University of Florida
College of Public Health & Health Professions Syllabus
Course Number: PHC7595 (3 credit hours)
Semester: Fall 2019
Delivery Format: On-Campus
Tuesdays, 9:35am-12:35pm
Course Website: E-Learning in Canvas

Instructor Name: Lusine Yaghjyan, MD, MPH, PhD
Room Number: G110
Phone Number: 352-294-5940
Email Address: lyaghjyan@ufl.edu
Office Hours: by appointment (2004 Mowry Road, Room 4216)
Class TA: None

Prerequisites
Knowledge of basic concepts in epidemiology and study designs: PHC 6001.

PURPOSE AND OUTCOME

Course Overview
This course covers the theoretical concepts in molecular epidemiology and use of biomarkers in epidemiologic studies. Class topics include: basics of molecular epidemiology, potential uses and limitations of biomarkers, sample collection and storage, issues in epidemiologic study design and analysis, and discussion of specific research examples involving molecular markers.

Course Objectives and/or Goals
The goal of this class is to provide a strong background for understanding the basic principles in molecular epidemiology design and methods. Upon successful completion of the course, students should be able to

1. Describe application of biomarkers in epidemiologic studies, including their strengths and limitations.
2. Identify the criteria used to evaluate a potential biomarker and critically evaluate selected examples
3. Describe the major problems in collecting, storing and processing various biological samples for human population studies, ethical and legal considerations and principles of quality control for laboratory assays.
4. Critically evaluate application of study designs in molecular epidemiology.
5. Critically evaluate the use of biomarkers as measures of the internal dose of exogenous substances (environmental toxins, micronutrients, etc.).
6. Effectively synthesize & evaluate research to address a specific research question.

DESCRIPTION OF COURSE CONTENT

Topical Outline/Course Schedule

Date	Topic	Readings (possibly alternate meeting place, or time)	HW Assigned	HW due date
Week 1 08/20/19	Introduction: Review of fundamental concepts in molecular epidemiology Use of Biomarkers in Molecular Epidemiology.	Shulte P. A Chapter 1. A conceptual and historical framework for molecular epidemiology. In: Molecular Epidemiology: Principles and Practices (***can be viewed online at Google Books***) Perera FP and Weinstein IB. Molecular epidemiology: recent advances and future directions. Carcinogenesis 2000; 21(3): 517-524. Ambrosone CB and Kadlubar FF. Toward an integrated approach to molecular epidemiology. Am J Epidemiol 1997; 146(11): 912-918.	HW 1	

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		Mayeux, R. Biomarkers: potential uses and limitations. NeuroRx 2004; 1(2): 182-188. Gallo et al. Strengthening the Reporting of Observational studies in Epidemiology--Molecular Epidemiology STROBE-ME: an extension of the STROBE statement. J Clin Epidemiol 2011; 64(12): 1350-1363.		
Week 2 08/27/19	Study designs in molecular epidemiology.	Fowke JH. Issues in the design of molecular and genetic epidemiologic studies. J Prev Med Public Health 2009; 42(6): 343-348.	HW2	HW 1
Week 3 09/03/19				
Week 4 09/10/19	Bias and confounding in molecular epidemiology **Study design exercise**	Vineis P and McMichael AJ. Bias and confounding in molecular epidemiological studies: special considerations. Carcinogenesis 1998. 19:2063-7.		
Week 5 09/17/19	UF CTSI Biorepository tour	The class will be meeting with biorepository staff at **10:00am in M-621 MSB (6th floor of Medical Science Building).** Please make sure to be on time.		
Week 6 09/24/19	Collecting and storing biospecimens: methodological considerations **Exercise: identification of relevant labs** **Dakota**	Holland et al. Biological sample collection and processing for molecular epidemiological studies. Mutat Res 2003; 543(3): 217-234. Schrohl et al. Banking of biological fluids for studies of disease-associated protein biomarkers. Mol Cell Proteomics 2008; 7(10): 2061-2066. **Serum Cytokine Profiles in Patients with Dengue Fever at the Acute Infection Phase**		HW2
Week 7 10/01/19	Biobanking. Selected laboratory techniques. **Exercise: planning sample retrieval from the freezer** **Deji**	Perera FP and Herbstman JB. Emerging technology in molecular epidemiology: what epidemiologists need to know. EPIDEMIOLOGY 2008. 19:350-2. Erickson HS. Measuring molecular biomarkers in epidemiologic studies: laboratory techniques and biospecimen considerations. Stat Med 2012. 31:2400-13. **Emergency room triage of patients with acute chest pain by means of rapid testing for cardiac troponin T or troponin I**		
Week 8 10/08/19	Environmental exposure assessment. Basics concept in genetic epidemiology, biomarkers of susceptibility, and gene-environment interactions **Exercise: Using CDC report on environmental exposures** **Pooja**	Links et al. Biomarkers and mechanistic approaches in environmental epidemiology. Annu Rev Public Health 1995; 16: 83-103. Gann et al. Biological markers in environmental epidemiology: constrains and opportunities. In: Methods for Assessing Exposure of Human and Non-Human Biota, 1991. Schulte PA, Waters M. Using molecular epidemiology in assessing exposure for risk assessment. Ann N Y Acad Sci. 1999; 895:101-11. Nurminen et al. Methodological issues in epidemiologic risk assessment. Epidemiology 1999; 10:585-593 Smith et al. Generic epidemiology and public health: hope, hype, and future prospects. Lancet. 2005; 22-28; 366(9495):1484-98. Hunter, D. J. Gene-environment interactions in human diseases. Nat Rev Genet 2005; 6(4): 287-298. **Short Leukocyte Telomere Length Predicts Risk of Diabetes in American Indians: the Strong Heart Family Study**		

