Study Design and Quantitative Methods for Food Science Syllabus

FDSCTE 6400 Spring 2021

Course Information

- **Course times and location:** Monday, Tuesday, Thursday 3:00 – 3:55 pm
- **Credit hours:** 3
- **Mode of delivery:** Hybrid

Instructor

- **Name:** Barbara Kowalcyk
- **Email:** kowalcyk.1@osu.edu
- **Phone Number:** 614-292-6487
- **Office location:** 213 Parker Food Science Building
- **Office hours:** By appointment
- **Preferred means of communication:**
  - My preferred method of communication for questions is **email.**
  - My class-wide communications will be sent through the Announcements tool in CarmenCanvas. Please check your notification preferences (go.osu.edu/canvas-notifications) to be sure you receive these messages.

Teaching Assistant

- **Name:** Aaron Beczkiewicz
- **Email:** beczkiewicz.1@osu.edu

Course Prerequisites

Students should have a basic understanding of statistics and taken an undergraduate course in statistics. Courses such as STAT1450, STAT1550, STAT2450 constitute appropriate prerequisites. Students can also sign up by permission of instructor.

Course Description

This graduate-level course is designed to introduce students to research study design and data analytic methods commonly used in food science. Since study planning is critical to the success of any research project, this course will focus primarily on appropriate study design. Successful students will be able to develop a statistical hypothesis, construct an appropriate study design, identify an appropriate analysis for data collected in the study, recognize the strengths and weaknesses of the study design and proposed analyses, develop data collection forms, and understand the importance of data quality and management. Students will gain familiarity with data analysis and interpretation through data laboratory sessions and homework assignments.

Learning Outcomes

Goals: Through this course, students will learn to:

- Value the role of epidemiology and data analytics in food production
- Understand different study designs, including their benefits and limitations
- Critically plan and evaluate the design of studies related to food
- Understand best practices in data collection and quality management
- Select and apply appropriate analytic methods for research question and study design

Learning Outcomes: Successful students will have the ability to:

1. Define epidemiology and statistics and describe how these can be used to advance One Health
2. Integrate the application of epidemiology and data analytics into their work
3. List the different types of study designs and identify biases and potential confounders in a study design
4. Develop a study design that appropriately addresses the hypothesis
5. Assess the appropriateness of a study design in addressing a hypothesis
6. List assumptions and limitations associated with a study design and the data analysis
7. List best practices in data collection and quality management
8. Develop a data collection tool that meets analysis needs
9. Anticipate and identify potential data quality problems
10. Describe common data analytic methods used in food science, including their assumptions and limitations
11. Select appropriate data analysis for different study designs
12. Develop a data analysis plan
13. Interpret results from data analyses appropriately

How This Course Works

Mode of delivery: This course is hybrid. There are required synchronous (real time) sessions in Zoom each week. R coding sessions will be held in-person.

Credit hours and work expectations: This is a 3 credit-hour course. According to Ohio State bylaws on instruction (go.osu.edu/credithours), students should expect around 3 hours per week of time spent on direct instruction (instructor content and Carmen activities, for example) in addition to 6 hours of homework (reading and assignment preparation, for example) to receive a grade of C average.

Attendance and participation requirements: Research shows regular participation is one of the highest predictors of success. With that in mind, students are required to attend all classes. If you are unable to attend class for a reasonable excuse (e.g. illness), please contact me prior to the class or exam start time. I will post recordings of synchronous sessions for those who cannot attend, although this should be the exception.

Course Materials, Fees and Technologies

Recommended/Optional Materials and/or Technologies

There are two textbooks recommended for this course. Both are available in electronic format through the library for free or physical copies can be purchased at the book store or online.

- John Bower. 2013. Statistical Methods for Food Science: Introductory Procedures for the Food Practitioner. John Wiley & Sons, Ltd. ISBN 978-1-118-54164-7.

- Frank Rossi, Victor Mirtchev. 2016. Statistics for Food Scientists: Making Sense of the Numbers. Elsevier. ISBN: 978-0-12-417179-4.

Required Equipment

- **Computer:** current Mac (MacOS) or PC (Windows 10) with high-speed internet connection.

- **Webcam:** built-in or external webcam, fully installed and tested

- **Microphone:** built-in laptop or tablet mic or external microphone

- **Other:** a mobile device (smartphone or tablet) to use for BuckeyePass authentication

If you do not have access to the technology you need to succeed in this class, review options for technology and internet access (go.osu.edu/student-tech-access).

