

GEOG 541

Geographic Information Systems in Public Health

Spring 2023

Mondays 3:35-6:35pm

Classroom: Peabody Hall 2024

Instructor: Michael Emch

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Office hours: Mondays 1:45-3:30pm or by appointment

Office: Carolina Hall 304

Teaching Assistant:

Email:

Office hours (computer CH 322 lab or office):

Course Objectives

GEOG 541 is an advanced course covering the theory and application of geographic information systems (GIS) in public health. The course includes an overview of the principles of GIS in health studies and practical experience in its use. The practical component involves the use of desktop GIS software packages including [ArcGIS](#) and other spatial analysis software including GeoDa and SaTScan. Other packages will also be discussed including QGIS and R. Both the theoretical and practical components of the course are important. Without a theoretical understanding of GIS methods, you will make bad geographic modeling decisions and when necessary, you will not be able to migrate to a new or different software package. Without a practical understanding of GIS software your theoretical knowledge cannot be put to use. A large component of this class will be devoted to students working on an individual project in which you investigate health study focusing on GIS application of your choice.

Required Text and Other Readings

Cromley, E. K., & McLafferty, S. L. (2012). *GIS and Public Health* (2nd edition). New York: Guilford Press. Available at the UNC Student Stores, Amazon, etc. Additional readings are on Sakai.

Class Activities, Reading Reflections, and Exercises

This is a seminar and thus it is designed to be interactive; it is not a lecture class. Class time will be comprised of different activities including discussions of readings and working in groups on exercises. Each week you will write a reflection of the readings of the week. Each reading reflection will consist of a typed, single-spaced document between ½ to 1 page long describing the 3-5 most useful things you learned from the materials for that week. Submit the reading reflections on Sakai Assignments for a particular week **before** class and be ready to discuss the material.

Discussion Lead

All students will help lead the class discussion for one class period during the semester. Two students will be assigned to each class period. The discussion leaders will give a short presentation summarizing the material for the day at the beginning of the class (no more than 15-

20 minutes). The discussion leaders will organize the rest of the class period by developing 3-4 discussion questions. The instructor will supplement the discussion leaders' questions with additional discussion questions. The point of the discussion is to have the class think more deeply about the materials that all students should have read before the class period.

Practical Component and Final Project

The practical exercises are GIS exercises that you will do on computers mostly outside of class time. They provide a way to acquire skills using GIS software packages and to apply the course concepts to real data. The project is intended to provide a deeper understanding of a GIS application through experience. You should acquire spatial data and the project should involve some type of spatial analysis. The deliverable is a Powerpoint presentation that you will also present orally to the class on the final exam day. You should use the knowledge and skills you acquired in the class discussion, books, papers, and practical component of the course. Every project must include the following sections: Introduction, Data, Methods, Results, and Discussion. The introduction should situate your project within the theoretical context that you learned about in this class.

Grading

Practical Exercises 20% (Divided equally)

Final Project and Presentation 25%

Class Exercises 30% (There are two parts to this grade. You get a 5% completion grade, divided equally, for handing in all of the exercises. At the end of the semester all of the exercises are combined to serve as a portfolio for parts of your class project. Since there is no paper in this class, only a Powerpoint presentation, this serves as a portfolio of the details and explanation of your project.)

Reading reflections 20% (There are two parts to this grade. You get a 5% completion grade for handing in all of the reading reflections. At the end of the semester all of the reading reflections are combined to serve as a portfolio and if you handed in a typed, single-spaced document between ½ to 1 page for all reading reflections then you will get full credit for this portion of the grade)

Discussion lead 5%

Late Assignments/ Missing Class

It's important that you keep up with the material so you can actively take part in the class discussions and classroom group exercises which build on previous exercises and readings. You must therefore hand in the assignments including the reading reflections on time. If you hand in deliverables late, including reading reflections, then 10% will be deducted each week they are late. All deliverables must be uploaded to Sakai before class; the time that each item is uploaded is logged on the instructor Sakai account. Also, it is important that you attend class. If you miss class, whether excused or unexcused, you will have to complete a makeup assignment that is described in the document called Makeupassignment on Sakai under the Make Up Assignments folder in Resources. You get one free day of missed class and then for each day beyond one day

you must do a Make Up Assignment. Please email the instructor before class saying that you won't be in class. It is also important that all students hand in all assignments and for each assignment that you do not hand in, whether it is a reading reflection, exercise, or make up assignment 3% will be deducted from your final grade. There is thus a lot of incentive to hand in all assignments in this class.

Schedule

Week: Dates	Topics, Materials, and Activities
Week 1:	<p>Introduction <u>Activities</u> Ice breaker and meet class members Goals of the class and introduction Create class discussion lead schedule</p> <p><u>Materials</u> Read the course syllabus in detail and explore the course Sakai site</p>
Week 2:	<p>Intro to GIS <u>Materials</u> C&M Introduction and Chapter 1</p> <p>Discussion Lead: Mike</p> <p><u>Activities</u> Intro to Practical Exercise 1</p> <p><u>Deliverables</u> Week 2 reading reflection</p>
Week 3:	<p>Spatial Data <u>Materials</u> C&M Chapter 2 O'Sullivan and Unwin Chapter 1</p> <p>Discussion Lead:</p> <p><u>Activities</u> Class Exercise 1</p> <p><u>Deliverables</u> Week 3 reading reflection</p>

