

# AUGSBURG COLLEGE

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## GST200: Statistical Literacy

2016 Summer 1 Online

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Memorial 314

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**COURSE DESCRIPTION:** This course focuses on critical thinking about statistics and its use as evidence in arguments, with an emphasis on interpretation, evaluation, communication, and analysis of statistically-based arguments. Topics include association, causation, observational studies, experiments, risk, confounding, bias and chance. Common techniques involving statistical opportunism, conditional reasoning using English to describe and compare rates and percentages presented in tables and graphs, and the use of standardization to take into account the influence of confounders. Emphasis is on interpretation, evaluation, communication, and analysis of statistically-based arguments.

**COURSE BENEFIT:** A Pass or grade of 2.0 or better satisfies both the Quantitative Foundation (QF) and the Quantitative Application (QA) skill requirements.

### AUDIENCE:

This course is designed for students in non-quantitative majors. It stresses quantitative reasoning about averages and percentages using ordinary English. It doesn't involve any statistical software.

### TEXTBOOK:

"Statistical Literacy 2011" textbook at bookstore (\$50). Buy by 1<sup>st</sup> class and enroll in Odyssey (\$5).

### TEACHER'S EXPECTATIONS OF STUDENTS

- To check Augsburg e-mail MWF for any updates. To do all assignments by the due date/time.

### COURSE LEARNING OUTCOMES AND OBJECTIVES (MAJOR)

- Recognize that statistics are numbers in context where the context matters (they are socially-constructed by people with motives and goals).
- Read, interpret and evaluate summary statistics in tables, graphs, statements, surveys & studies.
- Think hypothetically about ways statistics could be defined, counted, measured and presented.
- Think hypothetically about confounders and their impact on statistics and statistical significance.
- Evaluate ability of comparisons, ratios, models and study designs to resist confounder influence.
- Evaluate the potential influence of chance and bias (subject, measurement or sampling).

### COURSE COMPONENTS (OVERVIEW)

- Mathematics: Mainly percentages, weighted averages, proportional reasoning. Minimal Algebra.
- Moodle: This online course management system contains your assignments, resources, chapter exercises (multiple choice and one-line essay) and the grade book. Moodle also contains a student-generated question forum and a weekly student-generated sharing forum.
- Odyssey Written Analysis: Analyzing news articles, tables and graphs. The final challenge is the class project: the analysis of some secondary data. This is the non-math part of the course.
- Schedule: After the first day, all assignments are due by 11 PM the next Sunday. No late submissions on Moodle assignments or on Moodle forum. Odyssey responses are penalized by 10% per day late. Everything is on-line, open book and untimed.

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## COURSE SCHEDULE (ALL ASSIGNMENTS DUE BY 11 PM SUNDAY)

Assign	Due	Textbook Read/Hear	Moodle Surveys	Odyssey Cases	Moodle Exercises	Moodle Writing
5/02	5/09	Register in Odyssey	S0, S8	OD 1		
5/09	5/15	Ch1	Intro	OD 2	C1 (10)	
5/16	5/22	Ch2		OD 3&4	C2 (12)	C2W*
5/23	5/29	Ch3 (113-158)		OD 5&6	C3 (12)	C3H*
5/30	6/05	Ch4 (176-211)		OD 7&8	C4 (21)	C4N1*
6/06	6/12	Ch5 238-248;257-265		OD 9&10	C5 ( 9)	C5W1*,C5W3*
6/13	6/19	Ch6 (285-328)		OD 11&12	C6 (16)	
6/20	6/26	Final Exam	S1-3, 5, 6	OD 13	=====	=====
	7/05	Final Grades Due	7 surveys	13 cases	87 quizzes	5 writing

## COURSE COMPONENTS (DETAILS)

- Moodle multiple-choice exercises (87): Each involves a single topic involving 1-2 pages in the text. Usually 10 questions/exercise, 2 tries each; the second try typically "builds" on the first.
- Moodle writing (5): Writing 5 to 10 one-line descriptions or comparisons per assignment
- Odyssey Cases (13): Students submit written analysis of graphs, news stories and business studies using Odyssey: a new online multiplayer game involving challenges. Students gain "Power." They review the work of others and are reviewed by others. Odyssey grading is relative to the class median. Median is 3.0 (80%). Moodle score = (Student Power / Class Median)\*80%.
- Moodle surveys: Survey your understanding of basic ideas (S0), your understanding of the Syllabus (S8), and your evaluation of the course materials (S1, S2, S3, S5, S6),
- Final Exam: Open-book, open-notes. Ch 2 (comparisons); Ch 4 (Percent, Percentage grammar; Reading tables and graphs, describing percentages using ordinary English).

