GEOG 541
Geographic Information Systems in Public Health

Spring 2024 Mondays 3:35-6:35pm
Classroom: Woolen Gym 303
Instructor: Michael Emch
Email: emch@unc.edu
Office hours: Mondays 2:15-3:15 pm (book via email)
Office: Carolina Hall 304

Teaching Assistant: Anh Quach
Email: ntaquach@unc.edu
Office hours: Mondays and Wednesdays 10-11am or by appointment. Book appointment via this calendly link. Contact Anh if you need to set up another time other than M W 10-11am.
Office: Carolina Hall 317

Course Objectives
GEOG 541 is a 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 Pro 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 implement a health study with a spatial component using GIS applications.

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. Three or four 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 (about 20 minutes). This is simply to get us started as everyone will have read the material and handed in a reading reflection for the day. 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. Discussion leaders are welcome to do something more innovative and spend some of the time having students do short exercises or work in small groups for very specific tasks for short periods of time and report back to the larger class. The entire discussion will be around half the class period (~1 ½ hours). The discussion leaders for the day should coordinate with one another.

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 UNC GIS librarian will visit our class early in the semester and talk about the resources available including help with spatial data acquisition and software help. The deliverable is a Powerpoint presentation that you present to class members and you will create an MP4 file of your presentation- see instructions on Sakai. 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%
Grade divided equally between the three Practical Exercises.

Final Project and Presentation 25%

Reading reflections 20%
You get a completion grade for handing in each reading reflection. If you hand in a typed, single-spaced document before the deadline that is between ½ to 1 page then you will receive 10 points out of 10 for each reading reflection. If the reflection is incomplete, then you'll get less than 10 points for a given reading reflection.

Class Exercises 30%
There are two parts to this grade. Half of the grade is a completion grade, divided equally, for handing in all parts of each exercise. If you hand in all parts then you will receive 10 points out of 10 for each exercise. If an exercise is incomplete, then you'll get less than 10 points for that exercise. At the end of the semester all of the exercises are combined to serve as a portfolio for the different parts of your class project which count towards the other half of the grade. The exercises sequentially build on each other towards the completion of your final project. Since

there is no paper in this class, only a presentation, this serves as a portfolio of the details of your project.

Discussion lead 5%
Grade based on Powerpoint slides, presentation, and facilitation of discussion.

Attendance
Attendance is taken via UNC Check-in. Please check in using the app each day- unccheckin.unc.edu/. If you miss class, whether excused or unexcused, you must complete a makeup assignment that is described in the document called MakeupAassignment on Sakai under Resources. Please email the TA before class saying that you will be absent.

Assignment Submission and Late Assignments
Submit all assignments via Sakai Assignments. 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 date they are due; the time that each item is uploaded is logged on the instructor Sakai account. 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 5% will be deducted from your final grade. The final project must be handed in to successfully complete the course. There is thus a lot of incentive to hand in all assignments in this class.

Schedule

Week: Dates	Topics, Materials, and Activities
Week 1: Jan 22	**Course Introduction** Activities Ice breaker and meet class members Goals of the class and introduction Create class discussion lead schedule Intro to Practical Exercise 1 ArcGIS virtual lab software demo Materials Read the course syllabus in detail and explore the course Sakai site
Week 2: Jan 29	**Introduction to GIS in Public Health** Materials C&M Introduction and Chapter 1 Discussion Lead: Mike Activities Class Exercise 1

	<u>Deliverables</u> Week 2 reading reflection
Week 3: Feb 5	**Spatial Data** <u>Materials</u> C&M Chapter 2 O'Sullivan and Unwin Chapter 1 Discussion Lead: Annabel Grocott, Lindsey Pegram, Borna Zareiesfandabadi <u>Activities</u> Class Exercise 1 GIS Librarian Session <u>Deliverables</u> Week 3 reading reflection
Week 4: Feb 19	**Spatial Databases for Public Health** <u>Materials</u> C&M Chapter 3 Ali et al. 2001 Discussion Lead: Natalie Hammond, Chandler Lugo, Cole Castillo, Jane Smoltz, Elizaveta Ushakova <u>Activities</u> Class Exercise 1 <u>Deliverables</u> Week 4 reading reflection
Week 5: Feb 26	**Mapping Health Information** <u>Materials</u> C&M Chapter 4 Koch Chapter 1 Discussion Lead: Shane Harinxma-Toelg, Teka T, Asher Eskind, Lauren Enochs, Payton Emerick <u>Activities</u> Class Exercise 2 <u>Deliverables</u> Week 5 reading reflection Class Exercise 1

