

Introduction

Lecture #1 | GEOG 510
GIS and Spatial Analysis for Public
Health

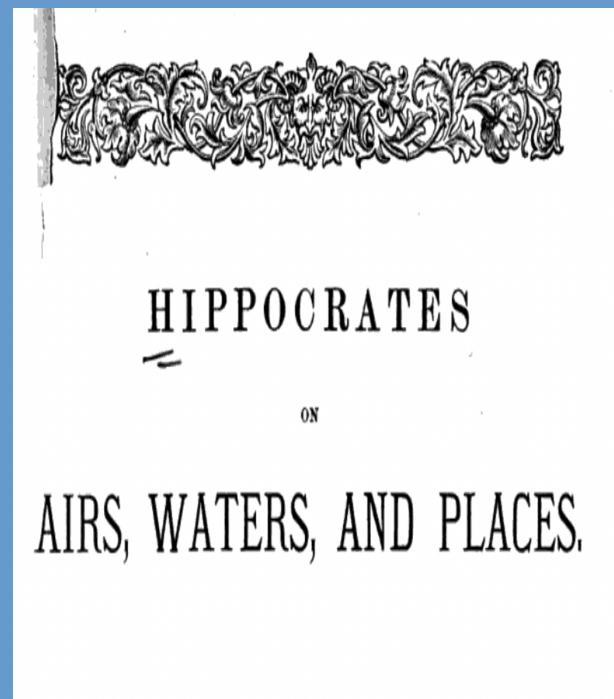
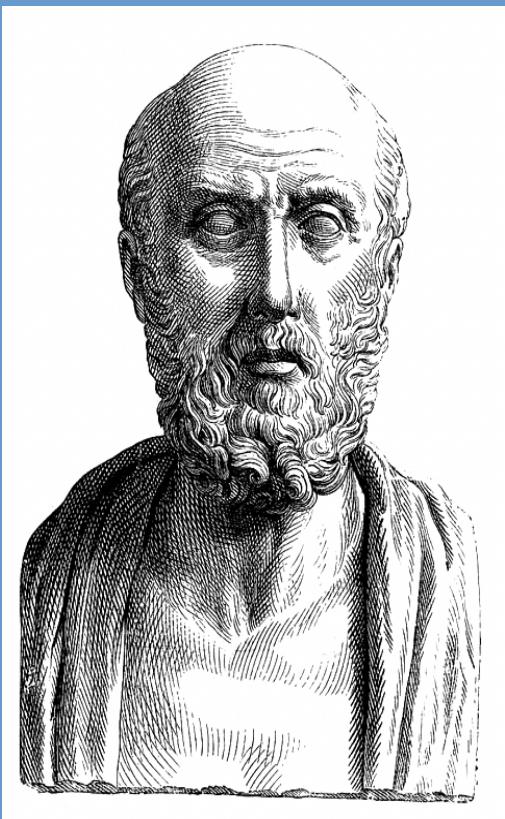
Varun Goel

Outline

- Course motivation
- Health Geography
- Course and syllabus overview
- Questions in Health & Geography

Geography and Public Health

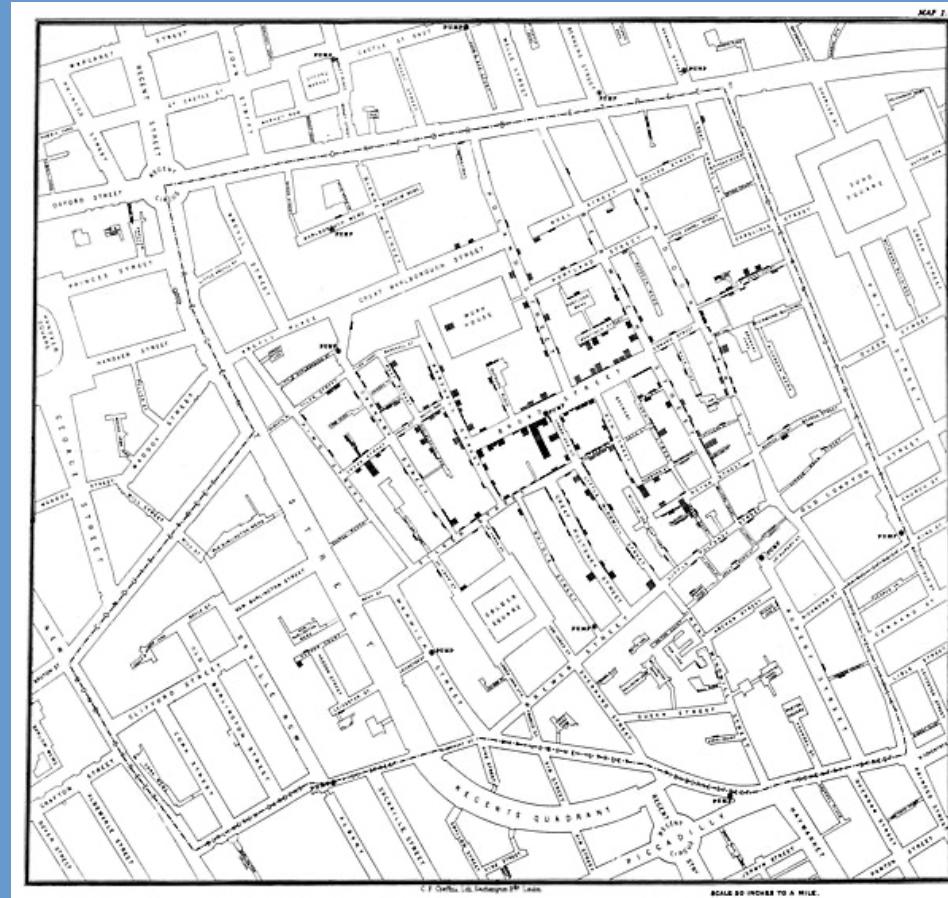
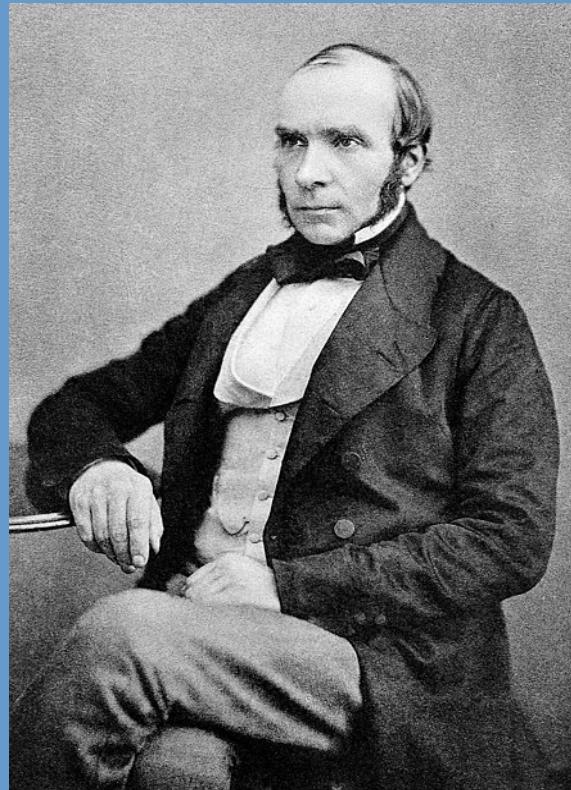
- A 'shared' history



Hippocrates (400 B.C.) stated that to investigate medicine properly, one should first consider the weather, then the quality of water, then the landscape, and finally the social habits of the people.

