Spatial Structures in the Social Sciences
2021 Summer GIS Institute

Final Presentation Program

May 7, 2021

All times indicated are in Eastern Time (ET)

9:30 – 9:40 am	**Opening Remarks**
9:40 – 10:40 am	**Session I:** GIS and Health I
11:00 am – 12:00 pm	**Session II:** GIS Applications in the Social Sciences I
12:00 – 1:00 pm	**Lunch Break**
1:00 – 1:40 pm	**Session III:** GIS and Health I
2:00– 3:20 pm	**Session IV:** GIS Applications in the Social Sciences II & Humanities
3:20 – 3:30 pm	Certificate Presentation & **Closing Remarks**

PARTICIPANTS

Haley Adrian (School of Public Health)

Karolina Dos Santos (Sociology)

Jill C. Heathcock (Hassenfeld Child Health Innovation Institute)

Sophia A. Higgerson (History of Art and Architecture)

Aarushi Kalra (Economics)

Geetika Nagpal (Economics)

Hyesung Oh (School of Public Health)

Yunyu Shu (Economics)

Rachel M. Thimmig (Anthropology)

Yuk Ping Wan (History)

Xiao Wang (School of Public Health)

Oliver J. Wisco (Warren Alpert Medical School)

PROGRAM

SESSION I:

GIS AND HEALTH I

[9:40am] Hyesung Oh, *Hospital mergers and their geographic relation to skilled nursing facilities*

[10:00am] Haley Adrian, *Spatial Analysis of HIV Clinics and HIV Hot Spots along the Trans-African Highway in Eastern Uganda*

[10:20am] Jill C. Heathcock, *Considering the Physical Environment and Participation in Different Delivery Models of Physical Therapy in Children with Cerebral Palsy*

BREAK, 10:40 – 11:00 AM

SESSION II:

GIS APPLICATIONS IN THE SOCIAL SCIENCES I

[11:00am] Aarushi Kalra, *Hate Speech on Social Media*

[11:20am] Yunyu Shu, *Local favoritism and environmental regulation*

[11:40am] Geetika Nagpal, *Let the Water Flow: Effects of Electrification on Agriculture*

LUNCH BREAK, 12:00 – 1:00 PM

SESSION III:

GIS AND HEALTH II

[1:00pm] Xiao Wang, *Identifying Nursing Home COVID-19 Outbreak Hot Spots*

[1:20pm] Oliver J. Wisco, *Predictive Modeling of Advanced Skin Cancer Risk in the United States, A Geospatial Risk Analysis*

BREAK, 1:40 – 2:00 PM

SESSION IV:

GIS APPLICATIONS IN THE SOCIAL SCIENCES II & HUMANITIES

[2:00pm] Karolina Dos Santos, *Wards of Action: Citymaking in Newark, New Jersey*

[2:20pm] Sophia A. Higgerson, *New Town, Old Character: Cologne's Neustadt Today*

[2:40pm] Rachel M. Thimmig, *Situating On- and Off-Reservation Sites within the Hidatsa World: A Multi-Scalar Study of Indigenous Villages on the Northern Plains*

[3:00pm] Yuk Ping Wan, *The relationship between environment and the distribution of settlements in Lingyuan County, Hunan Province during Han China (202 BC to 220 AD)*

PRESENTATION ABSTRACTS

Haley Adrian – Spatial Analysis of HIV Clinics and HIV Hot Spots along the Trans-African Highway in Eastern Uganda

In sub-Saharan Africa, long-distance truck drivers (truckers) and their sexual partners are disproportionately affected by HIV compared to the general population. Studies estimate that the HIV prevalence rate among truckers in Uganda ranges between 25% - 32%. This heightened risk for acquiring and transmitting HIV among truckers is largely influenced by their highly mobile lifestyle, routine accessibility to commercial sex along major transport corridors, and unmet need for health care services. Despite this knowledge, recent literature and health interventions targeting these key populations has been limited. Using data collected by Dr. Shanti Parikh at the University of Washington in St. Louis, this spatial study aims to map government-affiliated HIV clinics and major truck stops along the Trans-African highway in the Busoga subregion of Eastern Uganda. Using network analysis, we will explore the relationship between the distance from truck stops to HIV clinics, and antiretroviral therapy (ART) enrollment rates among male clients. Additionally, density estimation mapping and average nearest neighbor tools will be utilized to understand further analyze spatial patterns and relationships between our point and clinic-level HIV data. This exploratory study will provide important preliminary and previously unknown insights necessary to further inform targeted HIV prevention, care and treatment interventions for truckers and their sexual partners.