Required Software

Microsoft Office 365: All Ohio State students are now eligible for free Microsoft Office 365. Visit the installing Office 365 (go.osu.edu/office365help) help article for full instructions.

R statistical package: All students should download the R Statistical Package onto their laptop. Instructions will be provided in class.

CarmenCanvas Access

You will need to use BuckeyePass (buckeyepass.osu.edu) multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you do each of the following:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass - Adding a Device (go.osu.edu/add-device) help article for step-by-step instructions.

- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click **Enter a Passcode** and then click the **Text me new codes** button that appears. This will text you ten passcodes, good for 365 days, that can each be used once.

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Department of Food Science and Technology

- [Install the Duo Mobile application](go.osu.edu/install-duo) (go.osu.edu/install-duo) on all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service.

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at [614-688-4357 (HELP)](tel:614-688-4357) and IT support staff will work out a solution with you.

Technology Skills Needed for This Course

- Basic computer and web-browsing skills
- [Navigating CarmenCanvas](go.osu.edu/canvasstudent) (go.osu.edu/canvasstudent)
- [CarmenZoom virtual meetings](go.osu.edu/zoom-meetings) (go.osu.edu/zoom-meetings)
- [Recording a slide presentation with audio narration and recording, editing and uploading video](go.osu.edu/video-assignment-guide) (go.osu.edu/video-assignment-guide)

Technology Support

For help with your password, university email, CarmenCanvas, or any other technology issues, questions or requests, contact the IT Service Desk, which offers 24-hour support, seven days a week.

- **Self Service and Chat**: [go.osu.edu/it](go.osu.edu/it)
- **Phone:** [614-688-4357 (HELP)](tel:614-688-4357)
- **Email:** servicedesk@osu.edu

Grading and Faculty Response

How Your Grade is Calculated

Assignment Category	Points
Class attendance/participation	5%
Homework Assignments	25%
Exam #1	20%
Exam #2	20%
Study Protocol	30%

See Course Schedule for due dates.

Descriptions of Major Course Assignments

Class Attendance and Participation

Description: Weekly class meetings will consist of theoretical and coding lectures. Coding sessions will be used to reinforce material presented in theoretical lectures and provide students with hands on experience with statistical software. Since this is an important part of the learning process, attendance is mandatory. For coding sessions, students will need to bring their own laptop and be prepared to conduct data analyses. Class participation is also critical so attendance without participation will affect your grade. If you are unable to attend class on a specific date for a reasonable excuse (e.g. illness), please contact me prior to the class start time.

Homework Assignments

Description: Homework will be assigned to reinforce concepts discussed in class and explored in the coding sessions. Homework will be due at the beginning of class on the day it is due. No late homework will be accepted. However, the two lowest homework grades will be dropped in calculating the final course grade. Student presentations will count as a homework assignment but are not eligible to be dropped.

Exams

Description: There will be two take-home exams worth 20% each of the total grade. Partial credit will be given so it is important to show all work (e.g. code, computations, etc). <u>Problem answers without supporting work will receive no credit</u>. **No late exams will be accepted.**

Study Protocol

Description: Each student will prepare a study protocol for a research project in their area of expertise. Requirements for the study protocol will be provided in class but generally will require the following elements: study aims, background and relevance, proposed study design, sampling and data collection plan, data analysis plan and an identification of study limitations. Depending on the study design, supplemental material may also be required (e.g. informed consent for human research). The study protocol will be worth 30% of the overall grade and is due the last day of class. Each day the assignment is late will result in a 5% reduction in the grade of the protocol.

Academic integrity and collaboration: Your written assignments should be your own original work. For the study protocol, you should follow the stated style to cite the ideas and words of your research sources. You are encouraged to ask a trusted person to proofread your assignments before you turn them in but no one else should revise or rewrite your work.

Late Assignments

Please refer to Carmen for due dates. Due dates are set to help you stay on pace and to allow timely feedback that will help you complete subsequent assignments. Late homework assignments will not be accepted. However, the lowest two homework grades will be dropped. Homework assignments #1 and #11 are not eligible to be dropped. Each day the study protocol is late will result in a 5% reduction in the grade of the assignment. **No late exams will be accepted.**

Instructor Feedback and Response Time

I am providing the following list to give you an idea of my intended availability throughout the course. Remember that you can call <u>614-688-4357 (HELP)</u> at any time if you have a technical problem.

- **Preferred contact method:** If you have a question, please contact me first through my Ohio State email address. I will reply to emails within **24 hours on days when class is in session at the university**.

