

Spatial Structures in the Social Sciences 2021 Winter GIS Institute

Final Presentation Program January 15, 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 Applications in the Social Sciences II
2:00– 3:00 pm	Session IV: GIS Applications in the Social Sciences III & Humanities
3:20 – 4:00 pm	Session V: GIS and Health II
4:00 – 4:15 pm	Certificate Presentation & Closing Remarks

PARTICIPANTS

Josepha Cabrera (School of Public Health)

Francesco Ferlenga (Economics)

Rachel Gaither (School of Public Health)

Janelle K. Haire (Education)

David J. Herrera (Political Science)

Alexandria N. Macmadu (School of Public Health)

Sara Mohr (Egyptology and Assyriology)

James R. Morden (School of Public Health)

Jon M. Nelson (Sociology)

Shayla L. Nolen (School of Public Health)

Christopher M. Woods (Political Science)

Rachel R. Yorlets (School of Public Health)

Callista C. Zingas (School of Public Health)

PROGRAM

SESSION I:

GIS AND HEALTH I

[9:40am] Shayla L. Nolen, *Naloxone Coverage Equity for the Prevention of Opioid Overdose Fatalities in Racial Minority Communities*

[10:00am] Josepha Cabrera, *The spatial distribution of adult tooth loss severity in Rhode Island*

[10:20am] Rachel R. Yorlets, *The impact of migration on accuracy of self-reported HIV status in South Africa*

BREAK, 10:40 – 11:00 AM

SESSION II:

GIS APPLICATIONS IN THE SOCIAL SCIENCES I

[11:00am] Christopher M. Woods, *Spatial Associations of Household Indebtedness and Right-Wing Populism*

[11:20am] Francesco Ferlenga, *Vote early and vote often? Detecting electoral fraud from the timing of 19th century elections*

[11:40am] Jon M. Nelson, *Federal Flood Mitigation Policy and Inequality*

LUNCH BREAK, 12:00 – 1:00 PM

SESSION III:

GIS APPLICATIONS IN THE SOCIAL SCIENCES II

[1:00pm] Callista C. Zingas, *Examining third grade RICAS student scores based on school location in Rhode Island*

[1:20pm] James R. Morden, *In Pursuit of a Public Health Approach to Chemicals Management: A spatial analysis of current health effect distribution and key populations in Ontario*

BREAK, 1:40 – 2:00 PM

SESSION IV:

GIS APPLICATIONS IN THE SOCIAL SCIENCES III & HUMANITIES

[2:00pm] Sara Mohr, *The spatial distribution of participants in the annual meeting of the American Society of Overseas Research (ASOR), 2010-2019*

[2:20pm] Janelle K. Haire, *Examining local access to early childhood education in Providence, Rhode Island*

[2:40pm] David J. Herrera, *Assessing Patterns of Inequality: Race, Voting, and Toxic Air Pollution in California*

BREAK, 3:00 – 3:20 PM

SESSION V:

GIS AND HEALTH II

[3:20pm] Rachel Gaither, *A spatial approach to birth outcomes disparities in Rhode Island: preliminary sociodemographic analysis*

[3:40pm] Alexandria N. Macmadu, *Neighborhood characteristics and buprenorphine prescribing during the COVID-19 pandemic*

PRESENTATION ABSTRACTS

Josepha Cabrera – The spatial distribution of adult tooth loss severity in Rhode Island

Overall, oral health in the U.S has improved, however, susceptible groups continue to suffer from unfortunate consequences due to poor oral hygiene. Practicing good oral hygiene is beyond maintaining healthy teeth, rather, it is vital to take care of all parts of the face including the head, skull, gums and tissues. Diet, nutrition, sleep, psychological status, social interaction, school, and work are affected by impaired oral health through a compromised ability to bite, chew, and swallow foods. Adults who do not practice good oral hygiene are susceptible to oral diseases such as dental caries, tooth loss, periodontal disease, diminished salivary function, orofacial pain, and oropharyngeal cancer. Access and affordability are major influences in regards to oral health care. We will use data from the Rhode Island 2018 U.S Behavioral Risk Factor Surveillance System (BRFSS) to determine the spatial distribution of adult tooth loss severity in Rhode Island by ZIP code tabulation areas. Through a series of descriptive and spatial analysis, we demonstrate the variations in tooth loss severity due to decay or gum disease and explore possible associations between various socio-demographic factors in areas where tooth loss is severe.

