THE OHIO STATE UNIVERSITY
COLLEGE OF PUBLIC HEALTH

PUBHBIO 7225: Survey Sampling
Methods Autumn Semester, 2017
3 Credit Hours

Instructor:	Stanley Lemeshow, Ph.D.
	Division of Biostatistics
	College of Public Health
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TA:	Shuyuan Lou
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	Office: Cunz Hall 200-1
	Office Hours: Tuesday 2:45-3:45, Thursday 10-11 am

Lectures: In-Class
309 Campbell Hall
TR 3:55pm-5:15pm

Course Description: This course concentrates on the statistical aspects of conducting and analyzing sample surveys with brief discussion on questionnaire design and sampling frame construction. The course will cover materials on various sampling
designs from simple random sampling to complex surveys. Application to real data from public health and social research will be used to illustrate the material

Textbook: Levy PS, Lemeshow S (2008). *Sampling of Populations: Methods and Applications, Fourth Edition* A Wiley-Interscience Publication, John Wiley & Sons Inc., New York, NY, 576 pages.

Software: All students will be expected to use statistical software appropriate for analyzing sample survey data. Most students will choose STATA but some may choose other options (e.g., SAS or SUDAAN). All data analyses of sample survey data should use software capable of taking the survey design into consideration.
For the purpose of in-class illustration and to get the best computing support from the TA, we suggest that you use Stata for all homework. Stata is available free of charge on the PCs in the Cunz Hall computer lab.

Calculator: You should have access to a scientific calculator that can perform basic arithmetic, square roots, logarithms, and exponentiation.

Website: There is a Canvas site for this course.
              Announcements, lecture notes, homework assignments and datasets, and answer keys to homework and exams will be posted to Canvas.

Learning Objectives:
Upon successful completion of this course, students are expected to:

1. Explain the basic statistical concepts: review of descriptive statistics, sampling distributions, confidence intervals, hypothesis tests, basics of random sampling, examples of non-random sampling
2. Explain and implement simple random sampling: selecting a simple random sample, with replacement sampling versus without replacement sampling, estimating a mean or proportion, variance estimation, finite population correction factor, survey weights, sample size estimation
3. Explain and implement stratified random sampling: estimation of means, proportions and variances, sample allocation to strata, comparison with simple random sampling, post- stratification, design effect
4. Explain and implement one-stage and two-stage cluster sampling: examples of clusters, intracluster correlation, estimation of means, proportions and variances, cluster sample design
5. Explain and implement unequal probability sampling: examples, estimation of means, proportions and variances, with replacement sampling versus without replacement sampling
6. Describe and analyze complex surveys: examples of surveys combining stratified, cluster, and unequal probability sampling (most large public-use surveys have complex designs)
7. Discuss and critique survey nonresponse mechanisms: impact of nonresponse in survey sampling, missing data mechanism, imputation for missing data
8. Design survey questionnaires: brief overview of some principles for designing good survey questions including some issues specific to different survey modes (telephone, personal interview, mail, or web-based)

Core Competencies
This course will satisfy the following Biostatistics core competencies for MPH students:

- Apply appropriate descriptive and inferential statistical techniques to public health data and interpret results of statistical analyses in the context of public health research and evaluation. (1)
- Demonstrate effective written and oral skills for communicating with different audiences in the context of professional public health activities. (6)

This course will satisfy the following competencies for MPH students with a specialization in Biostatistics:

- Critique scientific research articles and assess the appropriateness of statistical applications involved. (1)
- Describe preferred methodological alternatives to commonly used statistical methods when assumptions are not met. (2)
- Develop written and oral presentations based on statistical analyses for both public health professionals and educated lay audiences. (3)
- Apply appropriate statistical techniques for analyzing public health-related data with specific characteristics. (4)
- Describe basic concepts of probability, random variation and commonly used statistical probability distributions. (6)
- Use standard statistical software for both data management and data analysis.

This course will satisfy the following Biostatistics core competencies for MS students:
- Read the scientific literature in the student's field and critique the methods and results. (8)

This course will satisfy the following Biostatistics core competencies for PhD students:

- Understands the theoretical foundations of statistical methods. (1)
- Critique general scientific research articles and assess the appropriateness of the statistical applications and methodology involved. (2)
- Work effectively and collaboratively in a team on a biological or health-related scientific question. (3)
- Communicate the results of statistical analyses to statistical and non-statistical audiences. (5)

References: Sampling: Design and Analysis by Sharon L. Lohr
                Sampling Techniques, 3rd Edition   by Cochran WG
                Survey Sampling   by Kish L
                Elementary Survey Sampling by Scheaffer RL, Mendenhall W, and Ott
                Statistical Survey Techniques   by Jessen RJ
                Sample Survey Methods and Theory
                                  by Hansen MH, Hurwitz WN, & Madow WG
                Statistics: A Guide to the Unknown, 2nd Edition edited by Tanur JM

Prerequisites:

PUBHBIO 702, or equivalent. You should be comfortable with expectation, variance, conditional probability and confidence intervals as a minimum. Students are strongly encouraged to speak with the instructor if they do not have the adequate background before registering for this course.

Attendance:
The class will move quickly and cover a substantial amount of material; thus, attendance at each class is expected.