Date	Topic	Readings (possibly alternate meeting place, or time)	HW Assigned	HW due date
Week 9 10/15/19	Use of biomarkers in cancer epidemiology **Exercise: Using NCBI website** **Paper discussion*** **Carmen**	Vineis P, Perera F. Molecular epidemiology and biomarkers in etiologic cancer research: the new in light of the old. Cancer Epidemiol Biomarkers Prev 2007; 16(10): 1954-1965. Boffetta, P. Biomarkers in cancer epidemiology: an integrative approach. Carcinogenesis 2010; 31(1): 121-126 *** Sisti et al., Caffeine, coffee, and tea intake and urinary estrogens and estrogen metabolites in premenopausal women. CEBP 2015; 24(8):1174-83** **Osteoprotegerin and breast cancer risk by hormone receptor subtype: a nested case-control study in the EPIC cohort**		
Week 10 10/22/19	Intermediate review of student final project topics **Planning and executing a molecular epi study: practice example** **Joseph**	**Gene expression and association analysis of vascular endothelial growth factor in major depressive disorder**		
Week 11 10/29/19	Special topics: Biomarkers of drug abuse Biomarkers of kidney and liver damage **Paper discussion*** **Wenjie**	Gjerde et al. Using biological samples in epidemiological research on drugs of abuse. Norwegian Journal of Epidemiology 2011; 21(1) Chang WJ, Joe KT, Park HY, Jeong JD, and Lee DH. The relationship of liver function tests to mixed exposure to lead and organic solvents. Ann Occup Environ Med 2013. 25:5. Beulens JW, Rimm EB, Hu FB, Hendriks HF, and Mukamal KJ. Alcohol consumption, mediating biomarkers, and risk of type 2 diabetes among middle-aged women. Diabetes Care 2008. 31:2050-5 *** Nassef et al. Performance of diagnostic biomarkers in predicting liver fibrosis among hepatitis C virus-infected Egyptian children. Memórias do Instituto Oswaldo Cruz 2013; 108(7):887-93.** **Serum Levels of Carbamylated LDL and Soluble Lectin-Like Oxidized Low-Density Lipoprotein Receptor-1 Are Associated with Coronary Artery Disease in Patients with Metabolic Syndrome**		
Week 12 11/05/19	Special topics: Biomarkers of dietary intake and interventions Biomarkers of allergy and asthma Biomarkers in infectious diseases **Nana & Michael**	Eliassen, A. H., et al. Biomarker validation of dietary intervention in two multiethnic populations. Prev Chronic Dis 2006; 3(2): A44. Blanck, H. M., et al. Laboratory Issues: Use of Nutritional Biomarkers The Journal of Nutrition 133(3): 888S-894S. Diamant et al. Biomarkers in asthma and allergic rhinitis. Pulm Pharmacol Ther 2010; 23(6): 468-481. Foxman B. Contributions of molecular epidemiology to the understanding of infectious disease transmission, pathogenesis, and evolution. Ann Epidemiol 2007; 17(2): 148-156. **Intestinal Damage and Inflammatory Biomarkers in Human Immunodeficiency Virus (HIV)–Exposed and HIV-Infected Zimbabwean Infants** **Molecular Epidemiology of Tuberculosis in Foreign-Born Persons Living in San Francisco**		
Week 13 11/12/19	Special topics: Biomarkers of smoking and	Shields PG. Molecular epidemiology of smoking and lung cancer. Oncogene 2002; 21(45): 6870-6876. Guipaud O and Benderitter M. Protein biomarkers for radiation		