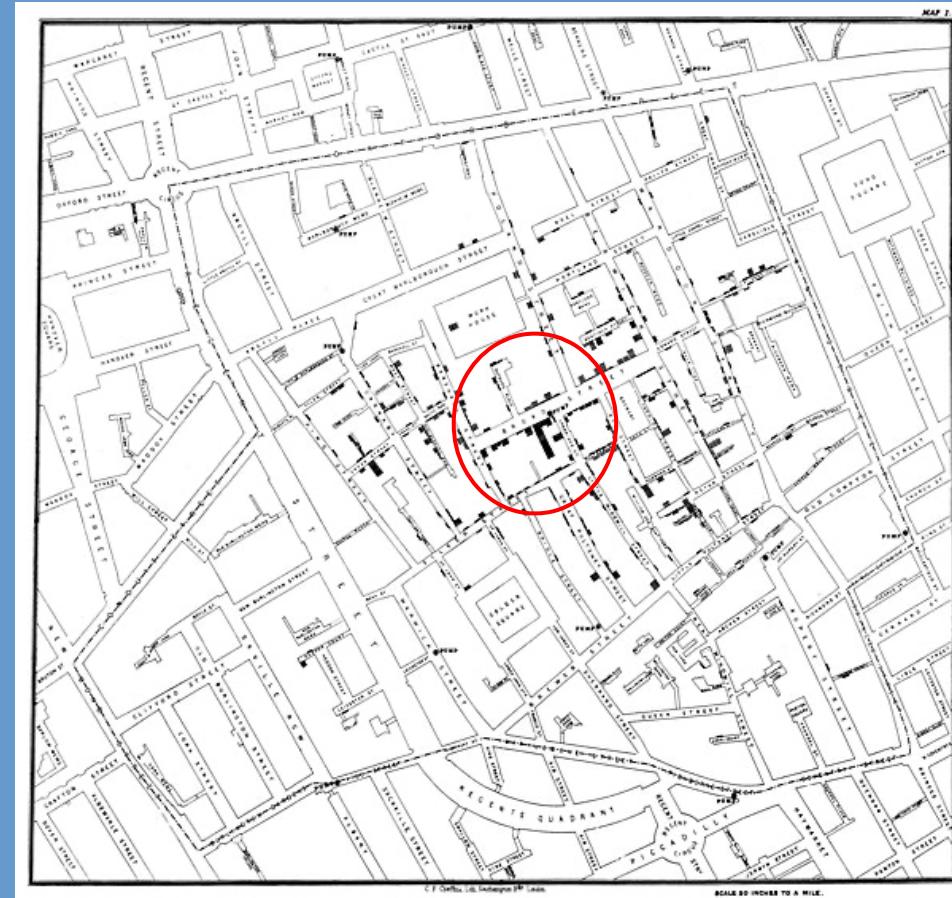
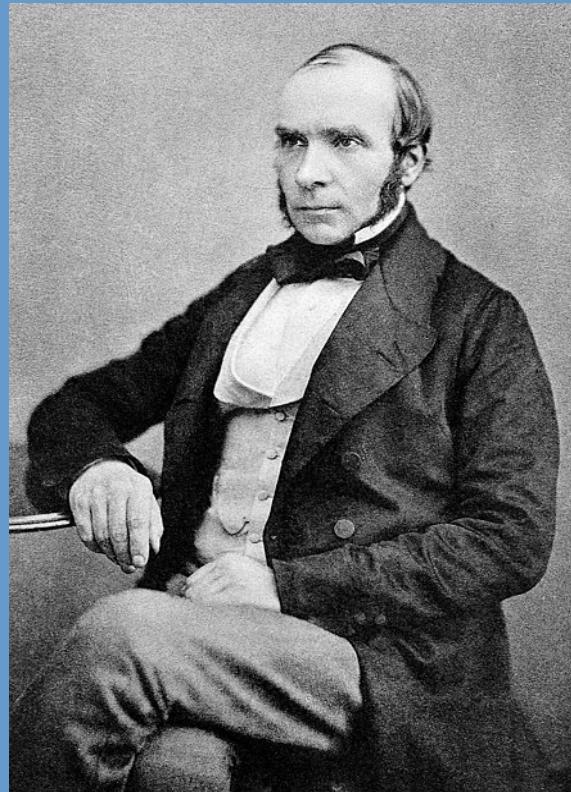
GIS and Public Health