## GRADING POLICY

90% - 100% = 4.0  
 85% - 89.9% = 3.5  
 80% - 84.9% = 3.0  
 75% - 79.9% = 2.5  
 65% - 74.9% = 2.0  
 55% - 64.9% = 1.5  
 45% - 54.9% = 1.0  
 35% - 44.9% = 0.5  
 Below 35% = 0.0

Moodle exercises: 42%  
 Final Exam: 15%

Odyssey challenges: 45%  
 Surveys: 3%

The Augsburg undergraduate grading model uses a 4.0 scale:  
 4.0 = Achieves highest standards of excellence  
 3.0 = Achieves above basic course standards  
 2.0 = Meets basic standards for the course  
 1.0 = Performance below basic course standards  
 0.0 = Unacceptable performance (no credit for the course)

## COURSE RHYTHM

Doing well in a weekly online course takes self-discipline. Estimated time: 6-8 hours per week.

DAY	TIME	ACTIVITY	[Time is in minutes. Estimated total is 480 minutes: 8 hours]
1. Mon	15	Review Gradebook for results of previous week's work posted in Moodle.	
2. Mon.	120	View chapter slides; listen to the associated audio. Read text.	
3. Tues	50	Odyssey: Craft/post your response. Post required reviews of other responses.	
4. Tu-Sa	240	Moodle: Make first try; review text on items missed. Complete second try. E.g., 12 exercises, 20 minutes/exercise: 10 min 1 <sup>st</sup> try, 5 min review, 5 min 2 <sup>nd</sup> try	
5. Sat	15	Moodle forum: Comment on week: like/interesting/hard.	
6. Sun	40	Odyssey: Post extra reviews of others. Moodle forum: Post reviews of others.	

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## FIRST DAY ASSIGNMENTS

This online course is very fast paced. Getting a quick start is critical. The following assignments **are due the first day of class by 11 PM May 9**: In Moodle, complete surveyS0, exercise S8 and submit your introduction in the Introductions forum. In Odyssey, register, respond to challenge 1, and review the responses of your fellow students. Note: All of these can be submitted before the first day of class.

## QUESTIONS POLICY

- Questions of a personal nature that you do not want to be shared with your classmates should be directed via the Augsburg e-mail to me: Schield@Augsburg.edu
- All other questions (questions that may be of interest to other students) should always be asked using the Questions forum within Moodle. This way every student has the same information.

## WORKING TOGETHER

Students can work together in understanding the text and in understanding unfamiliar terms or ideas in the homework and the Odyssey cases. Students are expected to work individually in forming and submitting their answers to the homework, the Odyssey cases, the surveys and the final exams.

## ACADEMIC HONESTY POLICY

A College is a community of learners whose relationship relies on trust. Honesty is necessary for functioning of the Augsburg College community and dishonesty is, therefore, abhorred and prohibited. Augsburg College has adopted an honesty policy. Please be sure to consult your **student guide** to ensure you understand it. You are expected to abide by this code in my class. Any student guilty of plagiarism or any form of cheating will receive a zero for that assignment. More grievous transgressions will result in additional penalties. An example of academic dishonesty is plagiarism. If you are confused about what constitutes plagiarism, or are having any other problem, please feel free to see me.

## CLASS DISABILITY SERVICES

Augsburg College is committed to providing an environment where all students have the opportunity to equally participate in the academic experience, including students with disabilities. Students with disabilities have rights as determined by federal and state laws which require institutions to provide reasonable accommodations for the student's disability in order to afford an equal opportunity to participate in the college's programs, courses, and activities.

Students with disabilities who believe that they may need accommodations, please contact the Center for Learning and Adaptive Student Services (CLASS) Office (x1053). Please contact the CLASS office as soon as possible to better ensure that such accommodations are implemented in a timely manner. If you have a letter from these offices indicating you have a disability which requires academic accommodations, please present the letter to me so I will be able to provide the accommodations that you will need in this class. You can request test proctoring through our class Moodle site.

## NON-DISCRIMINATION POLICY

Augsburg recognizes that our individual differences can deepen our understanding of one another and the world around us, rather than divide us. In this class, people of all races, ethnicities, gender expressions and gender identities, religions, ages, sexual orientations, disabilities, socioeconomic backgrounds, regions, and nationalities are strongly encouraged to share their rich array of perspectives and experiences. If you feel your differences may in some way isolate you from Augsburg's community or if you have a need of any specific accommodations, please speak with the instructor early in the semester about your concerns and what we can do together to help you become an active and engaged member of our class and community.

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## Learning Outcomes for Chapter 1: Critical Thinking and Statistical Literacy

1. Critical thinking outcomes: Distinguish four types of arguments.  
Distinguish association from causation.
2. Statistical literacy outcomes:  
Recognize the difference between numbers and statistics (numbers in context).  
Recognize all statistics are socially constructed by people with motives and goals.  
Understand that all influences on statistics can be grouped into 4 categories.  
See how Confounding, Assembly, Randomness and Error can influence statistics.