Date	Topic	Readings (possibly alternate meeting place, or time)	HW Assigned	HW due date
	radiation Biomarkers of cardiac injury. Considerations in statistical analysis of ME studies **Paper discussion*** Nathan	exposure: towards a proteomic approach as a new investigation tool. Ann Ist Super Sanita 2009. 45:278-86. Vasan RS. Biomarkers of cardiovascular disease: molecular basis and practical considerations. Circulation 2006; 113(19): 2335-2362 *** Stiby et al. Association of maternal smoking with child cotinine levels. Nicotine Tob Res 2013; 15(12): 2029-2036 Loneliness in middle age and biomarkers of systemic inflammation: Findings from Midlife in the United States**		
Week 14 11/19/19	Course review			Final papers
Week 15 11/26/19	Student presentations			
Week 16 12/03/19	Student presentations			

Course Materials and Technology

Text/Readings
No required text.

Recommended: Molecular Epidemiology of Chronic Diseases by Chris Wild, Paolo Vineis, and Seymour Garte. Hoboken, NJ: John Wiley & Sons Inc., 2008.

Each week there will be one or more required readings that could include information from articles, or book chapters provided by the instructor. When possible, the articles for the class will be posted on Canvas.

Canvas

Canvas is accessible at lss.at.ufl.edu or through my.ufl.edu. You must have a valid Gatorlink ID and password. For assistance, call the UF Help Desk at 392-HELP.

Required: All materials will be posted in Canvas. Students are responsible for all course material, including required readings prior to each class. Readings will be assigned from textbook chapters, historical or current scientific research literature.
For technical support for this class, please contact the UF Help Desk at:

- Learning-support@ufl.edu
- (352) 392-HELP - select option 2
- https://lss.at.ufl.edu/help.shtml

ACADEMIC REQUIREMENTS AND GRADING

Course Requirements

Homework
There is no formal exam for this course. However, the students will be required to complete two homework assignments and a final project. All files will need to be submitted electronically.

Homework #1 (10 points): Due by the class start time on the 2nd week. Students will have to select one example of biomarker of external dose, internal dose, biologically active dose, and biological effect and explain why they chose each of the markers. During the class discussion, all students will present their selections and justifications to the class (no PowerPoint!). This homework will count 10% towards the final grade.

Homework #2 (20 points). Due by the class start time on the 6th week. Students need to select one biomarker for the final project and write two-page justification why this is a good candidate biomarker for their final

project. They will also need to select the preferred format for the final paper. If format #3 is selected, please provide citations for two selected articles. This homework will count 20% towards the final grade.

Class Participation and in-class paper discussion: Each student will be asked to choose one article of their choice that uses biomarkers to investigate associations of interest. The paper will be sent to the instructor by Friday of the preceding week and posted online. The student will briefly present the study and prepare 2-3 questions to lead a 20-30 minute discussion. The questions should focus on various methodological issues pertinent to overall study design, specimen collection, biomarker use, and data analysis/interpretation.

Students will also discuss strengths and limitations of papers assigned by the instructor for group exercise. For this exercise, students will be randomly assigned to "strengths" or "limitations" groups in class. Both groups will have 10-15 minutes to prepare their arguments followed by a brief presentation from each group and discussion. The " strengths" group will also introduce the article by summarizing the key design elements. Students are expected to come prepared for this exercise.

Class participation and in-class discussion will count 10% towards the final grade.
Final project. Students will have an opportunity to choose from three possible formats for their final project (40 points total):

Format #1: Students will develop a 6-page proposal for a molecular epidemiology study. The proposal will adhere to the following format: introduction; hypothesis/specific aims; research strategy; study limitations. Special attention will be paid to the proper use of Mol Epi terminology and sufficient details on different aspects of the selected biomarker. The paper will be graded based on the clarity of the research question, its justification and supporting literature (10 points); proper design choice and description of the research strategy (population; exclusion/inclusion criteria; sample collection; detailed biomarker measurement, including lab methods (if more than one exist; justification of the method selection); statistical analysis (20 points); proper proposal structure (5 points); critical thinking (5 points). Sample size and power calculations are not required, but additional points will be assigned if discussed.