Karolina Dos Santos – Wards of Action: Citymaking in Newark, New Jersey

Latino immigrants are increasingly moving to post-industrial, Black majority cities in the East and Midwest. Despite the trend of Latinos and African Americans increasingly living in the same cities, there is a tendency to look separately at how these groups move within cities. Thus, I ask, "How have Newark, New Jersey's racial demographics changed from 1970 to 2010?" I use census data to better visualize which census tracts in the city have become more Latino, African American, and more interracial (African American and Latino) over the past forty years.

Jill C. Heathcock – Considering the Physical Environment and Participation in Different Delivery Models of Physical Therapy in Children with Cerebral Palsy

Children with cerebral palsy (CP) and those with special health care needs often receive physical therapy services in different dosing models. Comparing the effectiveness of focused intense periodic therapy and usual weekly therapy in managing cerebral palsy in children (verbatim) is one of the Institutes of Medicine's Top 100 priorities (2009). Delivering a physical therapy treatment in a short intense burst has been studied experimentally and used pragmatically with positive results on health and motor function. We geocoded locations of participants who received physical therapy services delivered in a model of care that was both high-frequency (daily) and high-intensity (multiple hours per day) for at least 2 weeks. Location of hospital systems, distance needed to travel to treatment, and motor skills were considered. Health care delivery for children with disabilities are an understudied area but the real significance is that high dosage programs likely improve gross motor skills more rapidly than a spread out model of care. Access to care, transportation, and electronic scheduling are likely contributing factors to how children with CP access high dosage models. This means that objective information on the physical environment may impact on how health services are delivered ultimately improving motor function, independence, and quality of life for patients and families.

Sophia A. Higgerson – New Town, Old Character: Cologne's Neustadt Today
My project aims to spatially analyze the continued historic character of Cologne's Neustadt or "new town", an urban extension built in a semi-circle around the German city's historic core at the end of the 19th century. The urban extension was designed and executed by the urban planner Josef Stübben, who was an extremely prolific urban planner across Germany well through the early 20th century but who is significantly under-researched, likely due to the impression that his designs were less innovative and more reflective of prevailing urban design trends. By creating less dense residential neighborhoods, increasing access to green space, and constructing public amenities like baths and schools, Stübben aimed to create a social, morally edifying urban environment that would improve on the cramped, crowded conditions of Cologne's ancient urban center, or Altstadt.
"Cologne's Neustadt Today" aims not only to understand the spatiality of this 19th century urban extension, but also how the character that Stübben designed for this space has continued (or perhaps disappeared) in the modern era. By assessing population and building density, building age across the city, access to green space, the concentration of public amenities, and the spatial geometry of the extension's streets and housing blocks, I will analyze whether Stübben's grand ring design and spacious neighborhoods have been maintained, and how the population of Cologne might hypothetically interacts with them.

Aarushi Kalra – Hate Speech on Social Media
We seek to understand the economic reasons behind propagation of hate speech on social media, using a novel data set from a hugely popular content generation app in India. Our research question is: *How do economic changes within and across social groups change user engagement with hateful content that is directed towards vulnerable groups?*
Our objective is to draw causal inference about the relationship between socio- economic indicators of users and their engagement (likes/ comments/ shares) with hateful content. In order to do this, we link shocks to socio-economic status at neighborhood levels (which are segregated along communal lines) to measure the causal effect of inter-group inequality on hate speech. One such shock to economic status is the closure of neighborhoods in Mumbai due to COVID outbreaks. Using GIS, we check whether neighborhoods designated as COVID containment zones in Mumbai were producing more hate speech against minority communities.

Geetika Nagpal – Let the Water Flow: Effects of Electrification on Agriculture
Over one billion people worldwide live in rural areas without access to electricity. In developing countries, while governments use electrification programs to stimulate non-agricultural employment, they may also have benefits for the agricultural sector. We estimate the impacts of India's large-scale rural electrification program on agricultural output using a difference-in-difference design and a combination of administrative and satellite data. We find that electrification leads to a xx% increase in agricultural output which is largely driven by the rain-fed summer cropping season. Agriculture in electrified villages becomes less sensitive to rainfall shocks, which is of growing importance given worsening environmental conditions. We provide suggestive evidence that this decline in sensitivity is due to an increase in the uptake of electric shallow tube wells, particularly at the intensive margin.