- People, Place, and Time

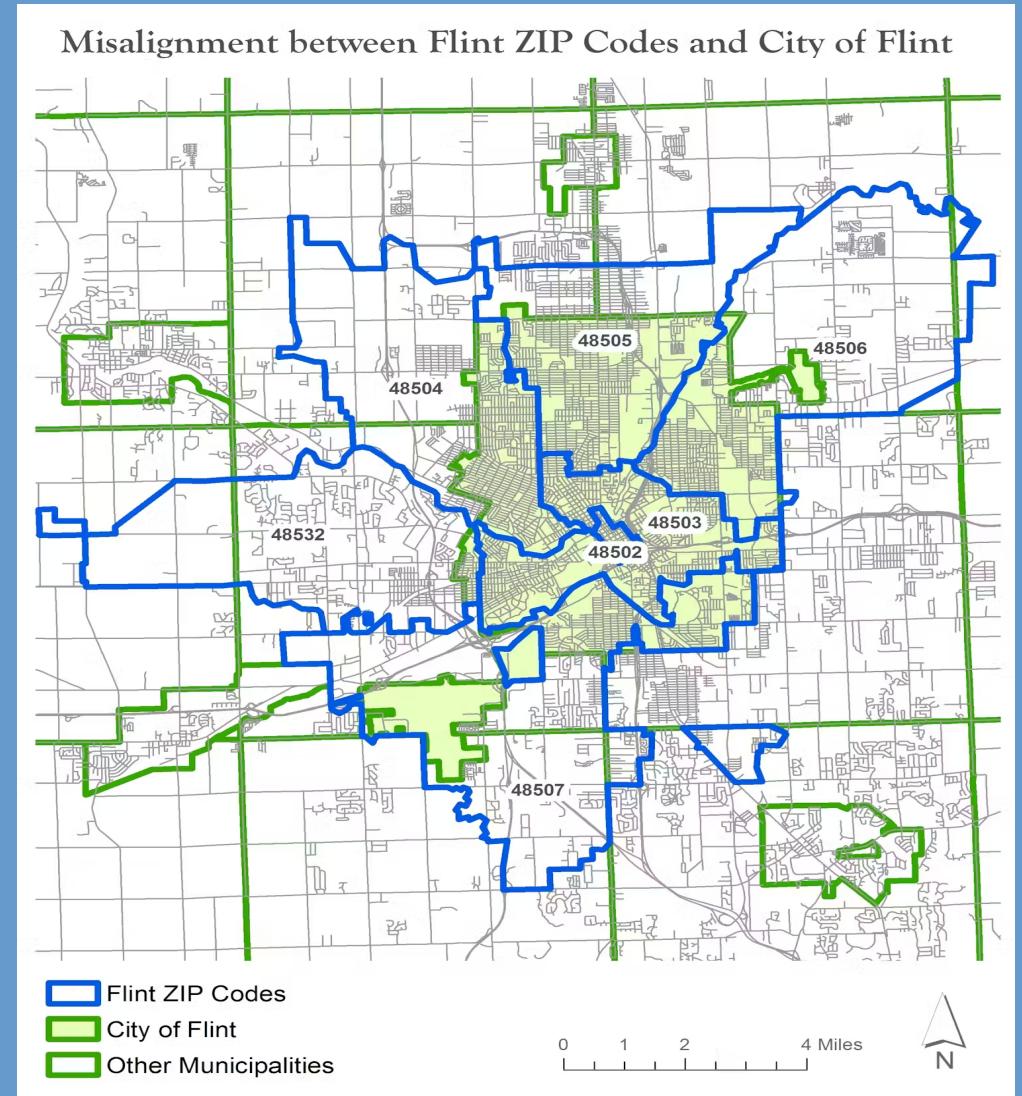


GIS and Public Health

- People, Place, and Time

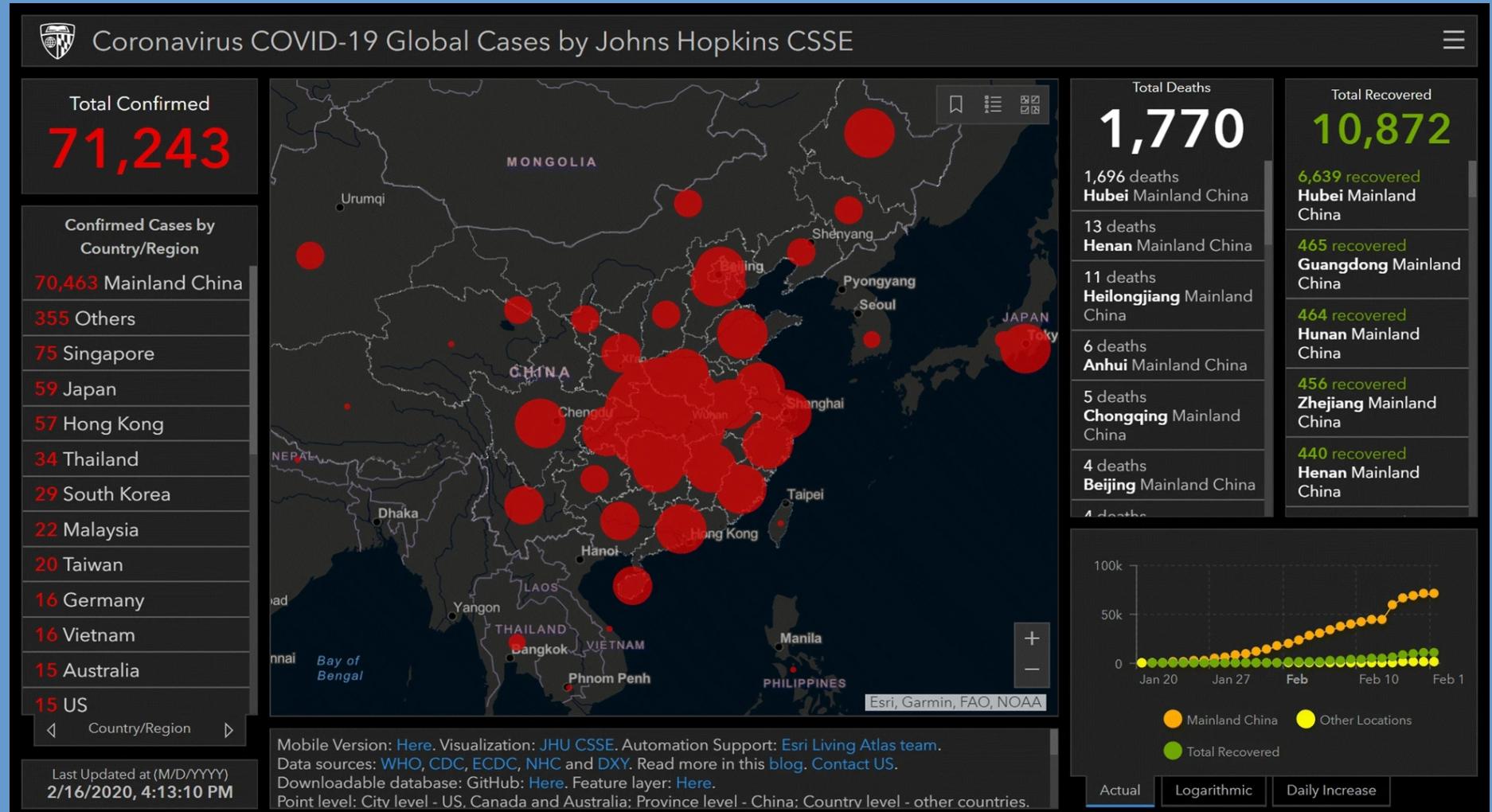


Flint Water Crisis



<https://theconversation.com/how-zip-codes-nearly-masked-the-lead-problem-in-flint-65626>

COVID-19 Surveillance



<https://coronavirus.jhu.edu/map.html>

Patient Zero

Science

Current Issue First release papers Archive About Submit manuscript

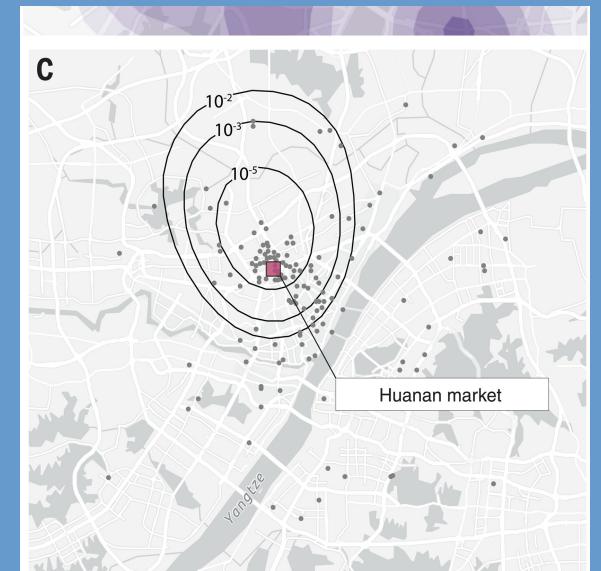
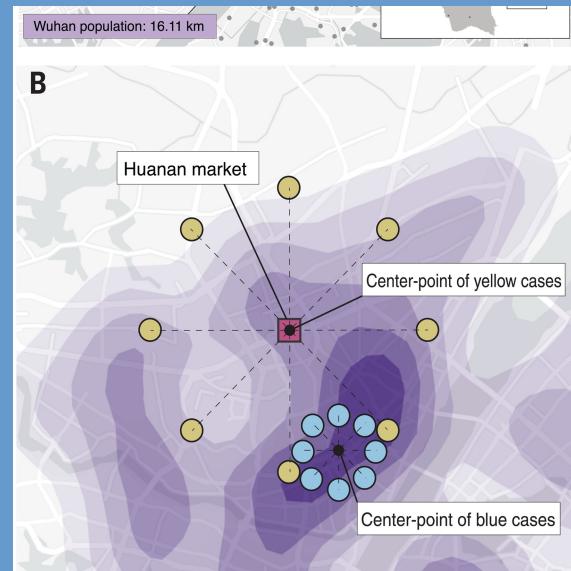
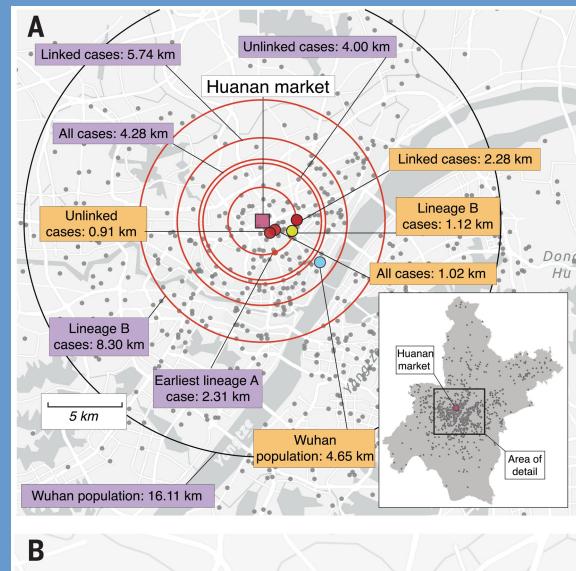
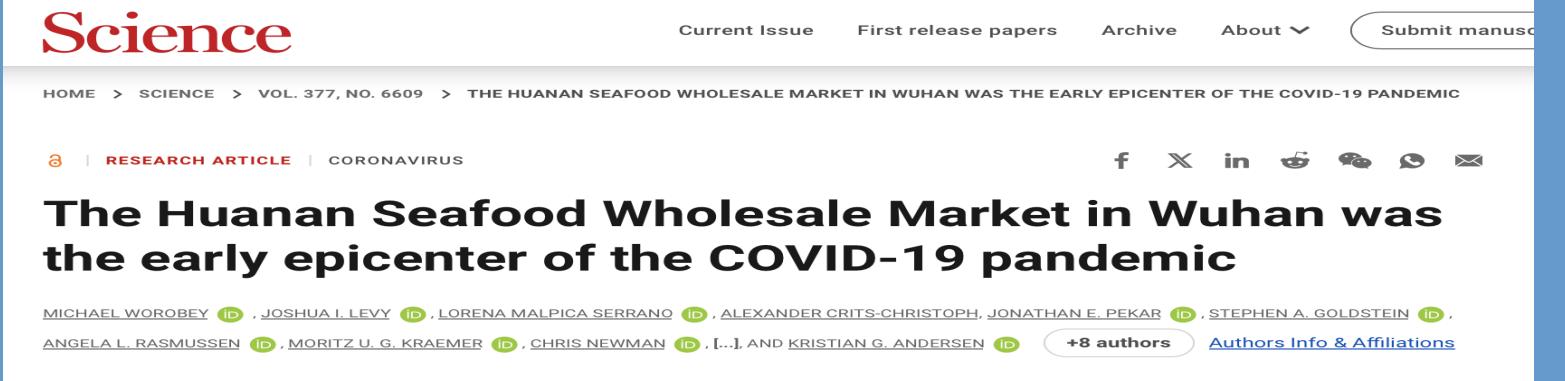
HOME > SCIENCE > VOL. 377, NO. 6609 > THE HUANAN SEAFOOD WHOLESALE MARKET IN WUHAN WAS THE EARLY EPICENTER OF THE COVID-19 PANDEMIC