The 8 homework assignments and midterm exam will be returned during the regular class time. It is the student's responsibility to show up for every class and pick up graded homework and exams.

Exams:
Midterm – Oct. 17th
Final presentations – Nov 30th, Dec 5th
Final Exam – December 13th, 4:00pm – 5:45pm
Exams are in class and open book, open notes. You also need to bring a calculator to facilitate the computations. Cell phones and computers are not permitted.

As a general rule, make-up exams and advance exams will not be given. Exceptions to this rule are evaluated on a case-by-case basis. Permission to taking the exam at a time other than scheduled is granted solely at instructor's discretion. Students must submit the request before the exam takes place with valid supporting document. No post-exam request will be considered except the student is hospitalized during the exam period.

Homework:
There are eight homework assignments in all, worth 15% of the course grade. Homework will include both writing and computing exercises. Late homework will not be accepted.

Clear and effective communication is crucial in statistical practice. This rule is applied to both homework and exams. In any problem-solving question that is required to show the work, it is the student's responsibility to make sure that he/she justifies his/her answer and provides enough detail for the grader to understand. Points will be taken for not-well- justified answer.

The students are required to turn in a hard copy of the homework assignments. Email is an option only for emergencies. Also, the students should assume the full responsibility for sending the homework via email and need to make sure the instructor receive them on time and can open the attachment successfully.

Final Project:

Students are required to complete a final project by the end of the class, which includes an in-class oral presentation. Students will be distributed into groups of approximately 4-5 students each. Each group will work on a project from a large sample survey, the data for which is available from the internet. An oral presentation will be made by each group at which time the survey's design will be carefully described and results of the statistical analyses that were performed will be presented.

Grading:

Midterm		35%
Final Exam		35%
Final Project		15%
Homework		15%

Any questions regarding the grading should be addressed within one week of the return of the homework or exams. No request of regrading on previous homework or exams will be accepted after the final exam except for the last homework and the final exam. As a general policy, when requested, the regrading will apply to the whole exam or the homework, not just to the specific part which the student thinks there might be a mistake. As a consequence, regrading may lead to a lower overall score. All questions regarding grading should be directed to the professor and not the TA.

Grading scale:

A	94-100	B+	87-89	C+	77-79	D	60-69
A-	90-93	B	84-86	C	74-76	E	<60
		B-	80-83	C-	70-73		

The instructor reserves the right to adjust the grading scale if it appears necessary due to overall class performance. These adjustments will only raise a student's grade, not lower it.

TA responsibilities:
The TA assigned to the course will hold regular office hours and may lead review sessions for any students who need help with class material. The TA may assist with scoring homework and exams; however, final grades will be assigned by the professor. All questions regarding grading should be directed to the professor and not the TA.

Office of Student Life: Disability Services
Any student who feels s/he may need an accommodation based on the impact of a disability should contact me privately to discuss your specific needs. Please contact the Office of Student Life: Disability Services at 614-292-3307 in room 098 Baker Hall to coordinate reasonable accommodations for students with documented disabilities (http://www.ods.ohio-state.edu/).

Mental Health Services
As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292-5766. CCS is located on

the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273-TALK or at suicidepreventionlifeline.org.

Academic integrity:
Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University, the College of Public Health, and the Committee on Academic Misconduct (COAM) expect that all students have read and understood the University's *Code of Student Conduct* and the College's *Student Handbook*, and that all students will complete all academic and scholarly assignments with fairness and honesty. The *Code of Student Conduct* and other information on academic integrity and academic misconduct can be found at the COAM web pages (http://oaa.osu.edu/coam/home.html). Students must recognize that failure to follow the rules and guidelines established in the University's *Code of Student Conduct*, the *Student Handbook*, and in the syllabi for their courses may constitute "Academic Misconduct."
The Ohio State University's *Code of Student Conduct* (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the University, or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Please note that the use of material from the Internet without appropriate acknowledgement and complete citation is plagiarism just as it would be if the source were printed material. Further examples are found in the *Student Handbook*. Ignorance of the *Code of Student Conduct* and the *Student Handbook* is never considered an "excuse" for academic misconduct.

If I suspect a student of academic misconduct in a course, I am obligated by University Rules to report these suspicions to the University's Committee on Academic Misconduct. If COAM determines that the student has violated the University's *Code of Student Conduct* (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in the course and suspension or dismissal from the University. If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.

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PUBHBIO 7225: Survey Sampling Methods
3 credit hours -- Fall Semester, 2017
Course Outline

Week	Topic		
1	Introduction		
2	Review of Fundamental Concepts		
3	Concepts of Estimation		
4	Basic Concepts of Sampling Theory		
5	Simple Random Sampling		
6	Systematic Sampling		
7	Stratified Sampling		
8	Ratio Estimation		
9	**MIDTERM EXAM** Cluster Sampling		
10	Cluster Sampling		
11	Cluster Sampling		
12	Variance Estimation in Complex Surveys		
13	The EPI Survey Method Lot Quality Assurance Sampling (LQAS)		
14	**TEAM PROJECTS**		
Finals	**FINAL EXAM**		

Note: Homework due dates will be decided in class after required material is covered. Homework due dates will be posted on Canvas.