STA 580-001/002: Biostatistics I **Fall 2008**
Course Information and Syllabus Document **Dr. Charnigo**

Contact information

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About this course

Course Description: STA 580 introduces the basic principles of biostatistics used in the univariate analysis of data commonly encountered in biomedical studies.

Course-Specific Objectives:
1. You will learn the elements of hypothesis testing, including power, sample size, and tests of significance.
2. You will learn methods for analyzing data from one-way and two-way layouts, including multiple comparisons and contrasts.
3. You will learn the analysis of contingency tables, including related concepts of relative risks and odds ratios.
4. You will be introduced to the concepts of regression modeling and correlation.
5. You will be introduced to the analysis of time-dependent data subject to right censoring.

Textbook: Rosner, Bernard (2005). *Fundamentals of Biostatistics*, sixth edition. Belmont, CA: Thomson.

Prerequisite: MA 109 (or equivalent).

Course policies and logistics

Class Meetings: Lectures will take place on Thursdays from 3:30 to 5:20 p.m. in NURS 115 (except 27 November). Section 001 laboratories will take place on Thursdays from 6:00 to 7:50 p.m. in NURS 602J (except 28 August, 23 October, 27 November, 11 December). Section 002 laboratories will take place on Mondays from 3:30 to 5:20 p.m. in NURS 602J (except 01 September, 27 October, 01 December).

E-mail Memoranda and Course Materials: I will be sending e-mail memoranda regularly to distribute course materials, post grade information (for those who request it), and make announcements. Course materials will also be available from my home page, www.richardcharnigo.net. Please inform me if you are not receiving the memoranda.

Written Assignments: There will be six written assignments for you to prepare in laboratory and outside of class, tentatively due at 5:20 p.m. on the Thursdays of 18 September, 02 October, 16 October, 06 November, 20 November, and 11 December. *Submitting an assignment during the Thursday laboratory, instead of during the lecture, will result in a loss of 1/8 the credit otherwise earned*. You are encouraged to work in self-selected groups of two or three, in which case you may hand in one copy of the assignment for the group. *Different groups may compare their answers prior to submitting an assignment, but working in a group of 4 people will result in a loss of 1/4 the credit otherwise earned, working in a group of 5 people will result in a loss of 2/5 the credit otherwise earned, and so forth.* Many items on the written assignments will require the use of statistical software. Do not worry if you have little or no prior experience with statistical software, as you will become familiar with SAS during laboratory. Written assignments are ordinarily to be submitted in hard copy. However, electronic submission (in Microsoft Word 2003 or PDF) may be allowed under exceptional circumstances if you obtain my permission in advance. *Permission will not be given simply to facilitate cutting class.*

Examinations: There will be an in-class midterm examination from 3:30 p.m. to 5:30 p.m. on Thursday 23 October. There will be a final examination at the University's designated time from 3:30 to 5:30 p.m. on *Friday* 19 December, location TBA. The examinations are open-book in the sense that you may refer to any printed materials that you care to bring, including the textbook and your notes. However, you may not share printed materials or calculators during examinations, you may not use a computer or otherwise go "online" during examinations, and there is to be no collaboration on examinations.

Grading: Your grade for the course will be determined by the written assignments (30%), the midterm examination (35%), and the final examination (35%). There may also be opportunities to earn bonus points. The cutoff for an "A" will be no higher than 90%, the cutoff for a "B" will be no higher than 75%, and the cutoff for a "C" will be no higher than 60%.

Late Policy: Cases involving any of the following will be handled individually: University-excused absences, University-prescribed academic accommodations, recommendations from an appropriate Dean or the Ombud. Otherwise, a written assignment may be submitted up to 24 hours late, subject to a 1/8 credit penalty if received by 7:50 p.m. Thursday and subject to a 1/4 credit penalty if received by 5:20 p.m. Friday. A late submission should be given to Ms. Thaxton in person or left under her office door (Patterson Office Tower 857) with e-mail notification to acthax2@uky.edu no later than three hours following the late submission.

Makeup Policy: Cases involving any of the following will be handled individually: University-excused absences, University-prescribed academic accommodations, recommendations from an appropriate Dean or the Ombud, legitimate scheduling difficulties of which I am informed at least seven days in advance. Otherwise, a makeup examination for an unexcused absence will be available on the Monday following the scheduled examination, subject to a 1/4 credit penalty. A request for such a makeup examination must be made by e-mail to RJCharn2@aol.com before 6 p.m. on the Sunday following the scheduled examination.

Accommodations: If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center. If you have not already done so, please register with the Disability Resource Center (Room 2 Alumni Gym, 257-2754, jkarnes@uky.edu) for coordination of campus disability services available to students with disabilities.

Academic Honesty: The Department of Biostatistics, the College of Public Health, and the University of Kentucky place a premium on academic honesty. The Student Rights and Responsibilities document is available at www.uky.edu/StudentAffairs/Code/part2.html.

Unforeseen Contingencies: In the unlikely event that an unforeseen contingency requires additional course policies, you will be promptly notified in an e-mail memorandum.