RESEARCH ARTICLE | CORONAVIRUS

f x in g m s e

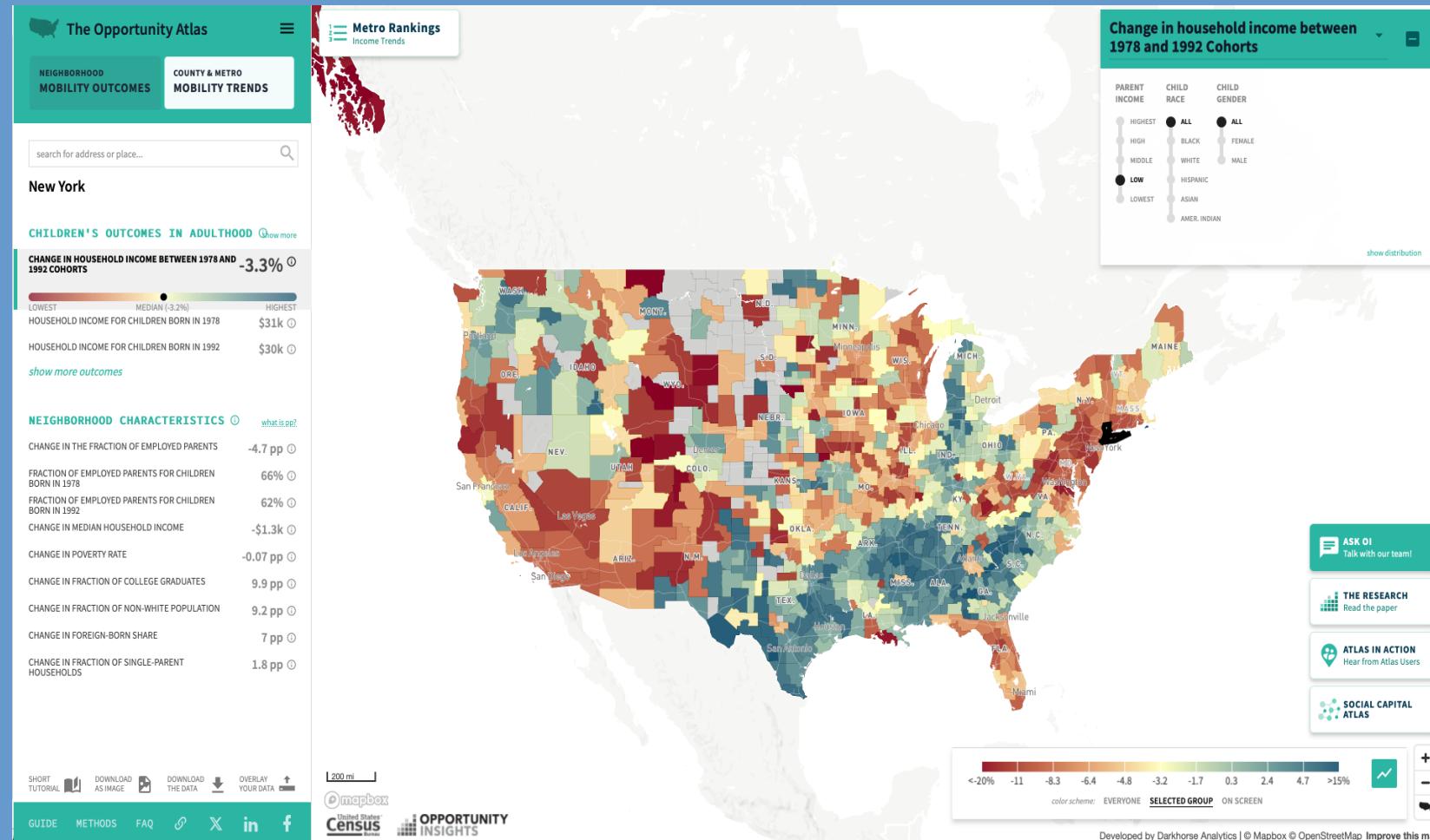
The Huanan Seafood Wholesale Market in Wuhan was the early epicenter of the COVID-19 pandemic

MICHAEL WOROBAY ID, JOSHUA I. LEVY ID, LORENA MALPICA SERRANO ID, ALEXANDER CRITS-CHRISTOPH, JONATHAN E. PEKAR ID, STEPHEN A. GOLDSTEIN ID, ANGELA L. RASMUSSEN ID, MORITZ U. G. KRAMER ID, CHRIS NEWMAN ID, [...], AND KRISTIAN G. ANDERSEN ID +8 authors Authors Info & Affiliations



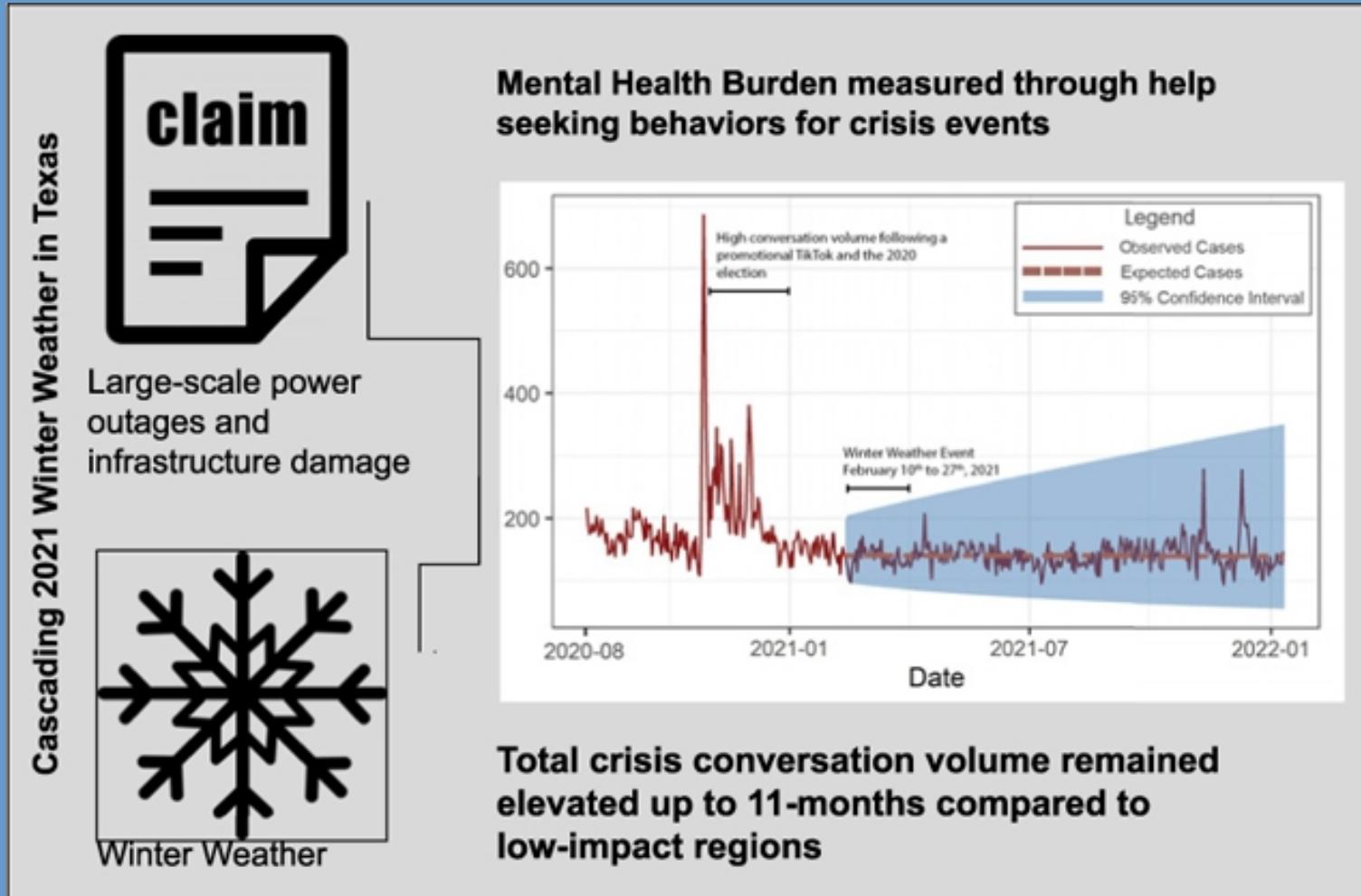
Source: Worobey et al.
<https://doi.org/10.1126/science.abp8715>