- **Class announcements:** I will send all important class-wide messages through the Announcements tool in CarmenCanvas. Please check <u>your notification preferences</u> (go.osu.edu/canvas-notifications) to ensure you receive these messages.

- **Grading and feedback:** For assignments submitted before the due date, I will try to provide feedback and grades within **seven days**. Assignments submitted after the due date may have reduced feedback and grades may take longer to be posted.

Grading Scale

93–100: A
90–92.9: A-
87–89.9: B+
83–86.9: B
80–82.9: B-
77–79.9: C+
73–76.9: C
70–72.9: C-
67–69.9: D+
60–66.9: D
Below 60: E

Other Course Policies

Discussion and Communication Guidelines

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Writing style**: You should remember to write using good grammar, spelling, and punctuation. A more conversational tone is fine for non-academic topics.

- **Tone and civility**: Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always come across online.

- **Citing your sources**: When we have academic discussions, please cite your sources to back up what you say. For the textbook or other course materials, list at least the title and page numbers. For online sources, include a link.

- **Backing up your work**: Be sure to save your work regularly, particularly programs used to analyze data.

- **Synchronous sessions**: During our Zoom sessions, I ask you to use your real name and a clear photo of your face in your Carmen profile. During our full-group lecture time, you may turn your camera off if you choose. You are always welcome to use the free, Ohio State themed virtual backgrounds (www.osu.edu/downloads/zoom-backgrounds.html). Remember that Zoom and the Zoom chat are our classroom space where respectful interactions are expected.

Academic Integrity Policy

See Descriptions of Major Course Assignments for specific guidelines about collaboration and academic integrity in the context of this online class.

Ohio State's Academic Integrity Policy

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 and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the university's Code of Student Conduct (studentconduct.osu.edu), and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the university's *Code of Student Conduct* and this syllabus 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. Ignorance of the university's *Code of Student Conduct* is never considered an excuse for academic misconduct, so I recommend that you review the *Code of Student Conduct* and, specifically, the sections dealing with academic misconduct.

If I suspect that a student has committed academic misconduct in this course, I am obligated by university rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the university's Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this 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.

Other sources of information on academic misconduct (integrity) to which you can refer include:

- [Committee on Academic Misconduct](go.osu.edu/coam) (go.osu.edu/coam)
- [Ten Suggestions for Preserving Academic Integrity](go.osu.edu/ten-suggestions) (go.osu.edu/ten-suggestions)
- [Eight Cardinal Rules of Academic Integrity](go.osu.edu/cardinal-rules) (go.osu.edu/cardinal-rules)

Copyright for Instructional Materials

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Creating an Environment Free from Harassment, Discrimination, and Sexual Misconduct

The Ohio State University is committed to building and maintaining a community to reflect diversity and to improve opportunities for all. All Buckeyes have the right to be free from harassment, discrimination, and sexual misconduct. Ohio State does not discriminate on the basis of age, ancestry, color, disability, ethnicity, gender, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, pregnancy (childbirth, false pregnancy, termination of pregnancy, or recovery therefrom), race, religion, sex, sexual orientation, or protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. Members of the university community also have the right to be free from all forms of sexual misconduct: sexual harassment, sexual assault, relationship violence, stalking, and sexual exploitation.

To report harassment, discrimination, sexual misconduct, or retaliation and/or seek confidential and non-confidential resources and supportive measures, contact the Office of Institutional Equity:

1. Online reporting form at equity.osu.edu,
2. Call 614-247-5838 or TTY 614-688-8605,
3. Or Email equity@osu.edu

The university is committed to stopping sexual misconduct, preventing its recurrence, eliminating any hostile environment, and remedying its discriminatory effects. All university employees have reporting responsibilities to the Office of Institutional Equity to ensure the university can take appropriate action:

- All university employees, except those exempted by legal privilege of confidentiality or expressly identified as a confidential reporter, have an obligation to report incidents of sexual assault immediately.
- The following employees have an obligation to report all other forms of sexual misconduct as soon as practicable but at most within five workdays of becoming aware of such information: 1. Any human resource professional (HRP); 2. Anyone who supervises faculty, staff, students, or volunteers; 3. Chair/director; and 4. Faculty member."

This course adheres to The Principles of Community adopted by the College of Food, Agricultural, and Environmental Sciences. These principles are located on the Carmen site for this course; and can also be found at https://go.osu.edu/principlesofcommunity. For additional information on Diversity, Equity, and Inclusion in CFAES, contact the CFAES Office for Diversity, Equity, and Inclusion (https://equityandinclusion.cfaes.ohio-state.edu/). If you have been a victim of or a witness to a bias incident, you can report it online and anonymously (if you choose) at https://studentlife.osu.edu/bias/report-a-bias-incident.aspx.