Francesco Ferlenga – Vote early and vote often? Detecting electoral fraud from the timing of 19th century elections

The existence of voting fraud in the 19th century United States is widely documented by journalistic evidence, but we lack statistical evidence to properly assess its relevance and impact on the electoral process. In a setting where transportation was slow, the non-synchronous and state-specific timing of US presidential elections allowed "repeaters" to move from one state to another, and cast multiple illegal votes. Using a spatial network analysis, I exploit the progressive expansion of the US railroad system (the means of transportation most used by repeaters) and the progressive synchronization of election dates across states to evaluate the "size" of the fraudulent vote. I use a diff-in-diff methodology and compare railway-connected counties to the unconnected ones, before and after synchronization. I find a XX percentage point increase in turnout in treated countries, which is imputable to voting fraud.

Rachel Gaither – A spatial approach to birth outcomes disparities in Rhode Island: preliminary sociodemographic analysis

There is evidence that neighborhood-level variation of social and environmental factors is associated with adverse birth outcomes. Birth outcomes disparities are well characterized on a national level, but Rhode Island-specific analyses have not been done, particularly with a spatial approach. This project aims to analyze sociodemographic differences by neighborhood in RI (race, ethnicity, income, education, housing, health insurance, etc.) and assess how these social determinants of health may produce disparities of reproductive outcomes like preterm birth, low birth weight, stillbirth, and infant mortality. We seek to produce actionable information about populations and neighborhoods with disproportionate burdens of adverse reproductive outcomes. This is particularly salient because race-based income inequality in the Providence area is among the highest in the nation and thus represents a major public health challenge.

Since this project is in its very early stages, we do not yet have access to the geocoded reproductive outcomes data necessary to complete the full analysis. For the purposes of the GIS Institute, I will be conducting a preliminary analysis using census tract- and block group-level demographic data from the 2018 American Community Survey (provided by Brown's

Hassenfeld Institute without needing a formal data request) and tract-level general health outcomes data from the 2016 Behavioral Risk Factor Surveillance System (data publicly available as part of the CDC's 500 Cities initiative). I will eventually apply the analytic methods presented here towards the reproductive data, when available, to create a fuller picture of the scope of spatial birth outcomes disparities in Rhode Island.

Janelle K. Haire – Examining local access to early childhood education in Providence, Rhode Island

On November 1st, 2019, Rhode Island's Providence Public School District (PPSD) was taken over by the state's education agency, the Rhode Island Department of Education (RIDE). This unprecedented takeover is largely in response to the publication of a scathing Johns Hopkins Report on the district, released just five months earlier. RIDE's turnaround action plan outlines the district's goals to achieve transformative change in Providence's school system.

One major goal is to increase the number of four-year-olds enrolled in high quality pre-k from less than 1% to at least 20% by school year 2024/2025. In turn, district administrators and local experts are drafting a pre-k expansion plan to adequately and equitably fulfill this goal. The research I will present today serves to inform PPSD's pre-k expansion plan which must include programmatic goals and facilities needs. By incorporating spatial analysis in my examination of the current state of pre-k in Providence, I will be able to examine pre-k availability and accessibility across the district.

David J. Herrera – Assessing Patterns of Inequality: Race, Voting, and Toxic Air Pollution in California

Air pollution continues to be unevenly distributed within U.S. states. Studies on environmental justice have repeatedly found that toxic pollution can differently affect disadvantaged individuals and communities based on race. At the same time, social scientists have pointed out that uncovering environmental inequalities is not easy, especially when it comes to measuring the level of pollution affecting vulnerable communities. Research cannot always confirm where and how pollution impacts individuals because of various factors including wind speed, type of pollutant, the amount of toxic release, and combination of different pollutants. However, further research could explore where polluting facilities are located and who live near these facilities. By using the most recent Census and EPA data, this study will assess the relationship between race, voter turnout, and the location of environmental pollutant facilities in California. In evaluating race and voter turnout, this study aims to explore whether underprivileged communities, such as African Americans and Latinos, are more likely to live near polluting facilities and exercise their political power less than other communities within the state. Understanding where environmental inequalities are occurring within California can help inform decision making on future placement of toxic facilities and policy on where political empowerment needs to be improved.

Alexandria N. Macmadu – Neighborhood characteristics and buprenorphine prescribing during the COVID-19 pandemic

Across the United States, COVID-19 pandemic is colliding with and accelerating the ongoing epidemic of drug overdose death. The economic, social, and psychiatric repercussions of the COVID-19 pandemic—including lost wages, social isolation, and eroded mental health—have disrupted drug use patterns and greatly increased drug overdose risk. In Rhode Island, the final count of overdose deaths in 2020 are projected to exceed the highest year on record by 20%.