Hyesung Oh – Hospital mergers and their geographic relation to skilled nursing facilities
The health care industry is consolidating at a quickening pace. In the last 20 years, hospital mergers have been a driving force behind increased health care prices, utilization, and expenditures. While there has been extensive research analyzing the direct effect of these horizontal integrations (defined as mergers between firms that serve the same function) on patient outcomes, there have been no studies to date analyzing the effect of hospital mergers on skilled nursing facility (SNF) referrals and processes. SNFs rely on hospitals to refer patients who require post-acute care (PAC) after hospital admission. Approximately 19% of all Medicare discharges result in a referral to SNFs and, in 2019, Medicare spent approximately $46billion on fee-for-service SNF care. Understanding how hospital consolidation might affect downstream SNF processes is thus crucial for policymakers and health care industry leaders to understand. For this project, I will study whether there are any geospatial relationships between hospital merger activity and local SNF bed supply using data from the Online Survey Certification and Reporting (OSCAR) system, the American Hospital Association (AHA), and publicly-available hospital merger indicator data. Because there is much heterogeneity of hospital/SNF markets across the US, I will first map the number of hospital mergers and SNF bed supply within each county in the US for each year. I will then calculate the average distances of acquired hospitals to its nearest SNF within each county. I will finally calculate local indicators of spatial autocorrelation (LISA) of the metric, "hospital mergers SNF bed per 1000 Medicare beneficiaries", among others. These spatial analyses will help me understand whether any regions were showing high levels of hospital merger activity relative to local SNF bed supply over time.

Yunyu Shu – Local favoritism and environmental regulation
In this paper, I examine how city leaders' hometown favoritism affect the local environmental regulation stringency and pollution among different border polluting firms within their jurisdictions. Since industrial pollution produced in upstream areas is transported by rivers to downstream areas and can harm downstream residents, if city leaders care more about the environmental welfare in their hometowns than people elsewhere, I hypothesis that: given the existing polluting firms, when facing more environmental regulation pressure from the central government, polluting firms located in the borders upstream of city leaders' hometowns face more stringent regulation from the local government and produce fewer pollution emissions compared to those in non-home upstream border areas. To test this main hypothesis, my main identification strategy relies on the construction of spatial treated (Home) and control (nonhome) buffer areas centered around river exit points in each city using ArcGIS. More specifically, I first spatially match prefectural city boundaries with river networks and DEM elevation data to identify the river flow direction and then the upstream or downstream relationship across cities connected by rivers. Second, by matching the local leader's home city with downstream destination cities for each given city, I construct the key uphome indicator for each downstream buffer segments. Last, I identify the polluting firms located in these downstream buffer segments and combine the information for firm pollution behavior. Based on the preliminary analysis, I find no significant heterogeneity in pollution intensity for firms upstream of local leader's hometowns compared to those upstream of nonhome cities.

Rachel M. Thimmig – Situating On- and Off-Reservation Sites within the Hidatsa World: A Multi-Scalar Study of Indigenous Villages on the Northern Plains

Much of what we know archaeologically about the Reservation Period (1850s-present) on northern Plains village groups like the Mandan, Hidatsa, and Arikara, come from government-sponsored salvage excavations conducted in the 1940s. The resulting reports are primarily based on acculturative approaches, which assess the relative loss of Indigeneity and growing Europeanization based on ratios of 'European' objects and traditional 'Native' artifacts. Over 150 of these sites lie beneath Lake Sakakawea. They are understood by archaeologists as some of the last remaining settlements within a larger refuge area thought to be where Native culture succumbed to assimilative forces. However, ethnographic and ethnohistorical records indicate a continuation of traditional cultural practices, and recent anthropological studies have shown that the MHA's relocation to what is now the Garrison reservoir area fit within their ancient patterns of migration. This research is a multi-scalar spatial examination of site locations within Hidatsa conceptual landscape, the organizational layout of communities, and areas of use within structures. Through the utilization of spatial analysis, this project hopes to break free of the previous archaeological assumptions supporting Native culture disappearance and add to the growing literature of Native survivance and perseverance during this tumultuous time.