Format #2: (Preferred format) Literature Review: Each student will write a publishable review of the literature on the use of a biomarker(s) in a particular disease/organ system. The manuscript will be prepared according to specifications outlined by the journal to which you intend to submit the manuscript. Using the guidelines of the journal, the literature review will: identify and describe the disease-exposure relationship (5 points); organize information and relate it to the research question you are developing (5 points); synthesize results into a summary of what is and is not known (10 points); identify gaps and controversy in the literature (10 points); use tables and/or figures to graphically represent data (5 points); develop questions for further research (5 points). The journal specifications for a literature review should accompany your paper.

Format #3: (Format available for those working in areas with little existing research) The students will select two articles investigating the same marker-disease association but reporting controversial findings. They will write a 6 page paper comparing two investigations and critically summarizing study features that contribute to the differences in findings. Special attention should be paid to the differences in molecular epidemiology methods used by the authors. Simple summary of the two studies or comparison of general design features will not be sufficient. The paper will be graded based on the paper structure and flow (5 points); in-depth comparison of the molecular epidemiology methods (15 points); discussion of the design features that contribute to controversial findings (20 points).

The final project will contribute 40% towards your final grade and will be due before the class on 11/19/2019.

Presentations. Regardless of the chosen format for the final project, each student will present their final work as a 30 minute presentation scheduled during the last two weeks (20 minute talk + 5-10 minute Q&A). Assessment of presentations will be based on organization and flow (3 points), subject knowledge (8 points), visual representation (5 points); style (mechanics, eye contact, etc., 2 points), and Q&A session (2 points). The form used to evaluate the critique will be posted on Canvas prior to presentations. The presentation will contribute 20% towards the final grade.

Grading

Grading will be based on attendance and class participation (10%), homework assignments (10% for HW #1 and 20% for HW#2); in-class paper discussion (10%), final paper (40%), and final presentation (20%). There will be no exams.

Assignment	Due date	Points or % of final grade
Homework 1	08/27/2019	10% (10 points)
Homework 2	09/24/2019	20% (20 points)
Final project	11/19/2019	40% (40 points)
Final presentation	As scheduled	20% (20 points)
Attendance and in-class participation	NA	10% (10 points)

This course will be graded following the policies described here
http://gradcatalog.ufl.edu/content.php?catoid=4&navoid=907&hl=grades&returnto=search#grades

Percentage or points earned in class	**93%-100%**	**90%-92%**	**87%-89%**	**83%-86%**	**80%-82%**	**77%-79%**	**73%-76%**	**70%-72%**	**67%-69%**	**63%-66%**	**60%-62%**	**Below 60%**
Letter Grade equivalent	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E

A	**A-**	**B+**	**B**	**B-**	**C+**	**C**	**C-**	**D+**	**D**	**D-**	**E**	**WF**	**I**	**NG**	**S-U**
4.0	3.67	3.33	3.0	2.67	2.33	2.0	1.67	1.33	1.0	0.67	0	0	0	0	0

For greater detail on the meaning of letter grades and university policies related to them, see the Registrar's Grade Policy regulations at:
http://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Policy Related to Make up Exams or Other Work

Make-up work will be allowed by the course instructor on an individual basis after an excused absence (see above). Students should consult with the professor for new deadlines for assignments. Please consult the university guidelines for more information on makeup policies:
https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx.

Policy Related to Required Class Attendance

This is an interactive class and students are expected to be present and to participate in all class sessions. Students who know they will need to miss a class session should discuss this with the instructor prior to the date of the class, or on the day of the absence for illness or emergency. According to the UF Catalog (link below) "In general, acceptable reasons for absences from class include illness, serious family emergencies, special curricular requirements, military obligation, severe weather conditions, religious holidays, and participation in official University activities. Absences from class for court-imposed legal obligations (e.g., jury duty or subpoena) must be excused. Other reasons also may be approved."

Please note all faculty are bound by the UF policy for excused absences. For information regarding the UF Attendance Policy see the Registrar website for additional details:
https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

STUDENT EXPECTATIONS

Academic Integrity

Students are expected to act in accordance with the University of Florida policy on academic integrity. As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge:

"**We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity**."

You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied:

"On my honor, I have neither given nor received unauthorized aid in doing this assignment."

