Department of Epidemiology
University of Florida College of Public Health and Health Professions
University of Florida College of Medicine
PHC 7XXX: Advanced Epidemiologic Methods III
Date (XXX)
Class Schedule: Thursdays, 12:50 to 3:50
Classroom: HPNP G110

Instructor Information

Instructor: Xinguang "Jim" Chen, MD, PhD
Address: 2004 Mowry Road, CTRB #4228
Phone Number: 352-294-5945
Email Address: jimx.chen@ufl.edu
Office Hours: On appointment

Course Overview or Purpose

To expand the methodology inventory by introducing advanced and new statistical and modeling methods to address **m**easurement, **d**escriptive, **c**omparative, **a**ssociative and **c**ausal relations in modern epidemiology. This advanced course will focus on the application of six advanced analytical and modeling methods through lectures, actual data analysis, student presentation and discussion.

Course Objectives and/or Goals

1. Understanding the significance of methods and methodologies in epidemiology, the concept of data and information, and assessing the need of individual students for new and advanced methods (1 session)
2. Mastering the measurement modeling methods/techniques for scale development and evaluation (2 sessions)
3. Utilizing three modeling methods for (a) developmental trajectory analysis, (b) age-period-cohort analysis, and (c) probabilistic discrete event system analysis (6 sessions)
4. Employing mixed effect modeling methods, including the generalized mixed effect modeling analysis in analyzing randomized controlled trials, including cluster-randomized trials (2 sessions)
5. Exploring the cusp catastrophe modeling methods in analyzing epidemiologic data to quantify complex associative or causal relationships (2 sessions)

Prerequisites

PHC 6000 Epidemiology Research Methods I, PHC 6011 Epidemiology Research Methods II, or consent of instructor

Textbooks Recommended

No one single textbook meets the need of this class. The following four books are recommended.

1. Twisk Jos WR., 2013. *Applied longitudinal data analysis for epidemiology*, (2nd ed.) Cambridge University Press

2. O'Brien, RM., 2014. *Age-period-cohort models: Approaches and analyses with aggregate data*. CRC press
3. Nagin, DS., 2005. Group-based modeling of development. Harvard University Press
4. Saunders, PT., 1980. *An introduction to catastrophe theory*. Cambridge University Press

Course Requirements

Since this is a hands-on course, attendance at all classes is required. Students should read all required materials and complete all homework exercises. Students are allowed to locate their own readings to address the same topic after communicating with the instructor

Instructor Expectations

Students must have a solid knowledge basis and hands-on skills with commonly used methods, including descriptive and comparative analysis, and analysis of correlation and association. Typical examples include rate, ratio, mean, standard deviation, t-test, chi- square test, ANOVA, interaction, correlation, factor analysis, and regression (e.g., linear, logistic, proportional hazards or Cox model). Proficiency in SAS is needed and knowledge and skills with R will be a plus.

Grading

Grades will be based on points accumulated for class attendance and participation, assignments, exams and final project. Total points earned will be assigned as follows:

Component	Percent
Attendance	10%
Participation	20%
Homework Assignments	70%

(1) Attendance will be graded based absence from classes. One percent point will be deducted for each absence of a class session without notifying the instructor of any excusable reason. (2) Participation will be assessed based on required presentation made in class and participation in classroom discussion. Fail to make presentation will lost the total 20% point; points will also be deducted according to the quality of the work presented in class and active in participating classroom discussion. (3) There are seven homework assignments for this class. Students earn up to 10% points per assignment. Turning homework on time with quality work will ensure full marks. Points will be deducted for delayed submission and poor quality of work.

Homework #	Assigned during	Contents	Due
HW (1)	Session I	Essay	By session II
HW(2)	Session II	Measurement modeling analysis Write an essay	By session III By Session IV
HW(3)	Session IV	Trajectory analysis Write a short essay	By session V By Session VI
HW(4)	Session VI	Mixed effect modeling analysis Write a short essay	By session VII By Session VIII
HW(5)	Session VIII	Age-period-cohort analysis Write a short essay	By session IX By Session X
HW(6)	Session X	PDES modeling analysis	By Session XI
HW(7)	Session XII	Cusp modeling analysis	By Session XIII

The grading scale for this course consists of the standard scale, including minus grades, below:

93% -100% = A
90% - 92% = A-
87% - 89% = B+
83% - 86% = B
80% - 82% = B-
77% - 79% = C+
73% - 76% = C
70% - 72% = C-
67% - 69% = D+
63% - 66% = D
60% - 62% = D-
Below 60% = E

Letter Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E	W F	I	N G	S-U
Grade Points	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	0.0	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

Topical Outline

Session One: Introduction, January 8

Starting with discussion about the concept of data and information, significance of methodologies, followed by a self-assessment of the methods already learned or familiar with, ending with introduction to the methods to be covered in this class and potential changes to meet the need of the majority of the class. By the end of the class, each student selects one method he or she likes the most, and will serve as leading discussant for the sessions that cover the method later.

Homework (1) due before session two: Write an essay, no more than 2 pages with 1 inch's margin, to describe the significance of methodologies for epidemiological data analysis, a list of the methodologies already learned, and identify methods to be learned.

Session Two: Measurement Modeling I, January 15

Introduction to the basic concept of measurement errors, the need for measurement tools to objectively assess beliefs and behaviors that are subjective, the five-step measurement modeling approach, concept mapping for scale item development and measurement modeling, SAS program for measurement modeling analysis.

Homework (2): Conduct measurement modeling analysis for a scale of your own choice or assigned by the class (due before session three); and conduct a critical review, in writing of no more than one page, of one published scale with the concept mapping and the psychometric analysis methods (due before session four).

Readings:

1. Bollen K, Lennox R (1991). Conventional wisdom on measurement: A structural equation perspective. *Psychological bulletin* 110 (2): 305-14
2. Chen X, Li F, et al (2013). Brief sensation seeking scale for Chinese – cultural and psychometric assessment. *Personality and individual differences* 54, 604-09.

Session Three: Measurement Modeling II, January 22

Student's report of the results from the critical review/measurement modeling analysis, discussion; recap of the contents covered in the previous session, old and new questions, answers and discussion.

Readings:

1. MacDonell K, Chen X, Yan Y, et al. 2013. A protection motivation theory-based scale for tobacco research among Chinese youth. *Journal of addiction Research and Therapy*. 4: 154 (doi: 10.4172/2155-6105.1000154)
2. Edwards, J. R., & Bagozzi, R. P. (2000). On the nature and direction of relationships between constructs and measures. *Psychological Methods, 5*(2), 155-174.

Session Four: Developmental trajectory analysis I, January 29

Patterns and process of development, heterogeneity of study populations, principles of group-based modeling, applications with examples, and SAS programming PROC TRAJ

Homework (3): Conduct developmental trajectory analysis of your own data or data provided by class (due before session five); and write a one-page essay to demonstrate the need for developmental trajectory analysis (due before session six)

Readings:

1. Jones BL, Nagin DS (2007). Advances in group-based trajectory modeling and an SAS procedure for estimating them. *Sociological methods and research*, 35(4): 542-71.
2. Chen X & Brogan K (2012). Developmental trajectories of overweight and obesity of US youth through the life course of adolescence to young adulthood. *Adolescent health, medicine and therapies*, 2013(3): 33-42.

Session Five: Developmental trajectory analysis II, February 5

Student's report of results from the developmental trajectory analysis using the PROC TRAJ in SAS or STATA, recap of the contents covered in the previous session, old and new questions, answers and discussion.

Readings:

1. Chen X & Jacques-Tiura A (2014). Smoking initiation associated with specific periods in the life course from birth to young adulthood: data from the National Longitudinal Survey of Youth 1997. American *Journal of Public Health*, 104(2): e119-26.
2. Nonnemaker JM, Morgan-Lopez AA, Pais JM et al (2009). Youth BMI trajectories: Evidence from the NLSY97. *Obesity*, 17: 1274-80
3. Chen X, Lunn S, Deveaux L et al. (2009). A cluster randomized controlled trial of an adolescent HIV prevention program among Bahamian youth: Effect at 12 months post-intervention. *AIDS and behavior*, 13(3): 499-508

Session Six: Mixed effect modeling analysis I, February 12

Complex sampling design and longitudinal data; the concept of fixed , mixed, and random effects; hierarchical modeling, mixed and generalized mixed effect models; and the application of PROC MIX and PROC GLIMMIX.