Yuk Ping Wan – The relationship between environment and the distribution of settlements in Lingyuan County, Hunan Province during Han China (202 BC to 220 AD)

The Chinese ancient silk maps unearthed from the early Western Han tomb (dated 168 BC) at Mawangdui site (Changsha, Hunan Province) were the earliest known Chinese maps. Among the three ancient silk maps, the topographic map depicted the southern part of the Changsha Kingdom within the Han China, which revealed that the settlements were distributed along the riverbank of the tributaries of Shenshui River. In order to verify the settlement patterns in the ancient map and their relationship with the rivers and mountains, it is essential to figure out the location and distribution of Han settlements with the textual materials and archaeological findings. Since the whole project is still in the stage of literature review and data collection, therefore, this presentation will try to explain with a regional case study. I will mainly focus on the Lingyuan County, Changsha where is part of the region covered by the ancient maps, so as to examine the relationship between environment and the distribution of settlements in Lingyuan region during Han China (202 B.C. to 220 AD).

Xiao Wang – Identifying Nursing Home COVID-19 Outbreak Hot Spots

Although emerging research has identified individual-level and facility-level risk factors for nursing home COVID-19 outbreaks, more research is needed to understand the community risk factors for nursing home COVID-19 outbreaks. This project serves as the first step to studying community risk factors by identifying nursing home COVID-19 outbreak hot spots at the zip code level, with three aims: 1) locate hot spots after accounting for the non-random distribution of nursing homes at the zip code level; 2) describe the trend of hot spots from June 2020 to February 2021; 3) describe community characteristics of hot spots with nursing home COVID-19 outbreaks.

Weekly nursing home COVID-19 reports are obtained from the Center for Medicare/Medicaid Services. Neighborhood characteristics at the level of zip code (e.g. racial/ethnic composition, household income, household size, education, unemployment rates, commuting methods) are from the American Community Survey. Nursing home facility-level data comes from Nursing

Home Compare. County-level COVID-19 infection and death reports come from USAfacts. Zip-code and county shapefiles are from the Census. The sample included 15,146 nursing homes in the United States. Nursing homes in Alaska, Hawaii, Puerto Rica, and Guam (N=71) were excluded. We further excluded 141 nursing homes that didn't report any data from June 2020 to February 2021. Nursing Home COVID-19 outbreak was defined using the definition of Center for Medicare and Medicaid Services: "greater than 1 confirmed case per 10 certified beds or greater than 1 total confirmed and suspected cases per 5 certified beds or greater than 10 deaths". Four data points were chosen to describe the development of hot spots: June 28, 2020, August 30, 2020, December 28, 2020, February 28, 2021. Nursing homes are first geocoded based on the address. Local Moran's I will be used to detect spatial auto-correlation. Geospatial hot spot analysis (Getis-Ord Gi*) will be applied to identify statistically significant hot spots with high nursing home COVID-19 death rates at the zip code level.

Oliver J. Wisco – Predictive Modeling of Advanced Skin Cancer Risk in the United States, A Geospatial Risk Analysis

In the US, there is a significant skin cancer burden of disease that is driving healthcare costs and care utilization. Considerable advancements have occurred in treatment modalities, lessening morbidity and mortality. However, although this progress on "how to better treat our patients" is improving the burden of disease, further work must be dedicated to identifying at-risk populations to focus interventions more precisely. The issue of "who should be the focus of our treatment" must be more comprehensively addressed. The skin cancer community has a relatively good understanding of the risk factors that lead to the occurrence of disease, but there is limited knowledge on how to predict who will present with advanced disease. As with many other disease processes, one of the primary issues leading to increased skin cancer morbidity and mortality is the delay in seeking care. Currently, there is a gap in our understanding on how access-to-care barriers serve as risk factors, or magnify the traditional risk factors, that influence the development of advanced disease.

To address this issue, the objective of this study is to identify the populations of patients in the United States that are at greatest risk for advanced stage skin cancer. We will use skin cancer, US census, and public health larger open-source data sets to perform multivariate and geospatial analysis to identify at-risk populations. By examining access-to-care risk factors and how they relate geographically, we hope to better focus care on identified high-risk populations. In addition, through this population-level data analysis, an opportunity also arises to identify where data gaps exist that could be addressed through a larger multidisciplinary cutaneous oncology database. Upon completing this analysis, a proposal to develop a GIS component with a comprehensive risk-focused data dictionary for a Brown multidisciplinary cutaneous oncology database will be formulated. This work will set the stage for a future planned retrospective study utilizing patient level data in RI.