Health Disparities



<https://www.opportunityatlas.org>

Climate and Mental Health



Sugg et al., 2023: <https://doi.org/10.1016/j.scitotenv.2023.163231>

Health Geography

- Sub-discipline of geography
 - aka: Medical Geography
 - Focus on population health topics
 - More similar to public health than medical or clinical care
 - Examines an extremely broad range of health-related topics/issues
 - e.g., infectious/chronic disease, environmental factors, healthy behaviors, access to healthcare, and many more

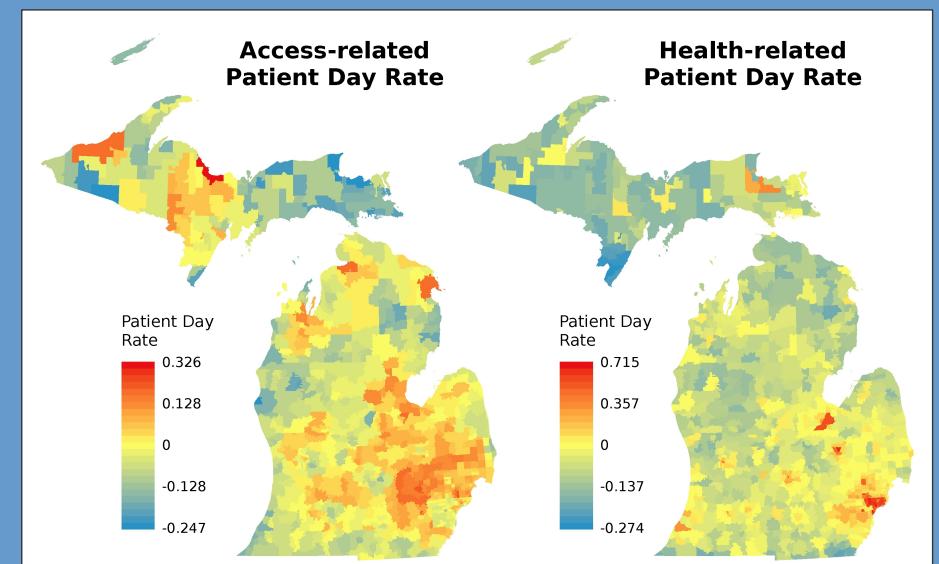
Health Geography

- From Dummer (2008)
 - Link between health and geography

Where we are born, live, study and work directly influences our health experiences: the air we breathe, the food we eat, the viruses we are exposed to and the health services we can access

Health Inquiry

- Biomedicine
- Medical (clinical)
- Epidemiology and Public health
 - Focus on populations



Defining Health

- Defining “health” is not trivial
 - Ralph Audy, 1971

Health is a continuing property that can be measured by the individual's ability to rally from a wide range and considerable amplitude of insults, the insults being chemical, physical, infectious, psychological, and social. One might prefer the term “stimuli” or “hazards” to “insults.” Such stimuli may be either negative or positive: The crucial thing is that the individual must respond to them.

Potential Stimuli

- Chemical
 - Carbon monoxide
 - Drugs (good/bad)
 - Benzene
 - Paint fumes
 - Vitamins
 - Ozone
 - Pesticides
 - Lead paint
- Physical
 - Trauma
 - UV radiation
 - Noise
 - Electricity
 - Humidity
 - Earthquake
 - Flood
 - Hurricane

Potential Stimuli

- Infectious
 - Virus
 - Prion
 - Bacteria
 - Protozoa
 - Rickettsia
 - Helminth
- Psychosocial
 - Danger
 - Crowds
 - Isolation
 - Anxiety
 - Community
 - Love

Defining Health

- Cromley and McLafferty
 - Health is a state of physical, social, and emotional well-being
 - Not just the absence of disease
 - Numerous factors affect health
 - Physiology
 - Behavior
 - Environment

Health

- Important to consider health as a continuum
 - Not binary
 - Perfect health or complete absence of health
 - Continuous property
 - People generally fall somewhere in between the two extremes

Health and Medicine

- Difference between health and medicine
 - Health is a more encompassing term
 - Medicine is focused on individualized treatment of disease or illness
 - Biomedicine focused on biological and chemical aspects of disease and medicine

Population Health

- A population health approach generally considers...
 - The health of groups of people, not specific individuals
 - A large range of potential factors that may determine/affect health

Population Health

- Practical reasons for examining population health
 - Description
 - Explanation
 - Prediction
 - Intervention

Health

- Question to think about as we move forward in the class
 - How do we measure or characterize health?
 - For a person?
 - For a group of people (a population)?
 - e.g., what information or metrics may be useful to understand a population's health?

Health Geography

- Some history...
 - Medical geography ⇈ Health geography
 - Broad area of study, but two main foci
 - Disease (infectious and chronic)
 - Health care services
 - Qualitative and quantitative approaches
 - Similar to geography in general

Health Geography

- Expanding area of inquiry
 - AAG Health and Medical Geography Specialty Group
 - International Medical Geography Symposium (biannual)
 - Academic Journals
 - International Journal of Health Geography
 - Health and Place
 - Spatial and Spatio-temporal Epidemiology
 - GeoHealth

GEOG 510

- GIS in Public Health
 - Theoretical material
 - How to think “geographically” about health-related topics
 - Applied material
 - How to implement a geographic analysis or supplement an analysis using GIS
 - Learning about...
 - What to do, why do it, and how to do it

GEOG 510

- Course Overview
 - Website - <https://gisph.netlify.app>
 - Syllabus
 - Discussion - <https://piazza.com/sc/spring2025/geog510>
 - Course material
 - e.g., lectures, readings, web content
 - Assignments
 - Grades
 - Announcements
 - Additional resources
 - Required and supplementary material will be clearly distinguishable

GEOG 510

- Classes
 - Lectures
 - Posted on website right before class
 - Discussion and In class exercises or activities (participation)
 - Prepare by reading the material
 - Software demonstrations

GEOG 510

- Evaluation
 - Assignments
 - Posted and turned in on OneDrive
 - Generally, completed outside of class
 - Final Paper / Presentation
 - Work on throughout semester
 - Participation
 - Exercises and Discussion
 - Participation is expected and we will all benefit if you get involved!

GEOG 510

- Computers/technology requirements
 - Software
 - QGIS, R, GeoDa, SaTScan
 - See Software document on Website!
 - Storage

GEOG 510

- Student support hours
 - Mon/Wed, 1 - 2 pm (in-person only)
 - Callcott 111
 - By appointment - Sign up here
 - If my door is open, I'm generally available for a few minutes

GEOG 510

- Classroom behavior
 - Show up on time
 - Please, silence your devices
 - Pay attention and be engaged
 - Please, no texting, emailing, etc.
 - Be respectful of others' views or opinions
 - "Health" can be a very personal subject
 - Humor my attempts at humor

Questions about the course
logistics or anything else?

About Me

- 1st year as a professor
 - PhD from the 'other' Carolina
 - Health Geographer
 - Also, GIScience and spatial analysis
 - Started in GIS and remote sensing
- First name is pronounced as “Maroon” but with a V, Last name as “Go-yell”
 - Dr. G, Dr. Goel, Professor V, or Varun is fine

My Research

- Major themes and interests
 - Global Health (Asia, Africa)
 - Infectious Disease Ecology
 - Evaluation of Health policy and Interventions
 - Social Determinants of Health
 - Environmental Health
 - Climate Change and Health
 - Drinking-water related health challenges

Introductions

- Name/Preferred name (if different)
- Major and Year
- What was the best dish that you ate over winter break?
- If given a one-way ticket, where would like to settle down for the next 5 years?