<p>Week 4:</p>	<p>Spatial Databases for Public Health <u>Materials</u> C&M Chapter 3 O'Sullivan and Unwin Chapter 4</p> <p>Discussion Lead:</p> <p><u>Activities</u> Class Exercise 1</p> <p><u>Deliverables</u> Week 4 reading reflection</p>
<p>Week 5:</p>	<p>Mapping Health Information <u>Materials</u> C&M Chapter 4 Koch Chapter 1</p> <p>Discussion Lead:</p> <p><u>Activities</u> Library Session Class Exercise 1</p> <p><u>Deliverables</u> Week 5 reading reflection</p>
<p>Week 6:</p>	<p>Analyzing Spatial Clustering of Health Events <u>Materials</u> C&M Chapter 5 Sabel and Loytonen (2004) Omer et al. (2008)</p> <p>Discussion Lead:</p> <p><u>Activities</u> Class Exercise 2</p> <p><u>Deliverables</u> Week 6 reading reflection Class Exercise 1</p>
<p>Week 7:</p>	<p>Analyzing Environmental Hazards <u>Materials</u> C&M Chapter 6 Chakraborty et al. 2011</p>

	<p>Discussion Lead:</p> <p><u>Activities</u> Class Exercise 2 Intro to Practical Exercise 2</p> <p><u>Deliverables</u> Week 7 reading reflection Practical Exercise 1</p>
Week 8:	<p>Analyzing the Risk and Spread of Infectious Diseases</p> <p><u>Materials</u> C&M Chapter 7 Janko et al. 2018 (bed nets)</p> <p>Discussion Lead:</p> <p><u>Activities</u> Class Exercise 3</p> <p><u>Deliverables</u> Week 8 reading reflection Class Exercise 2</p>
Week 9:	<p>Infectious Diseases: Context in Nationally Representative Surveys</p> <p><u>Materials</u> Messina et al. (2011) Janko et al. 2018 (agriculture)</p> <p>Discussion Lead:</p> <p><u>Activities</u> Class Exercise 3</p> <p><u>Deliverables</u> Week 9 reading reflection</p>

<p>Week 10:</p>	<p>Spatial Regression <u>Materials</u> Sparks and Sparks 2010</p> <p>Discussion Lead:</p> <p><u>Activities</u> Class Exercise 4 Intro to Practical Exercise 3</p> <p><u>Deliverables</u> Week 10 reading reflection Class Exercise 3 Practical Exercise 2</p>
<p>Week 11:</p>	<p>Exploring the Ecology of Vector-borne Diseases <u>Materials</u> C&M Chapter 8 Messina et al. 2016</p> <p>Discussion Lead:</p> <p><u>Activities</u> Class Exercise 4</p> <p><u>Deliverables</u> Week 11 reading reflection</p>
<p>Week 12:</p>	<p>Analyzing Access to Health Services <u>Materials</u> C&M Chapter 9 Delamater et al. 2013</p> <p>Discussion Lead:</p> <p><u>Activities</u> Class Exercise 5</p> <p><u>Deliverables</u> Week 12 reading reflection Class Exercise 4</p>
<p>Week 13:</p>	<p>Locating Health Services and Neighborhoods and Health <u>Materials</u> C&M Chapter 10 DiezRoux 2001</p> <p>Discussion Lead:</p>

	<u>Activities</u> Class Exercise 5 <u>Deliverables</u> Week 13 reading reflection
Week 14:	Health Disparities <u>Materials</u> C&M Chapter 11 Brandt et al. 2021 Discussion Lead: <u>Activities</u> Class Exercise 5 <u>Deliverables</u> Week 14 reading reflection
Week 15:	GIS in Health Intervention Research <u>Materials</u> Ali et al (2005) Emch et al. (2006) Discussion Lead: Emch <u>Activities</u> Class Exercise 6 <u>Deliverables</u> Week 15 reading reflection Class Exercise 5 Practical Exercise 3
Exam Time:	Final project presentations <u>Activities and Deliverables</u> Present project in Powerpoint and upload file to Assignments

Title IX

Any student who is impacted by discrimination, harassment, interpersonal (relationship) violence, sexual violence, sexual exploitation, or stalking is encouraged to seek resources on campus or in the community. Please contact the Director of Title IX Compliance (Adrienne Allison – Adrienne.allison@unc.edu), Report and Response Coordinators in the Equal Opportunity and Compliance Office (reportandresponse@unc.edu), Counseling and Psychological Services (confidential), or the Gender Violence Services Coordinators (gvsc@unc.edu; confidential) to discuss your specific needs. Additional resources are available at safe.unc.edu.

Accessibility Resources and Service (ARS)

The University of North Carolina at Chapel Hill facilitates the implementation of reasonable accommodations, including resources and services, for students with disabilities, chronic medical conditions, a temporary disability or pregnancy complications resulting in barriers to fully accessing University courses, programs and activities.

Accommodations are determined through the Office of Accessibility Resources and Service (ARS) for individuals with documented qualifying disabilities in accordance with applicable state and federal laws. See the ARS Website for contact information:

<https://ars.unc.edu> or email ars@unc.edu.

Honor Code

UNC has a student-led [honor system](#). Academic integrity is at the heart of Carolina and we all are responsible for upholding the ideals of honor and integrity. The student-led Honor System is responsible for adjudicating any suspected violations of the Honor Code and all suspected instances of academic dishonesty will be reported to the Honor System.

Information, including your responsibilities as a student is outlined in the Instrument of Student Judicial Governance. Your full participation and observance of the Honor Code is expected. Plagiarism in the form of "deliberate" or "reckless" representation of another's words, thoughts, or ideas as one's own without appropriate attribution to the original author in connection with submission of academic work, whether graded or otherwise, is a serious breach of the academic integrity demanded by the Honor Code and one of the most common forms of academic misconduct processed by the Honor System. Plagiarism can take many forms and there may be a number of reasons why it occurs. Quote and cite any words that are not your own. If you paraphrase the words of another, you must still give proper attribution. All academic work in this course is to be your own work, unless otherwise specifically provided such as the group exercises. It is your responsibility if you have any doubt to confirm whether or not collaboration is permitted.