Medications for opioid use disorder, such as buprenorphine, dramatically reduce overdose risk. However, the pandemic has also disrupted traditional health care delivery methods, limiting access to treatment through established care settings. In light of the accelerating and rapidly evolving syndemics of overdose and COVID-19, we propose to examine spatiotemporal patterns of buprenorphine prescribing from January 1, 2019 to July 31, 2020. We hypothesize that specific neighborhood characteristics (including race, income, COVID-19 burden, and population density) will be associated with reductions in the per capita buprenorphine prescribing rate. The finds from this analysis may be used to inform new strategies to proactively identify communities most at risk for drug-related harms and to allocate resources more effectively and efficiently to curb drug overdose deaths.

Sara Mohr – The spatial distribution of participants in the annual meeting of the American Society of Overseas Research (ASOR), 2010-2019

In the field of Near Eastern Studies, the newly renamed American Society of Overseas Research (ASOR) is one of the most widely attended conferences by researchers and students. Though based in the United States, the ASOR annual meeting attracts attendees from all over the world. Each year, the location of the conference moves to a different US city. These locations may repeat themselves, but they are never the same as the year before, usually announced before the call for session and papers. An express goal of the ASOR annual meeting organizers is to increase the diversity of locations from which attendees come with a specific focus on the Middle East. How is this goal affected by the location of the conference? Can spatial analysis give insights into the annual meeting location that best allows for scholars from the Middle East to attend? This project explores the relationship between the diversity of meeting attendees and the location of the annual meeting. What factors related to space and location make for ease of access to the annual meeting? Using publicly available data from the ASOR meetings from 2010 through 2019, this presentation will apply spatial analysis to the self-reported affiliations of each presenter as a possible measure of accessibility.

James R. Morden – In Pursuit of a Public Health Approach to Chemicals Management: A spatial analysis of current health effect distribution and key populations in Ontario

According to the World Health Organization, 22% of deaths globally can be attributed to the Environment with 4.2 million deaths globally related to exposure to ambient air pollution, and 4.9 million deaths annually related to environmental exposures related to chemicals. In pursuit of a Public Health Approach to Chemicals Management, defined as an approach to chemicals management that aims to tie risk of specific diseases or health outcomes to chemical management actions (i.e. research, monitoring, risk management, etc), this analysis aims to aid Health Canada's Office of Environmental Health in identifying populations of interest and concern. Given that Ontario is Canada's most populous province, this analysis highlights disease prevalence and other socio-demographic data in relation to local-integrated health networks that will enhance future coordination and work. This analysis uses data from Statistics Canada, GeoHub Ontario, and the Ontario Communities Health Profile Partnership to showcase Ontario's unique population health and life metrics. This exploratory and foundational work will enhance the Office of Environmental Health's efforts in pursuing a public health approach by highlighting key stakeholders at the provincial and sub-provincial level and may serve as the basis for future informant interviews, stakeholder development, and strategic planning.

Jon M. Nelson – Federal Flood Mitigation Policy and Inequality

As part of its flood mitigation efforts, the Federal government offers discounts on flood insurance to policyholders in communities that join the Community Rating System (CRS). I have found that participation in the CRS in New England is more likely among better resourced municipal governments. Because government resources in New England are based to a large degree on property taxes, I examine the association between property values at risk of flooding and CRS participation. Specifically, I combine a number of spatial datasets to create an index that compares a census block group's vulnerability to flooding and the risk posed to the town by losses in the block group. I then examine the relationships between these values and participation in the CRS.

Shayla L. Nolen – Naloxone Coverage Equity for the Prevention of Opioid Overdose Fatalities in Racial Minority Communities

Opioid-related overdose death rates continue to rise in the U.S., especially in municipalities with high proportions of non-white residents. Our objective was to determine if municipalities with high percentages of non-white residents have equitable access to community-based distribution of naloxone. We used community-based naloxone data from the Massachusetts Department of Public Health (MDPH) and the Rhode Island Non-Pharmacy Naloxone Distribution program for 2016-2018. We obtained publicly available opioid-related overdose death data from Massachusetts and from the Office of the State Medical Examiners in Rhode Island. We defined the naloxone coverage ratio as the number of naloxone kits distributed and received by a resident in a municipality divided by the number of opioid-related overdose deaths among residents created for each municipality and updated annually. We then determined if there was variation in naloxone coverage by municipal racial/ethnic composition. We hypothesized that municipalities with higher proportions of non-white residents would have lower naloxone coverage ratios.