Questions in Health Geography

- Geography
 - Space and place
- Population Health
 - Morbidity and mortality
 - Health care use
 - Behavior and society
 - Physical and social environment

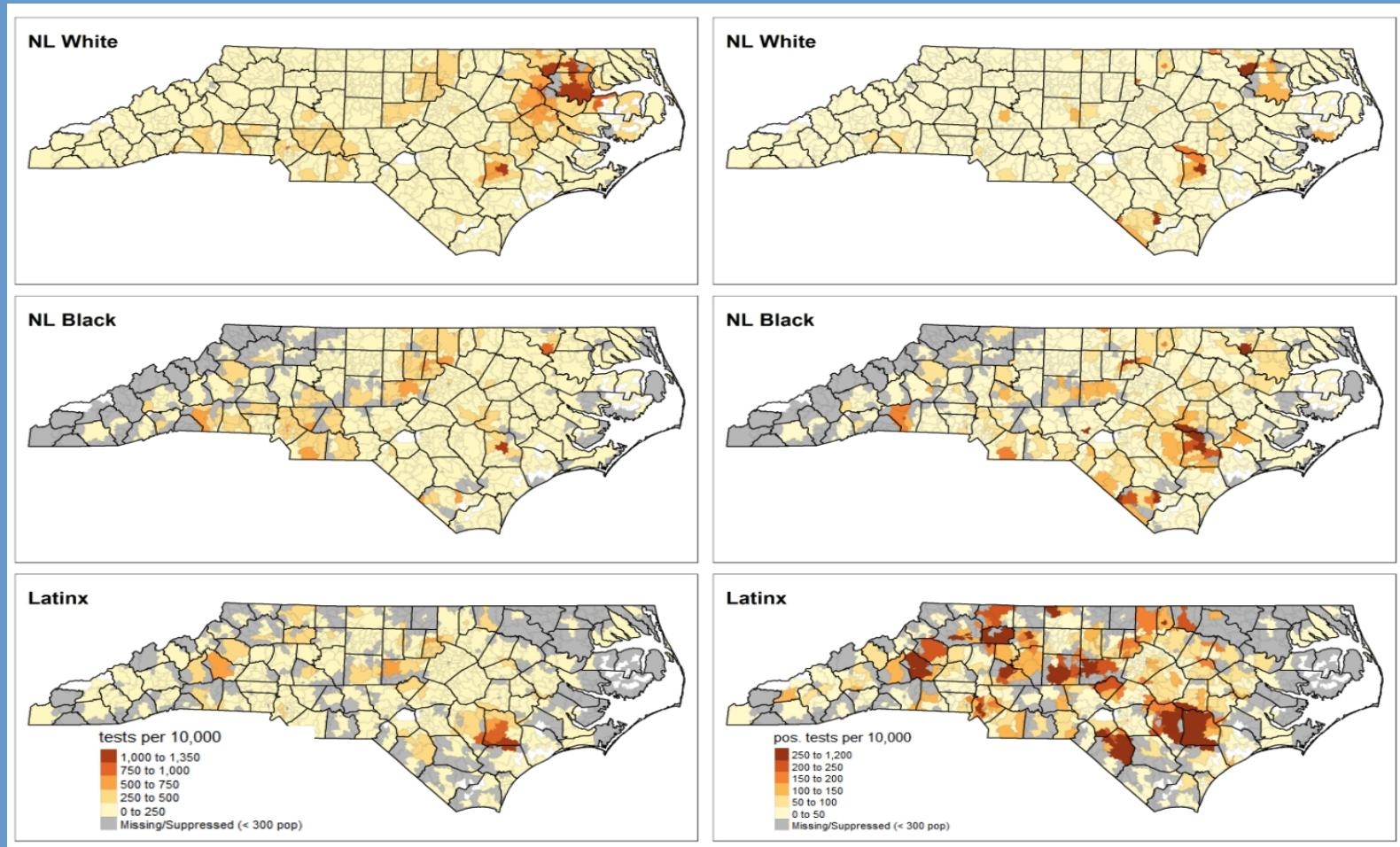
Geography

- Broad discipline
- Many ways to group geographers
 - Human
 - e.g., urban, economic, critical theory
 - Physical
 - Human/Environment
 - Geospatial Technology
 - e.g., GIS, remote sensing, cartography

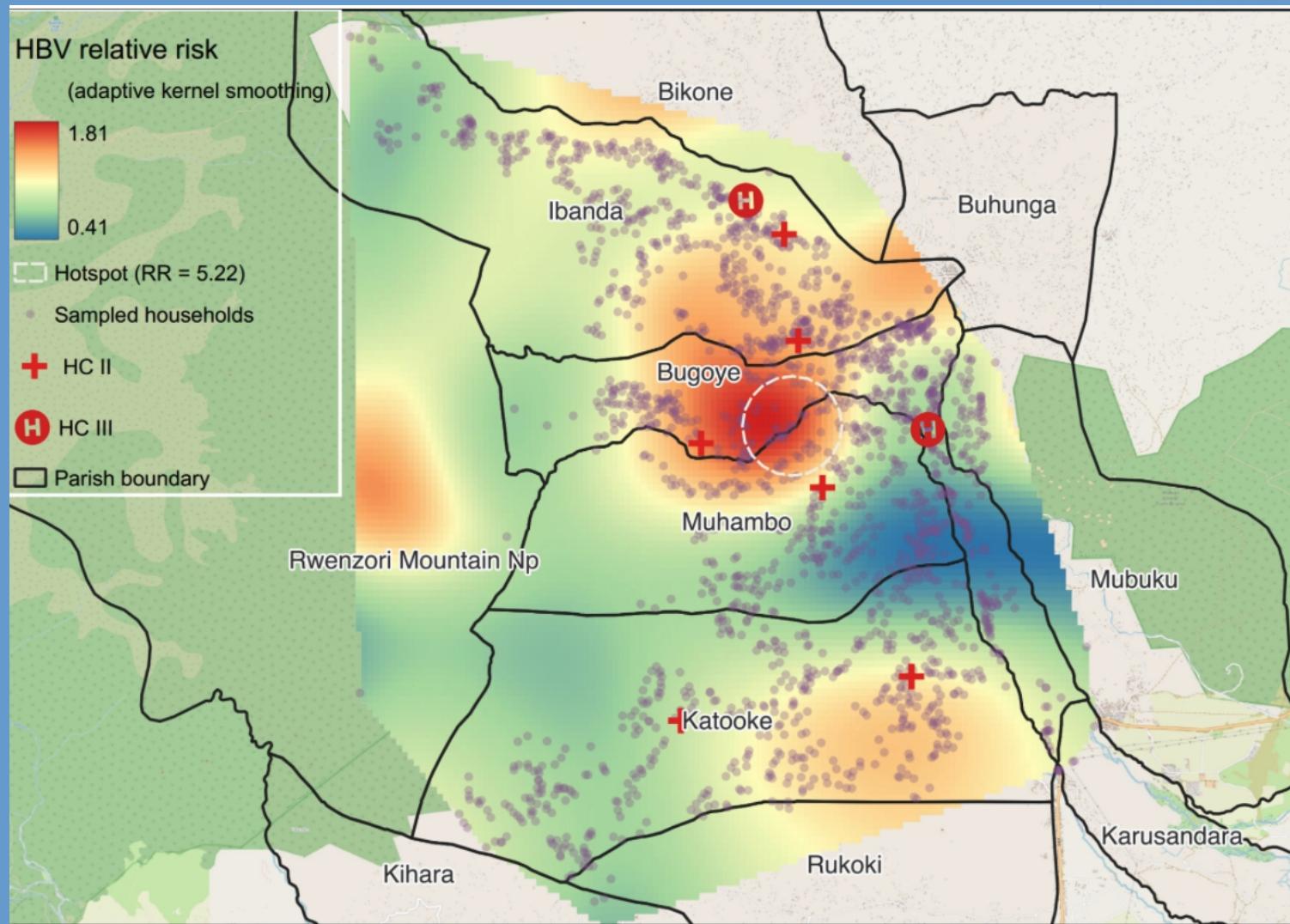
Questions in Health Geography

- Some core questions in Geography
 - Where? (descriptive)
 - Location and/or distribution of phenomena
 - Change over time/space
 - Why there? (explanatory)
 - Relationships among phenomena