Week 6: Mar 4	**Analyzing Spatial Clustering of Health Events** Materials C&M Chapter 5 Sabel and Loytonen (2004) Omer et al. (2008) Discussion Lead: Devin Rooney, Andrew Zadrozny, Julia Straight, Victor Hoppenot Activities Class Exercise 2 Intro to Practical Exercise 2 Deliverables Week 6 reading reflection Practical Exercise 1
Week 7: Mar 18	**Analyzing Environmental Hazards** Materials C&M Chapter 6 Chakraborty et al. 2011 Discussion Lead: Kate Leonard, Anna Kunz, Hannah Linberger, Ujunwa Onyeama, Jing Hu Activities Class Exercise 3 Deliverables Week 7 reading reflection
Week 8: Mar 25	**Analyzing the Risk and Spread of Infectious Diseases** Materials C&M Chapter 7 Janko et al. 2018 (bed nets) Discussion Lead: Blaine Jenkins, Cayley Robinson, Heewon Jang, Sean Quade, Henry Shriver Activities Class Exercise 3 Deliverables Week 8 reading reflection Class Exercise 2

Week 9: Apr 1	**Infectious Diseases: Context in Nationally Representative Surveys** Materials Messina et al. (2011) Janko et al. 2018 (agriculture) Discussion Lead: Alex Heffner, Daniel Larson, David Mallinson, Gayyoung Lee, Will Rawlings Activities Class Exercise 4 Deliverables Week 9 reading reflection
Week 10: Apr 8	**Spatial Regression** Materials Sparks and Sparks 2010 Emch et al. 2006 Discussion Lead: Daniel Crownover, Ann Safo, Angela Benson, Carmen Pergerson, Huijoo Shon Activities Class Exercise 4 Intro to Practical Exercise 3 Deliverables Week 10 reading reflection Class Exercise 3 Practical Exercise 2
Week 11: Apr 15	**Exploring the Ecology of Vector-borne Diseases** Materials C&M Chapter 8 Messina et al. 2016 Discussion Lead: Julia Holcomb, Eloise Maclean, Shaelynn Grifaldo, Gemma Diaz, Emily Ormond Activities Class Exercise 4 Deliverables Week 11 reading reflection

Week 12: Apr 22	**Analyzing Access to Health Services and Locating Health Services** <u>Materials</u> C&M Chapters 9 and 10 Delamater et al. 2013 Discussion Lead: Selena Kleber, Jasmin Benas, Heba Abdelsalam, Poonam Rawat, Chialy Xiong <u>Activities</u> Class Exercise 5 <u>Deliverables</u> Week 12 reading reflection Class Exercise 4
Week 13: Apr 29	**Neighborhoods & Health and Health Disparities** <u>Materials</u> C&M Chapter 11 Brandt et al. 2021 DiezRoux 2001 Discussion Lead: Gabby Johnson, Stephanie Caddell, Simone McFarlane, Lydia Rowen, Hannah Lillard <u>Activities</u> Class Exercise 6 <u>Deliverables</u> Week 13 reading reflection Practical Exercise 3 Class Exercise 5
Exam Time: May 3 4-7pm	**Final project presentations** <u>Activities and Deliverables</u> Project Presentation. See instructions on Sakai.

ChatGPT and other generative AI tools
For all assignments including reading reflections and class exercises you are not allowed to use ChatGPT and other generative AI tools. It is a violation of the UNC honor code if you do. Your assignments will be run through AI detector software periodically. There might be instances that the instructor allows AI tools but will tell you when. Do not use it without discussing with the instructor.

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.