It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For additional information regarding Academic Integrity, please see Student Conduct and Honor Code or the Graduate Student Website for additional details:
https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/
http://gradschool.ufl.edu/students/introduction.html

Please remember cheating, lying, misrepresentation, or plagiarism in any form is unacceptable and inexcusable behavior.

Citations and Plagiarism

The two key purposes of citation are to: 1) give appropriate credit to the authors of information, research findings, and/or ideas (and avoid plagiarism), and 2) facilitate access by your readers to the sources you use in your research.

Quotations: When directly quoting an outside source, the borrowed text, regardless of the amount, must be surrounded by quotation marks or block quoted. Quoted text over two lines in length should be single-spaced and indented beyond the normal margins. Every quote must include a source—the author, title, volume, page numbers, etc.—whether an internal reference, footnote, or endnote is used in conjunction with a bibliography page.

Paraphrasing or Citing an Idea: When summarizing an outside source in your own words or citing another person's ideas, quotation marks are not necessary, but the source must be included. This includes, but is not confined to, personal communications from other students, faculty members, experts in the field, summarized ideas from published or unpublished resource, and primary methods derived from published or unpublished sources. Use the general concept of "when in doubt – cite."

Plagiarism is a serious violation of the academic honesty policy of the College. If a student plagiarizes others' material or ideas, UF Policies on Honesty and honor code violations, noted above, will be followed.

Generally speaking, the three keys of acceptable citation practice are: 1) thoroughness, 2) accuracy, and 3) consistency. In other words, be sure to fully cite all sources used (thoroughness), be accurate in the citation information provided, and be consistent in the citation style you adopt. All references should include the following elements: 1) last names along with first and middle initials; 2) full title of reference; 3) name of journal or book; 4) publication city, publisher, volume, and date; and 5) page numbers referenced. When citing information from the Internet, include the WWW address at the end, with the "access date" (i.e., when you obtained the information), just as you would list the document number and date for all public documents. When citing ideas or words from an individual that are not published, you can write "personal communication" along with the person's name and date of communication.

Use of unauthorized assistance resources

As graduate students at the UF, you are expected to present your own work for grading. Unauthorized sources of help, including commercially available software and services are not allowed. Even though the

students will not be graded on their grammar, it is expected that as graduate students you will have sufficient English language skills to convey your thoughts in organized and understandable manner. If the assignment is unreadable, it will not be graded and will be assigned zero points. Use of unauthorized assistance sources will result in zero points on the written assignment and a report to the Dean of Student's Office. If you need assistance with English language and/or writing, you may visit the UF Writing Program Website to learn about available help.

Online Faculty Course Evaluation Process

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results/.

SUPPORT SERVICES

Accommodations for Students with Disabilities
If you require classroom accommodation because of a disability, you must register with the Dean of Students Office http://www.dso.ufl.edu within the first week of class. The Dean of Students Office will provide documentation of accommodations to you, which you must then give to me as the instructor of the course to receive accommodations. Please make sure you provide this letter to me by the end of the second week of the course. The College is committed to providing reasonable accommodations to assist students in their coursework.

Counseling and Student Health
Students sometimes experience stress from academic expectations and/or personal and interpersonal issues that may interfere with their academic performance. If you find yourself facing issues that have the potential to or are already negatively affecting your coursework, you are encouraged to talk with an instructor and/or seek help through University resources available to you.

- The Counseling and Wellness Center 352-392-1575 offers a variety of support services such as psychological assessment and intervention and assistance for math and test anxiety. Visit their web site for more information: http://www.counseling.ufl.edu. On line and in person assistance is available.
- You Matter We Care website: http://www.umatter.ufl.edu/. If you are feeling overwhelmed or stressed, you can reach out for help through the You Matter We Care website, which is staffed by Dean of Students and Counseling Center personnel.
- The Student Health Care Center at Shands is a satellite clinic of the main Student Health Care Center located on Fletcher Drive on campus. Student Health at Shands offers a variety of clinical services. The clinic is located on the second floor of the Dental Tower in the Health Science Center. For more information, contact the clinic at 392-0627 or check out the web site at: https://shcc.ufl.edu/
- Crisis intervention is always available 24/7 from:
  Alachua County Crisis Center:
  (352) 264-6789
  http://www.alachuacounty.us/DEPTS/CSS/CRISISCENTER/Pages/CrisisCenter.aspx

Do not wait until you reach a crisis to come in and talk with us. We have helped many students through stressful situations impacting their academic performance. You are not alone so do not be afraid to ask for assistance.