Description

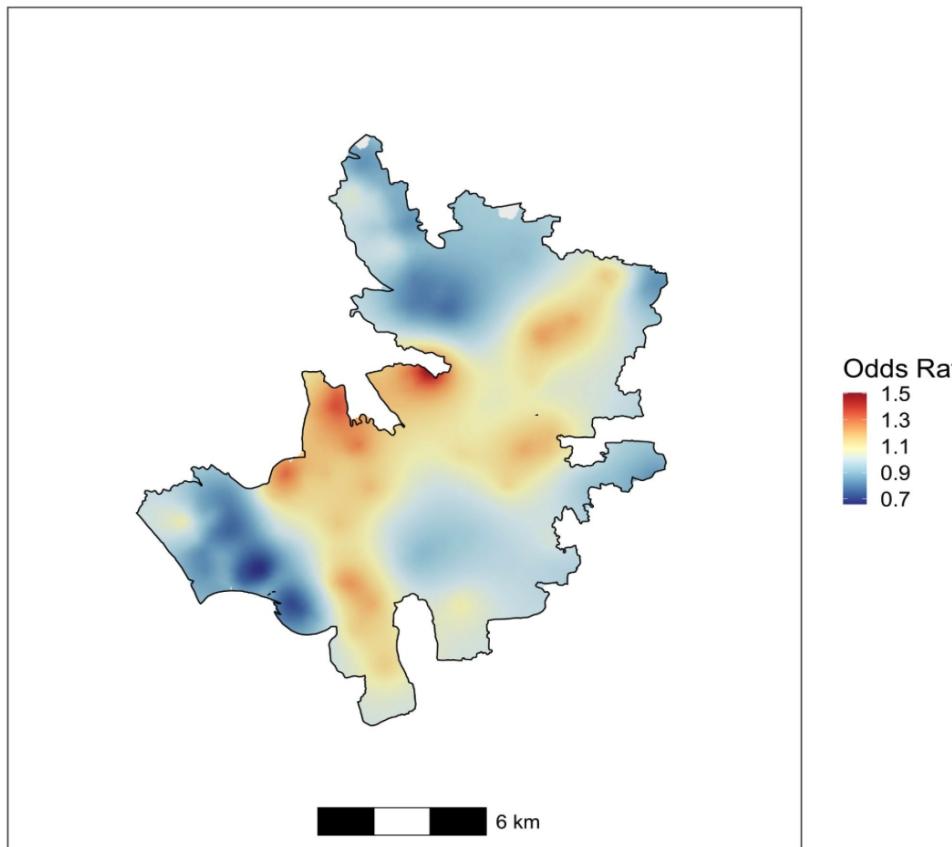


Description

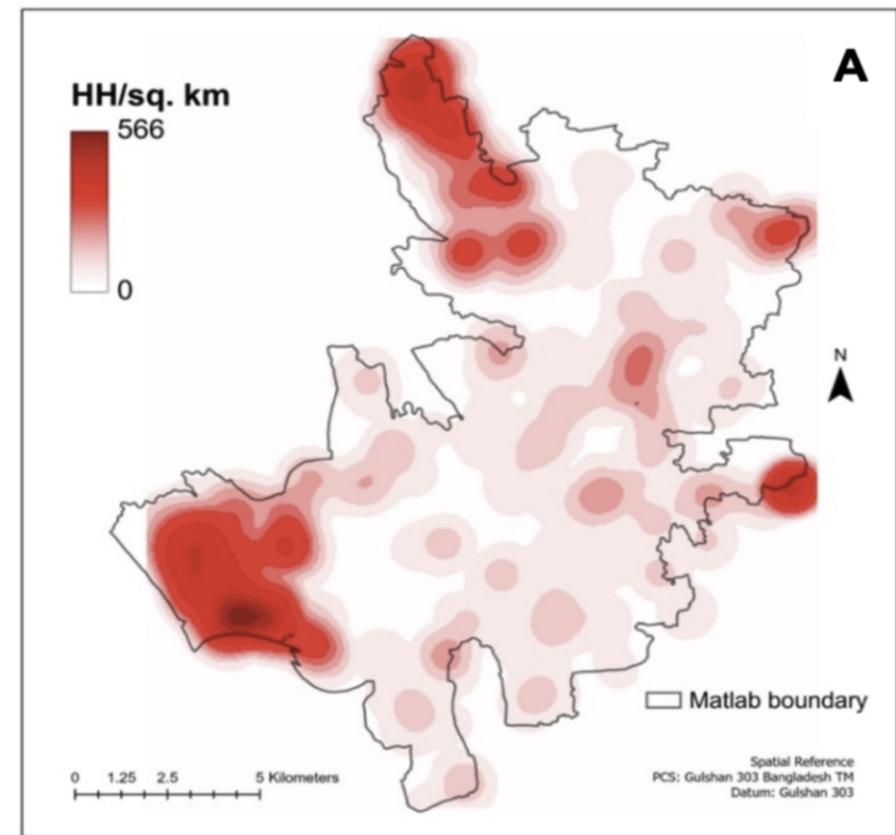


Explanation

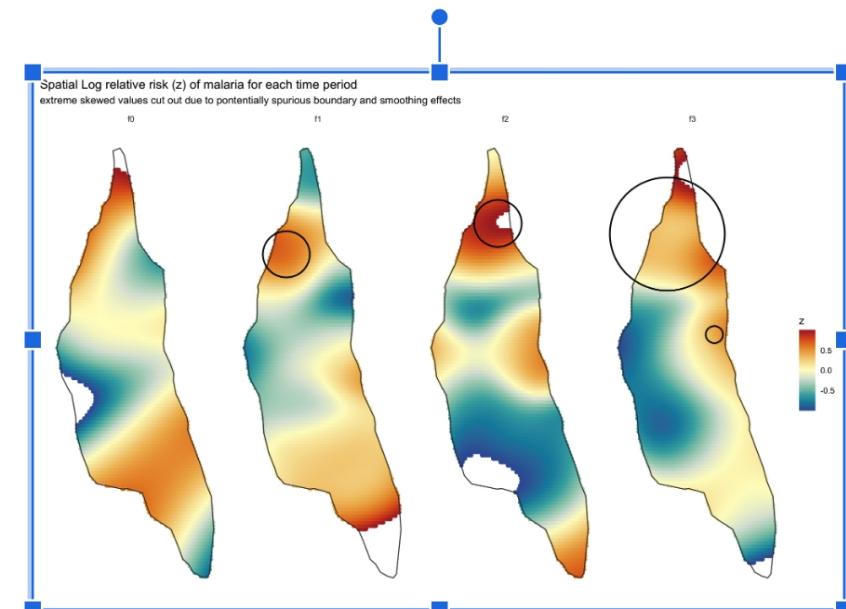
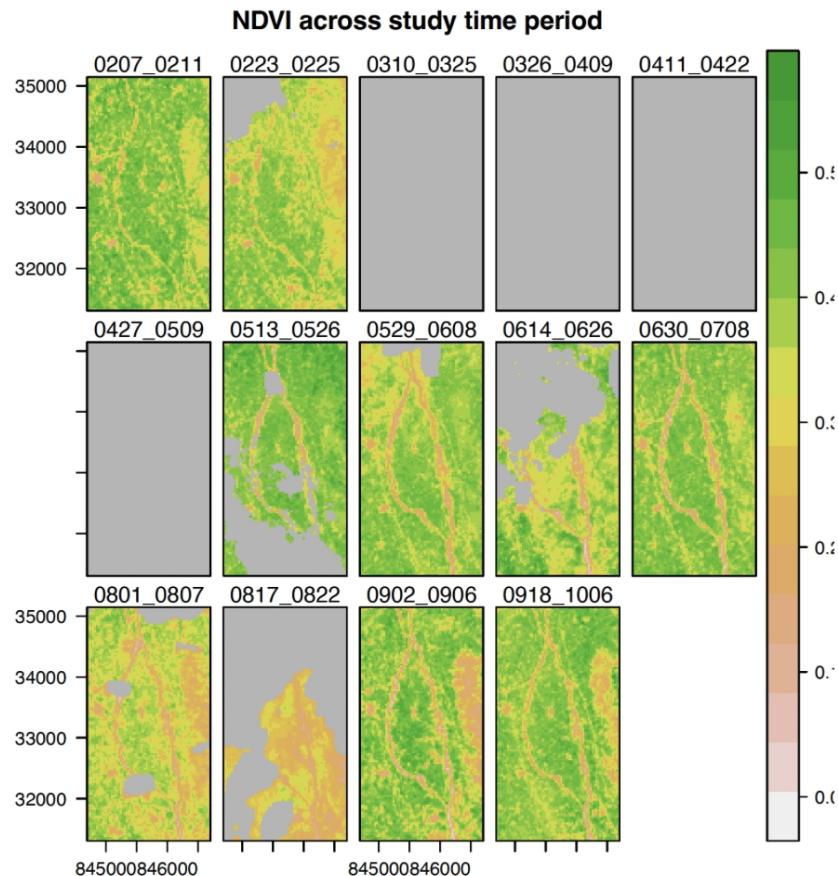
Odds of Diarrheal Disease Incidence