Homework (4): Conduct a mixed effect modeling analysis using either PROC MIX or PROX GLIMMIX with your own data or data provided by class (due before session seven), and write a one-page essay indicating the when a mixed effect modeling method is needed (due before session eight).

Readings:

1. Chen X, Fang X, Li X, et al. (2006). Stay away from tobacco: A pilot trial of a school- based adolescent smoking prevention program in Beijing, China. *Nic & tobacco research*, 8(2): 227-37
2. Twisk, Hos WR (2013). *Applied longitudinal data analysis for epidemiology: A practical Guide* (2nd Ed). Cambridge University Press

Session Seven: Mixed effect modeling analysis II, February 19

Student's report of the results from the homework, recap of the contents covered in the previous session, old and new questions, answers and discussion.

Readings:

1. Dinaj-Koci V, Lunn S, Deveaux L, Wang B, Chen X, et al. (2013). Adolescent Age at Time of Receipt of One or More Sexual Risk Reduction Interventions. *Journal of adolescent health*, 55(2): 228-32
2. Muirray D. 1998. *Design and analysis of group-randomized trials*. Oxford University Press

Session Eight: Age-Period-Cohort (APC) Modeling Analysis I, February 26

Concept of age-period-cohort (APC) modeling, utility in exploring history of disease epidemiology using current data, history of the method development, challenge to solving non-identifiable and new progress, approaches for analysis, regression approach using SAS or other related programs, intrinsic estimate using STATA, generalized inverse matrix methods through R.

Homework (5): Locate dataset or use data provided by the class to conduct an APC modeling analysis (due before session nine), and write a one-page essay describing the utility of APC modeling in research (due before session 10).

Readings:

1. Chen X, et al (2003). Secular trends in adolescent never smoking from 1990 to 1999 in California: An age-period- cohort analysis. *American journal of public health*,93(12): 2099-104.
2. O'Brien, RM., 2014. *Age-period-cohort models: Approaches and analyses with aggregate data*. CRC press

Spring Break

Session Nine: Age-Period-Cohort (APC) Modeling Analysis II, March 12

Student report of the results from the homework, recap of the contents covered in the previous session, old and new questions, answers and discussion.

Readings:

1. O'Brien, RM., 2014. *Age-period-cohort models: Approaches and analyses with aggregate data*. CRC press
2. Mousavi-Jarrahi SH, Kasaeian A, Mansori K, et al., 2013. Addressing the younger age at onset in breast cancer patients in Asia: An age-period-cohort analysis of fifty year of quality data from international agency for research on cancer. *ISRN Oncology* (http://dx.doi.org/10.1155/2013/429862)
3. Anderson WF, Reiner AS, Matsuno, RK, Pfeiffer, RM. 2007. Shifting breast cancer trends in the United States. *Journal of Clinical Oncology*, 25(25): 3923-29

Session Ten: Probabilistic Discrete Event Systems (PDES) Modeling I, March 19

Concept of dynamic changes and system modeling, continuous and discrete change, longitudinal and cross-sectional design, PDES modeling, challenges to solving non-identifiable PDES models and solutions, solutions with generalized inverse matrix methods through R.

Homework (6): Conduct PDES modeling with data provided by class or of your own (due by session 11).

Readings:

1. Chen X and Lin F. 2013. Estimating transitional probabilities with cross-sectional data to assess smoking behavior progression: A validation analysis. *J. biometrics and biostatistics* 4 (3): 1-6
2. Lin F and Chen X. 2010. Estimation of transitional probabilities of discrete event systems from cross- sectional survey data and its application in tobacco control. *Information science*, 180(3): 432-440.

Session Eleven: Probabilistic Discrete Event Systems (PDES) Modeling II, March 26

Student's report of the PDES modeling results, recap of the contents covered in the previous session, old and new questions, answers and discussion.

Readings:

1. Chen X, Ren YJ, Lin F, MacDonell K, Jiang YF. 2012, Exposure to school and community based prevention programs and reductions in cigarette smoking among adolescents in the United States, 2000-08. *Evaluation and program planning*, 35(3): 321-28
2. Hu X, Chen X, Chen D, Lin F, Cook R. Modeling the drinking behavior progression in youth through young adulthood: a partially-observed probabilistic discrete event systems (PDES) modeling with cross-sectional data. *Current HIV Research*. Invited manuscript, in preparation

Session Twelve: Cusp Catastrophe Modeling of Quantum Change I, April 2

Methodological challenges for analyzing epidemiologic data for etiological research, concept of quantum dynamics of outcome variables, cusp catastrophic modeling, methods to solve a cusp models, analytical software and programming with SAS and R.

