Effects and Remedies

Learning Objectives for class 7: Upon completion of this class, students will be able to:
1. What types of statistical corrections can be used to measures of association?
2. What types of statistical corrections can be used for measurement error in confounding variables?
3. How to interpret studies applying measurement error correction techniques?

Required Readings for class 7:
Chapter 12: Correction for the effects of measurement error


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Class 8 and Class 9: Energy Adjustment and Practicum 1

Learning Objectives for class 8 and 9: Upon completion of this class, students will be able to:
1. Why is energy intake measured and why do we need to energy adjust?
2. What are the components of energy expenditure?
3. What are the energy adjustment methods?
4. What considerations do you need to take into account when energy adjusting nutrient data?
5. Interpret the meaning of regression coefficients in statistical models

Required Readings for class 8:
Chapter 11: Implications of Total Energy For Epidemiological Studies


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Class 10: Physical Activity and Health

Learning Objectives for class 10: Upon completion of this class, students will be able to:
1. Why is the role of physical activity in health?
2. How to design studies in physical activity and chronic disease prevention?

**Required Readings for class 10:**

**Class 11: Epidemiology of Obesity**

**Learning Objectives for class 10:** Upon completion of this class, students will be able to:
1. What are the population obesity trends in US?
2. What are the metabolic consequences of obesity?
3. What are the predictors of obesity in children?
4. What are the key methodological issues in analyzing the relationship between obesity and mortality?
5. What are the methodological issues in studying childhood obesity?
6. What is the relationship between fatness versus fitness and mortality?

**Required Readings for class 10**
*Frank Hu’s Book Obesity Epidemiology*

*Chapter 20: Predictors and consequences of childhood obesity*


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**Class 12: Methodological considerations in study design**

**Learning Objectives for class 12:** Upon completion of this class, students will be able to:
1. Understand the difference between categorized versus continuous presentation of independent variables
2. Understand the issues with missing data and outliers
3. Understand the approaches for using repeated dietary assessments and related
hypotheses
4. Understand the need for subgroup analyses and interactions
5. Understand the importance of selection of confounders

Required Readings for class 12:
Chapter 13: Issues in Analysis and Presentation of Dietary Data


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Class 13: Dietary Patterns: Theoretical

Learning Objectives for class 13: Upon completion of this class, students will be able to:
1. Why use dietary pattern techniques to capture diet?
2. What are the types of food pattern methods used in nutritional epidemiology?
3. What are the advantages and disadvantages of theoretical derived patterns?
4. What are considerations in creating a diet index score?
5. How to interpret the results of studies using theoretically derived dietary patterns?


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Class 14: Dietary Patterns: Empirical

Learning Objectives for class 14: Upon completion of this class, students will be
able to:
1. Why use empirically derived dietary patterns?
2. What is the difference between factor analysis and cluster analysis?
3. How valid are these techniques?
4. What are the advantages and disadvantages of empirically derived patterns?
5. What are the limitations of dietary pattern approaches?


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Class 15: Practicum 2: Cluster/Factor Analysis

Learning Objectives for class 15: Upon completion of this class, students will be able to:
1. Under the statistical methodology underlying cluster and factor analysis
2. Interpret and critically evaluate statistical output


Class 16: Controversies in Epidemiology 1: Folate

Learning Objectives for class 16: Upon completion of this class, students will be able to:
1. What is the history behind folic acid fortification in the US?
2. What are the current intakes of folic acid compared to the past?
3. Is folic acid fortification successful in prevention of neural tube defects?
4. What are the controversies surrounding folic acid fortification?
5. What needs to be considered when interpreting the scientific evidence?
6. What is the future direction?
Required Readings for class 16:


Recommended: Chapter 18: Folic Acid & Neural Tube Defects


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Class 17: Nutrition Monitoring and Surveillance

Learning Objectives for class 17: Upon completion of this class, students will be able to:
1. Understand what is nutritional monitoring and surveillance
2. Understand the importance of monitoring and surveillance of knowledge, beliefs, attitudes about nutrition
3. Understand the emerging methods for nutritional surveillance

Required Readings for class 17: Chapter 14: Nutrition Monitoring and Surveillance


Class 19: The role of meta-analysis in Nutritional Epidemiology

Learning Objectives for class 19: Upon completion of this class, students will be able to:
1. Understand the utility of meta-analysis in nutrition epidemiology, including strengths and limitations.
2. Evaluate, summarize and interpret findings from meta-analyses while considering prior and new evidence.
3. Discuss how findings from meta-analysis can be used to shape dietary recommendations and policy and be communicated to the public.

Required Readings for class 19:


Class 20: Nuts and Bolts of Nutrigenetics

Learning Objectives for class 20: Upon completion of this class, students will be able to:
1. Understand main approaches to genetic association and interaction studies and the limitations of each
2. Understand the role of ethnicity and linkage disequilibrium in genetic epidemiologic studies
3. Basic knowledge of the major datasets and projects underlying the study of
genomics
4. Be able to critically evaluate a genetic association or genetic interaction study based on key concepts


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**Class 21: Nutrition and Diabetes**

**Learning Objectives for class 21:** Upon completion of this class, students will be able to understand:
1. What are the population diabetes trends in US adults?
2. What are the metabolic consequences of diabetes?
3. What is the relationship between diet and diabetes?
4. What are the methodological issues in analyzing the relationship between diet and diabetes?


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Class 22: Controversies in Epidemiology: Epidemiology vs Intervention

Learning Objectives for class 22: Upon completion of this class, students will be able to understand:
1. What are the inherent differences between intervention and observational studies?
2. How do treatment (secondary) and primary prevention study paradigms differ?
3. What is the optimal way to model nutritional exposures in a prevention study?
4. What are the main reasons why nutritional intervention studies do not replicate findings from epidemiologic studies?

Required Readings for class 22:


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Class 23: Nutrition and Skeletal Health

Learning Objectives for class 23: Upon completion of this class, students will be able to understand:
1. The epidemiology of osteoporosis and low bone mass
2. The role of foods and nutrients in the prevention of bone and muscle loss

Required Readings for class 23:

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Class 24: Nutrition and Cardiovascular Disease

Learning Objectives for class 24: Upon completion of this class, students will be able to understand:
1. The epidemiology of cardiovascular disease
2. Evidence behind current dietary guidelines for heart disease risk reduction
3. Current gaps and future directions in the prevention of cardiovascular disease

Required Readings for class 24:


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Class 25: Diet-Disease Relationships in Ethnic Populations

Learning Objectives for class 25: Upon completion of this class, students will be able to understand:
1. Issues in measuring diet in ethnic populations
2. Considerations in study design for ethnic populations

Required Readings for class 25:


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### Class 26: Translation of nutritional epidemiology findings into dietary guidelines and health policy

**Learning Objectives for class 26:** Upon completion of this class, students will be able to understand:

1. To be able to identify key nutritional problems for which a case can be made for population-wide interventions or dietary recommendations.
2. To be able to critically evaluate the strength of nutritional epidemiology evidence in terms of study design and analytic methods.
3. To understand the processes by which findings from nutritional epidemiology are translated into action and to consider potential barriers and benefits.
4. To consider the various levels of nutrition policy and sectors involved.

**Required Readings for class 26:**


**Optional**


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This schedule is subject to modifications at the discretion of the instructor.