Christopher M. Woods – Spatial Associations of Household Indebtedness and Right-Wing Populism

The 2010 midterm elections saw 129 Tea Party candidates run for the US House of Representatives employing messaging around reducing government spending, cutting the national deficit, and shrinking government, among other cultural and social positions that placed these insurgents further to the right than traditional republicans. The political science literature often tries to explain the Tea Party movement, and related modern political phenomena on the right like Brexit, Trumpism, and the Freedom Caucus, with either a cultural or an economic lens. While not mutually exclusive, the cultural explanations give primacy to racism, xenophobia, and nationalism, whereas the economic explanations focus more on anxiety and anger produced by globalization, the decline in unions, and stagnant wage growth over the past half-century. This project does not seek to weigh in on the debate between cultural and economic drivers, but looks to employ a spatial analysis to contextualize the role of household indebtedness in the rise in right wing populism, proxied by Tea Party candidates in the 2010 election. The hypothesis of this project is that household indebtedness is regionally clustered and associated with more Tea Party candidates seeking office to greater success than non-Tea-Party Republicans. This work will conduct indebtedness cluster analysis and spatial correlation between debt and Tea Party success in seeking federal office.

Rachel R. Yorlets – The impact of migration on accuracy of self-reported HIV status in South Africa

South Africa's HIV epidemic is shaped by its high prevalence of employment-driven circular migration. Migrants are at high risk of HIV and attrition across the care cascade and could more readily be linked to care if self-report of HIV proved a valid surrogate for biomarker testing. We hypothesize that migrants will be less likely than residents to accurately self-report HIV status, and that persons (regardless of migration status) who accurately self-report will be geographically clustered.

This analysis utilizes data from the first wave (n=3103) of The Migration and Health Follow-Up Study, a five-year longitudinal cohort of circular migrants and residents aged 18–40 years randomly sampled from the Agincourt Health and Demographic Surveillance System in the Agincourt sub-district of Mpumalanga province, South Africa. Interviews collected sociodemographic data, self-reported HIV status, and blood for HIV testing. We calculated sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of self-report (n=1911) and created a multivariable log-binomial regression model (n=485).

We will create a descriptive visualization of participants' current residences, defined as where they have slept the last four to five nights, using a population density map. We will then evaluate the proportion of persons with HIV who accurately self-reported their HIV status to determine if there is a clustering of accurate reporting; we will use spatial autocorrelation (Global Moran's I). If there is evidence of clustering, we will utilize local indicator of spatial association (LISA) mapping to determine where the clusters occur geographically.

Sensitivity of self-report was 44.1% (95% CI: 39.7–48.7), PPV was 93.5% (95% CI: 89.5–96.0), specificity was 99.0% (95% CI: 98.3–99.4), and NPV was 83.9% (95% CI: 82.8–84.9). Among persons with HIV (PWH), migrants were more likely than residents to accurately self-report HIV status (RR: 1.33, 95% CI: 1.09–1.62), and respondents who utilized formal health care for any reason were more than twice as likely to accurately self-report (RR: 2.40, 95% CI: 1.70–3.37) when adjusting for confounding.

Self-report of HIV-positive status is predictive of true HIV status, but most PWH do not report as HIV-positive. Migrants are more likely to accurately self-report than residents. This has important implications for field research and clinical settings in which biomarker confirmation is unavailable or in situations where migrants seeking care may not have documentation of HIV status. These findings support immediate policies to link migrants who report as HIV-positive directly to care without confirmatory testing or medical documentation of status; those who report as HIV-negative require confirmatory testing. Additional interventions are needed to address the complex barriers that prevent PWH from accurately disclosing status.

Callista C. Zingas – Examining third grade RICAS student scores based on school location in Rhode Island

The purpose of this spatial analysis research is to determine whether the third grade RICAS English and language arts scores of students in Rhode Island are clustered similarly based on school location, and if so, if these locations share common demographic and socioeconomic information. This research will attempt to show the spread of educational inequality in Rhode Island as it has been previously shown recently that spatial wealth and inequality have the ability to affect school performance in other areas such as Australia (Smith 2018). To inform further policy, spatial mapping of these scores can identify which neighborhoods are struggling the most in terms of school readiness and resources can be allocated accordingly.