Tentative syllabus

Lecture **Laboratory**	Lecture topics (Relevant sections of the textbook)
R 08/28 **NO LABORATORY**	Numerical and graphical summaries of data (2.1 – 2.8)
R 09/04 **R 09/04 or M 09/08**	Probability; conditional probability; Bayes' theorem (3.1 – 3.7)
R 09/11 **R 09/11 or M 09/15**	Random variables; sums of random variables and the Central Limit Theorem; population and sample (4.1 – 4.9, 5.1 – 5.7, 6.2)
R 09/18 **R 09/18 or M 09/22**	Point and interval estimation for a mean, a variance, and a proportion (6.5, 6.7 – 6.8)
R 09/25 **R 09/25 or M 09/29**	Introduction to hypothesis testing; test concerning a mean; power and sample size (7.1 – 7.6)
R 10/02 **R 10/02 or M 10/06**	Relating estimation to testing; test concerning a variance; test concerning a proportion (7.7, 7.9 – 7.10)
R 10/09 **R 10/09 or M 10/13**	Paired and unpaired tests concerning two means; test concerning two variances (8.1 – 8.7)
R 10/16 **R 10/16 or M 10/20**	Outliers; power and sample size; test concerning two proportions; chi-square test for association (8.9 – 8.10, 10.1 – 10.2, 10.6)
R 10/23 **NO LABORATORY**	*Midterm examination (covers Lectures 1 through 7)*

R 10/30 **R 10/30 or M 11/03**	Scales of measurement; sign test; signed rank test; rank sum test (9.1 – 9.4)
R 11/06 **R 11/06 or M 11/10**	One-way layouts and the analysis of variance; multiple comparisons and linear contrasts (12.1 – 12.4)
R 11/13 **R 11/13 or M 11/17**	Two-way layouts and the analysis of variance; Kruskal-Wallis test and Dunn procedure for one-way layouts; correlation (12.6 – 12.7, 11.7 – 11.8)
R 11/20 **R 11/20 or M 11/24**	Simple linear regression; least squares principle; inferences about coefficients; estimation and prediction (11.1 – 11.6)
NO LECTURE **NO LABORATORY**	
R 12/04 **R 12/04 or M 12/08**	Epidemiologic study design; relative risks and odds ratios (13.1 – 13.3)
R 12/11 **NO LABORATORY**	Survival function; censoring; Kaplan-Meier estimation; log-rank test (14.8 – 14.10)
F 12/19	*Final examination (emphasizes Lectures 8 through 14)*

Competency attainment

Your attainment after completing STA 580 will be at least the following and perhaps more, depending on the other courses in which you have enrolled. The numbers 0, 1, 2, and 3 indicate Unaware (No information or skill in this area), Aware (Basic mastery; able to identify the concept or skill but with limited ability to perform or apply it independently), Knowledgeable (Intermediate level of mastery; able to apply and describe the concept or skill), and Proficient (Advanced mastery; able to synthesize, critique, or teach the concept or skill).

Biostatistics

1. Describe the roles biostatistics serves in the discipline of public health. (2)
2. Distinguish among the different measurement scales and the implications for selection of statistical methods to be used based on these distinctions. (2)
3. Apply descriptive techniques commonly used to summarize public health data. (2)
4. Describe basic concepts of probability, random variation, and commonly used statistical probability distributions. (1)
5. Apply common statistical methods for inference. (2)
6. Describe preferred methodological alternatives to commonly used statistical methods when assumptions are not met. (2)
7. Apply descriptive and inferential methodologies according to the type of study design for answering a particular question. (2)
8. Interpret results of statistical analyses found in public health studies. (1)
9. Develop written and oral presentations based on statistical analyses for both public health professionals and educated lay audiences. (1)
10. Apply basic informatics techniques with vital statistics and public health records in the description of public health characteristics and in public health research and evaluation. (1)

Interdisciplinary - Communications and Informatics

1. Describe how the public health information infrastructure is used to collect, process, maintain, and disseminate data. (0)
2. Describe how societal, organizational, and individual factors influence and are influenced by public health communications. (0)
3. Discuss the influences of social, organizational, and individual factors on the use of information technology by end users. (0)
4. Apply theory and strategy-based communication principles across different settings and audiences. (0)
5. Apply legal and ethical principles to the use of information technology and resources in public health settings. (0)
6. Collaborate with communication and informatics specialists in the process of design, implementation, and evaluation of public health programs. (0)
7. Demonstrate effective written and oral skills for communicating with different audiences in the context of professional public health activities. (1)
8. Use information technology to access, evaluate, and interpret public health data. (1)
9. Use informatics methods and resources as strategic tools to promote public health. (0)
10. Use informatics and communications methods to advocate for community public health programs and policies. (0)

Interdisciplinary - Diversity and Culture

1. Describe the roles of history, power, privilege, and structural inequality in producing health disparities. (0)
2. Explain how professional ethics and practices relate to equity and accountability in diverse community settings. (0)
3. Explain why cultural competence alone cannot address health disparity. (0)