Homework: (7) Try to conduct a cusp modeling analysis with data provided by class or of your own (no due date).

Readings:

1. Chen X, Lunn S, Harris C et al., Modeling early sexual initiation among young adolescents using quantum and continuous behavior change models: Implication for HIV prevention. *Nonlinear dynamics, psychology, and life sciences*, 14(4): 491-509

2. Grassman RP, Mass HJ, Wagemakers E. Fitting the cusp catastrophe in R: A Cusp package primer. *Journal of statistical software*, 32(8): 1-27
3. Saunders, PT., 1980. *An introduction to catastrophe theory*. Cambridge University Press

Session Thirteen: Cusp Catastrophe Modeling of Quantum Change II, April 9

Student's report of the CUS modeling results, recap of the contents covered in the previous session, old and new questions, answers and discussion.

Session Fourteen: Integrative Review

1. Summary of topics covered, including principles, applications, tricks, strengths and weakness.
2. Discussion on typical issues commonly seen in using the each of the six methods
3. Comments on homework and class presentations

Final closing statement of the class by the instructor

Statement of University's Honesty Policy (cheating and use of copyrighted materials)

***Academic Integrity* –** Students are expected to act in accordance with the University of Florida policy on academic integrity (see Student Conduct Code, the Graduate Student Handbook or this web site for more details: www.dso.ufl.edu/judicial/procedures/academicguide.php).

Cheating, lying, misrepresentation, or plagiarism in any form is unacceptable and inexcusable behavior.

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

Policy Related to Class Attendance

Class attendance is mandatory according to school regulation. Detailed regulations and policies can be found at the URL: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx. Excused absences follow the criteria of the UFL Graduate Catalogue (e.g., illness, serious family emergency, military obligations, religious holidays), and should be communicated to the instructor prior to the missed class day when possible. UFL rules require attendance during the first two course sessions (Teachers are required to take roll for the College), and students also must attend all course sessions of student presentations for this class. Missing more than two scheduled sessions will result in a failure. Two weekly sessions are the equivalent of about 15% of the course contact hours. Regardless of attendance, students are responsible for all material presented in class and meeting the scheduled due dates for class assignments. Finally, students should read the assigned readings prior to the class meetings, and be prepared to discuss the material except for the first class session.

Policy Related to Make-up Exams or Other Work

Attendance and Make-up Work – I expect you to attend and to be prepared to participate in all class sessions. Personal issues with respect to class attendance or fulfillment of course requirements will be handled on an individual basis.

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/.

Statement Related to Accommodations for Students with Disabilities

Students requiring accommodations must first register with the Dean of Students' Office. The Dean of Students' Office will provide documentation to the student who must then provide this documentation to the faculty member when requesting accommodation. The College is committed to providing reasonable accommodations to assist students in their coursework. We all learn differently: however, if you have experienced problems in university classes with writing, in-class exams, understanding or concentrating in class; please talk to me or access a learning or education testing resource at the University or in another professional setting. For your assistance, should you need them, please consider either of the following:
University Counseling Services
http://www.counsel.ufl.edu/base.asp?include=counselingServices.inc
P301 Peabody Hall – 392-1575
Student Mental Health Services in the Student Health Care Center
http://www.health.ufl.edu/shcc
Room 245, Infirmary Bldg.- 392-11

Counseling and Student Health

Students may occasionally have personal issues that arise in the course of pursuing higher education or that may interfere with their academic performance. If you find yourself facing problems affecting your coursework, you are encouraged to talk with an instructor and to seek confidential assistance at the UF Counseling & Wellness Center, 352-392-1575. Visit their web site for more information: http://www.counseling.ufl.edu/.

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, including primary care, women's health care, immunizations, mental health care, and pharmacy 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: www.health.ufl.edu/shcc

Crisis intervention is always available 24/7 from: Alachua County Crisis Center: (352) 264-6789.

BUT – *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*.