Density of deep tubewell use

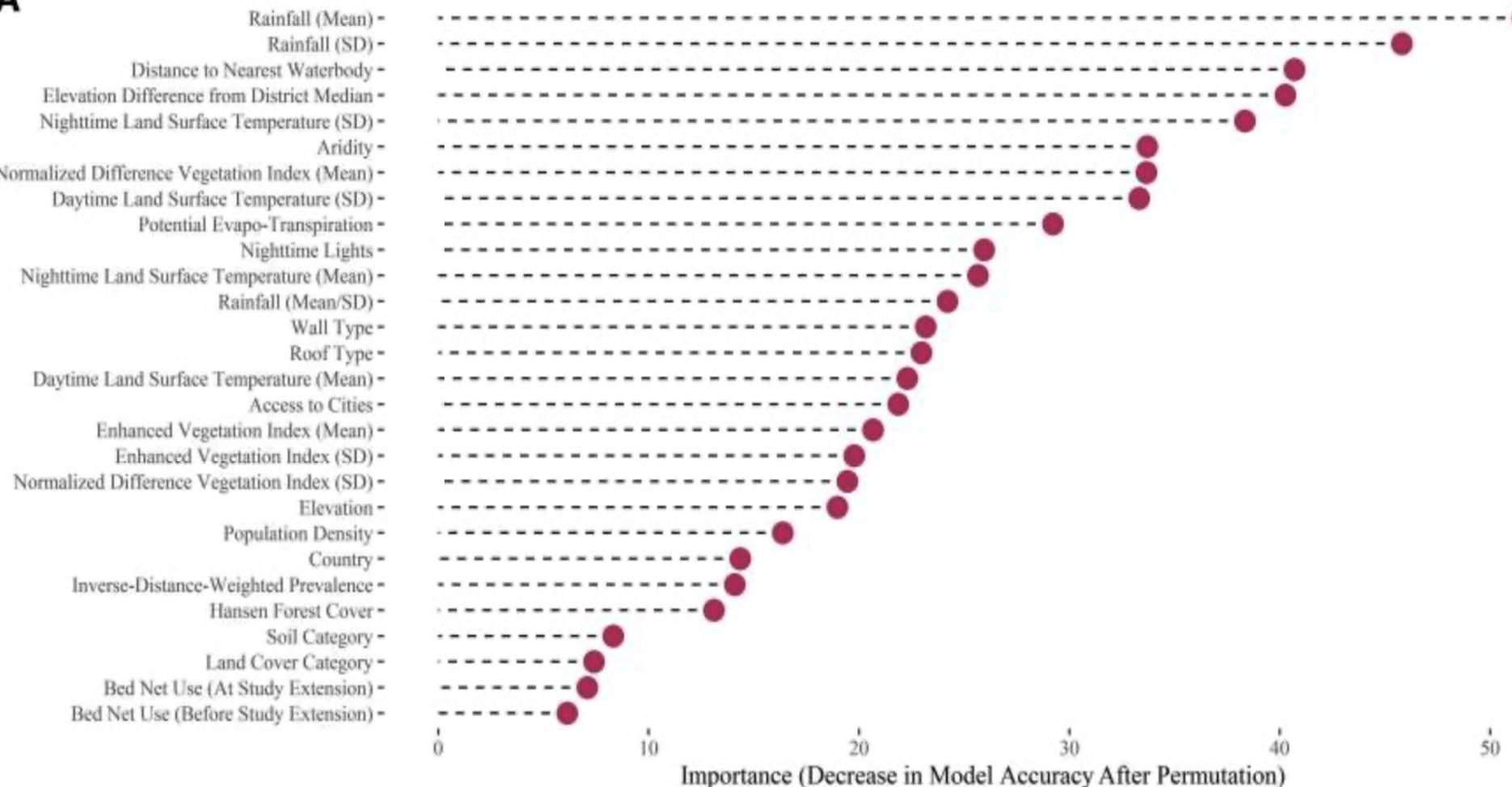


Explanation

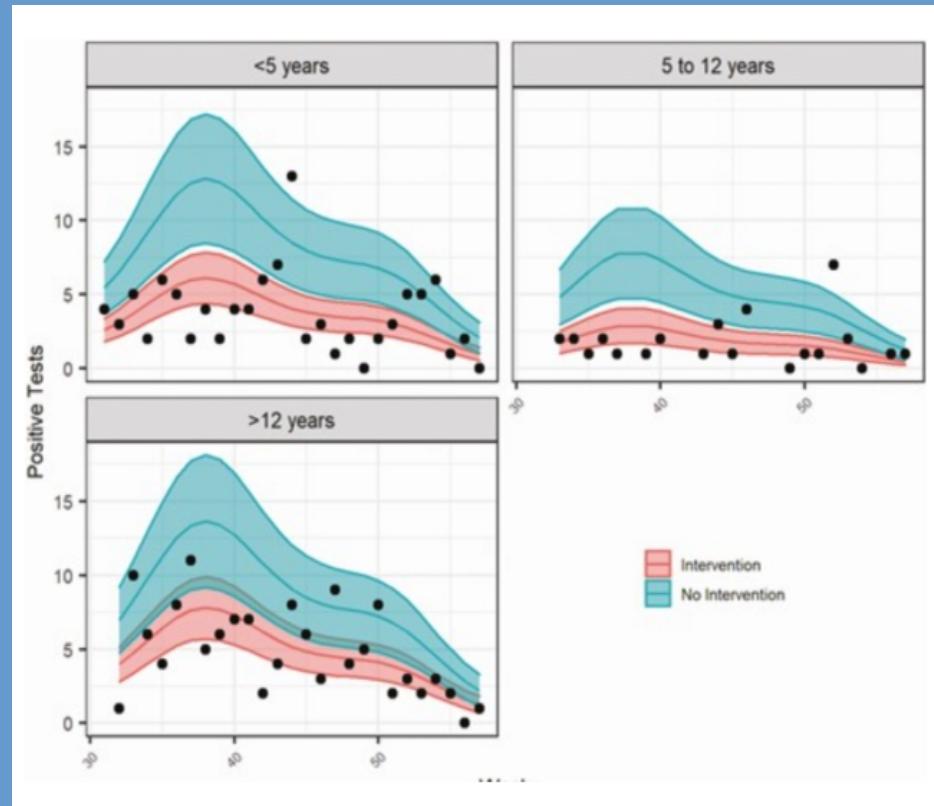


Prediction

A



Intervention evaluation



Questions in Health Geography

- Other questions in Geography
 - Effects of space?
 - The role of distance
 - Outcomes due to location/distribution
 - Place?
 - Factors (e.g., objects, landscapes, ideas) that interact to create a place
 - How do people experience place?

Health Geography

- Collaboration!
 - Multidisciplinary opportunities
 - I have worked on health-related research with...
 - Geographers, epidemiologists, physicians, geneticists, health policy researchers, civil engineers, statisticians, atmospheric physicists, policy makers, other awesome people, and politicians.. . .

Keywords

- Health
- Health geography