4. Discuss the importance and characteristics of a sustainable diverse public health workforce. (0)
5. Use the basic concepts and skills involved in culturally appropriate community engagement and empowerment with diverse communities. (0)
6. Apply the principles of community-based participatory research to improve health in diverse populations. (0)
7. Differentiate among availability, acceptability, and accessibility of health care across diverse populations. (0)
8. Differentiate between linguistic competence, cultural competency, and health literacy in public health practice. (0)
9. Cite examples of situations where consideration of culture-specific needs resulted in a more effective modification or adaptation of a health intervention. (0)
10. Develop public health programs and strategies responsive to the diverse cultural values and traditions of the communities being served. (0)

Interdisciplinary – Leadership

1. Describe the attributes of leadership in public health. (0)
2. Describe alternative strategies for collaboration and partnership among organizations, focused on public health goals. (0)
3. Articulate an achievable mission, set of core values, and vision. (0)
4. Engage in dialogue and learning from others to advance public health goals. (0)
5. Demonstrate team building, negotiation, and conflict management skills. (1)
6. Demonstrate transparency, integrity, and honesty in all actions. (1)
7. Use collaborative methods for achieving organizational and community health goals. (0)
8. Apply social justice and human rights principles when addressing community needs. (0)
9. Develop strategies to motivate others for collaborative problem solving, decision making, and evaluation. (1)

Interdisciplinary – Professionalism

1. Discuss sentinel events in the history and development of the public health profession and their relevance for practice in the field. (0)
2. Apply basic principles of ethical analysis (e.g., the Public Health Code of Ethics, human rights framework, other moral theories) to issues of public health practice and policy. (0)
3. Apply evidence-based principles and the scientific knowledge base to critical evaluation and decision making in public health. (0)
4. Apply the core functions of assessment, policy development, and assurance in the analysis of public health problems and their solutions. (0)
5. Promote high standards of personal and organizational integrity, compassion, honesty, and respect for all people. (1)
6. Analyze determinants of health and disease using an ecological framework. (0)
7. Analyze the potential impacts of legal and regulatory environments on the conduct of ethical public health research and practice. (0)
8. Distinguish between population and individual ethical considerations in relation to the benefit, costs, and burdens of public health programs. (0)
9. Embrace a definition of public health that captures the unique characteristics of the field (e.g., population-focused, community-oriented, prevention-motivated, and rooted in social justice) and how these contribute to professional practice. (0)
10. Appreciate the importance of working collaboratively with diverse communities and constituencies (e.g., researchers, practitioners, agencies, and organizations). (0)
11. Value commitment to lifelong learning and professional service including active participation in professional organizations. (0)

Interdisciplinary – Program Planning

1. Describe how social, behavioral, environmental, and biological factors contribute to specific individual and community health outcomes. (1)
2. Describe the tasks necessary to assure that program implementation occurs as intended. (0)
3. Explain how the findings of a program evaluation can be sued. (0)

4. Explain the contribution of logic models in program development, implementation, and evaluation. (0)
5. Differentiate among goals, measurable objectives, related activities, and expected outcomes for a public health program. (0)
6. Differentiate the purposes of formative, process, and outcome evaluation. (0)
7. Differentiate between qualitative and quantitative evaluation methods in relation to their strengths, limitations, and appropriate uses, and emphases on reliability and validity. (0)
8. Prepare a program budget with justification. (0)
9. In collaboration with others, prioritize individual, organization, and community concerns and resources for public health programs. (0)
10. Assess evaluation reports in relation to their quality, utility, and impact on public health. (0)

Interdisciplinary – Public Health Biology

1. Specify the role of the immune system in population health. (0)
2. Describe how behavior alters human biology. (0)
3. Identify the ethical, social, and legal issues implied by public health biology. (0)
4. Explain the biological and molecular basis of public health. (0)
5. Explain the role biology has in the ecological model of population-based health. (0)
6. Explain how genetics and genomics affect disease processes and public health policy and practice. (0)
7. Articulate how biological, chemical, and physical agents affect human health. (0)
8. Apply biological principles to the development and implementation of disease prevention, control, or management programs. (0)
9. Apply evidence-based biological and molecular concepts to inform public health laws, policies, and regulations. (0)
10. Integrate general biological and molecular concepts into public health. (0)

Interdisciplinary – Systems Thinking

1. Identify characteristics of a system. (0)
2. Identify unintended consequences produced by changes made to a public health system. (0)
3. Provide examples of feedback loops and “stocks and flows” within a public health system. (0)
4. Explain how systems (e.g., individuals, social networks, organizations, and communities) may be viewed as systems within systems in the analysis of public health problems. (0)
5. Explain how systems models can be tested and validated. (0)
6. Explain how the contexts of gender, race, poverty, history, migration, and culture are important in the design of interventions within public health systems. (0)
7. Illustrate how changes in public health systems (including input, processes, and output) can be measured. (0)
8. Analyze inter-relationships among systems that influence the quality of life of people in their communities. (1)
9. Analyze the effects of political, social, and economic policies on public health systems at the local, state, national, and international levels. (1)
10. Analyze the impact of global trends and interdependencies on public health related problems and systems. (1)
11. Assess strengths and weaknesses of applying the systems approach to public health problems. (0)