## Learning Outcomes for Chapter 2: Take CARE

1. **Study statistical comparisons as methods for controlling for confounder influence. Evaluate the difference between ordinal and arithmetic comparisons. Distinguish and evaluate four compares: difference, ratio, % difference and times difference. Write all four kinds of arithmetic comparisons using ordinary English. Understand when percentage points and percentiles are appropriate.**  
Distinguish and evaluate the ambiguity in common words such as "average" and "typical."
2. Recognize the difference between "control of" and "control for".  
Recognize how study design controls various kinds of confounders.  
Recognize and evaluate the differences between experiments and observational studies.  
Recognize and evaluate the difference between scientific experiments and statistical trials.  
Recognize and evaluate the difference between longitudinal and cross-sectional studies.  
Recognize that a controlled study simply means "a study involving a control group"
3. Recognize the sensitivity of statistics to assembly
4. Recognize & evaluate randomness: expected value, margin of error and statistical significance
5. Recognize and evaluate bias-control methods: placebo, single and double blind studies.

## Learning Outcomes for Chapter 3: Measurements

1. Understand the features, benefits and shortcomings of ranks, percentiles and measures.
2. Recognize how the mean, median and mode are arranged in skewed distributions.  
Write comparisons of means, medians or modes using ordinary English.  
Recognize how different kinds of comparison give different comparisons for the same data.  
Recognize that a difference between two percentages is measured in "percentage points."  
Recognize that difference between two percentiles is measured in "percentile points".
3. Understand how shifting from totals to ratios changes the size & direction of a comparison.
4. Control for the influence of a binary confounder on a comparison of two means.  
Calculate results using a graphical technique, algebra or proportional reasoning.  
Evaluate the impact of controlling for a confounder on an association.
5. Learn measures of spread such as range and standard deviation.  
Calculate, compare and evaluate Z-scores and coefficient of variation.  
Describe, compare and evaluate slopes or trends in an XY plot or relationship

## Learning Outcomes for Chapter 4: Describing Ratios

1. **Describe percentages in tables and graphs into percent, percentage and chance grammar.**
2. **Translate ordinary English part-whole statements into part-whole pie charts**
3. **Describe ratio statistics in tables, graphs or in tables with missing margins.**
4. Describe ratios expressed using rate or chance grammar.  
Distinguish prevalence from incidence.

**NOTE: The final exam covers just the material from Chapters 2 and 4 that is in bold.**

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## Learning Outcomes for Chapter 5: Comparing Ratios

1. Construct and evaluate percentage and counts "attributable to" a predictor.
2. Compare two ratios (with special focus on part-whole ratios) using ordinary English  
Distinguish between common-part comparisons and distinct-par comparisons  
Write ordinal and arithmetic comparisons involving all three kinds of grammar.  
Form comparisons of ratios using "Likely" grammar.
3. Compare ratios using Relative Risk and Odds-Ratio

## Learning Outcomes for Chapter 6: Interpreting Percentages and Rates

1. Understood various misunderstandings of ratios Identify and evaluate inverse ratios (the confusion of the inverse) Compare the relative sizes of ratios having the same part with different wholes  
Compare the relative sizes of ratios having the same whole with different parts.  
Compare the size of two three-term ratios where one term shifts from part to whole.
2. Understand and evaluate the difference between prediction and explanation.  
Understand and evaluate the difference between prediction and confirmation.
3. Calculate the predictive power of medical tests given the confirmation accuracy or error.  
Recognize and understand the base-rate fallacy.  
Recognize the "accuracy" and "error" are ambiguous.
4. Understand Simpson's paradox.  
Standardize rates and percentages by controlling for a binary confounder
5. Understand the necessary conditions for nullification or reversal of an association.  
Predict and evaluate the general effect of controlling for a confounder knowing the size & directions.

## Learning Objectives for Chapter 7: Randomness / Chance

1. Understand chance: independence, coincidence, the law of average, Use chance to conduct sensitive surveys and estimate population size Use chance to understand regression to the mean and evolution.
2. Use Margin of error to construct confidence intervals  
Distinguish confidence intervals from prediction intervals and probability intervals.  
Calculate the margin of error for subgroups.  
Determine if difference between sample means is statistically-significant using non-overlap.  
Evaluate various decisions based solely on statistical significance (or lack thereof).
3. Understand criminal trials and hypothesis testing.  
Understand the status of the null hypothesis.  
Understand failure to reject, Type 2 error and statistical power
4. Understand how statistical significance can be influenced by a confounder
5. Evaluate various decisions based solely on what might happen to statistical significance.