Your Mental Health

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. No matter where you are engaged in distance learning, The Ohio State University's Student Life Counseling and Consultation Service (CCS) is here to support you. If you find yourself feeling isolated, anxious or overwhelmed, on-demand mental health resources (go.osu.edu/ccsondemand) are available. You can reach an on-call counselor when CCS is closed at 614- 292-5766. **24-hour emergency help** is available through the National Suicide Prevention Lifeline website (suicidepreventionlifeline.org) or by calling 1-800-273-8255(TALK). The Ohio State Wellness app (go.osu.edu/wellnessapp) is also a great resource.

Accessibility Accommodations for Students with Disabilities

Requesting Accommodations

The university strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability including mental health, chronic or temporary medical conditions, please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services (SLDS). After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. In light of the current pandemic, students seeking to request COVID-related accommodations may do so through the university's request process, managed by Student Life Disability Services.

Disability Services Contact Information

- Phone: 614-292-3307

- Website: slds.osu.edu

- Email: slds@osu.edu

- In person: Baker Hall 098, 113 W. 12th Avenue

Accessibility of Course Technology

This online course requires use of CarmenCanvas (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations as early as possible.

- CarmenCanvas accessibility (go.osu.edu/canvas-accessibility)

- Streaming audio and video

- CarmenZoom accessibility (go.osu.edu/zoom-accessibility)

Course Schedule

Refer to the CarmenCanvas course for up-to-date due dates.

Day	Date	Topic	Assignment Due
M	11-Jan	Course Overview	
T	12-Jan	Role of Data Analytics in Food Science	
TH	14-Jan	Statistical Concepts	
M	18-Jan	**NO CLASS**	
T	19-Jan	Sampling	HW #1: Article Critique
TH	21-Jan	Intro to Coding – Part 1	
M	25-Jan	Biases and Confounders	
T	26-Jan	Study Design	
TH	28-Jan	Intro to Coding – Part 2 (In-person)	
M	1-Feb	Experimental Design – Part 1	
T	2-Feb	Experimental Design – Part 2	HW #2: Study Design Map
TH	4-Feb	Intro to Coding – Part 3 (In-person)	
M	8-Feb	Ethics in Statistical Practice	
T	9-Feb	Research Protections and IRBs	HW #3: Citi Training
TH	11-Feb	Intro to Coding – Part 4 (In-person)	
M	15-Feb	Descriptive Statistics and Confidence Intervals	
T	16-Feb	Hypothesis Testing	
TH	18-Feb	Hypothesis Testing	
M	22-Feb	Intro to Coding – Part 5 (In-person)	
T	23-Feb	**NO CLASS**	HW #4: Descriptive Statistics
TH	25-Feb	Intro to Coding – Part 6 (In-person)	
M	1-Mar	Data management	
T	2-Mar	Data visualization	HW #5: Hypothesis Testing
TH	4-Mar	R Coding – Data Management/Visualization (In-person)	
M	8-Mar	Measures of Association	
T	9-Mar	Categorical Data Analysis	HW #6: Data management and visualization
TH	11-Mar	R Coding – Categorical Data Analysis (In-person)	
M	15-Mar	Introduction to General Linear Models	
T	16-Mar	Testing Assumptions	**EXAM #1 DUE**
TH	18-Mar	R Coding – Linear Models (In-person)	
M	22-Mar	ANOVA	
T	23-Mar	ANCOVA	HW #7: Categorical Data Analysis
TH	25-Mar	R Coding – Linear Models (In-person)	
M	29-Mar	Logistic Regression	
T	30-Mar	Poisson Regression	HW #8: General Linear Models

TH	1-Apr	**NO CLASS**	
M	5-Apr	Introduction to Multivariate Methods	
T	6-Apr	Introduction to Multivariate Methods	
TH	8-Apr	R Coding – Other Regression and Multivariate Methods (In-person)	
M	12-Apr	Calculating Sample Sizes	HW #9: Other Regression and Multivariate Methods
T	13-Apr	Power Analysis	
TH	15-Apr	R Coding – Sample Size and Power Analysis (In-person)	
M	19-Apr	HW #11: Student Presentations	HW #10: Sample Sizes and Power
T	20-Apr	HW #11: Student Presentations	
Th	21-Apr	Open Lab	**STUDY PROTOCOL DUE**
Th	29-Apr	Final Exam - Take Home	**EXAM #2 DUE**