Spatial Structures in the Social Sciences
2017 Winter GIS Institute

Final Presentation Program

January 20, 2017 Population Studies and Training Center
Seminar Room

9:30 – 9:45 am	**Welcome**
9:45 – 11:00 am	**Session I:** **Space in the Human and Natural Worlds**
11:00 am – 11:45 pm	**Session II:** **Sexual Behavior and Health**
11:45 am – 1:00 pm	**Lunch**
1:00 – 2:00 pm	**Session III:** **Access to Care and Health Outcomes**
2:00 – 2:45 pm	**Session IV:** **Surveillance, Government Oversight, and Space**
2:45 – 3:00 pm	Certificate Presentation
3:00 pm	Close of Conference

PARTICIPANTS

Emerson Baptista (IBES)

Chelsea Carter (Boston University, Economics)

Brett Culbert (The John Carter Brown Library/Harvard University)

Tanesha Dudley (School of Public Health)

Alberto Edeza (School of Public Health)

Lauren Flynn (School of Public Health)

Lillian Hancock (Ecology and Evolutionary Biology)

Aderonke Ilegbusi (School of Public Health)

Tammy Jiang (School of Public Health)

Hannah Kimmel (School of Public Health, Epidemiology)

Matthew Murphy (Alpert Medical School, Department of Internal Medicine)

Adedotun Ogunbajo (School of Public Health)

Arjee Restar (School of Public Health)

Selim Can Sazak (Department of Political Science)

Lee Scrivener (University of Wisconsin, Sociology)

Sylvia Shangani (School of Public Health)

PROGRAM

SESSION I:
SPACE IN THE HUMAN AND NATURAL WORLDS

Lillian Hancock, *The Biogeographic and Climatic Space of Rumicastrum (Montiaceae)*

Emerson Baptista, *Migratory Dynamics in the Cocoa Region of Brazil*

Chelsea Carter, *The Road to the Urban Interstates: A Case Study from Detroit*

Lee Scrivener, *Lead Paint and the Reproduction of Poisonous Space in Baltimore City*

Tammy Jiang, *The Longitudinal Association Between Neighborhood Deprivation and Risk of Depression*

SESSION II:
SEXUAL BEHAVIOR AND HEALTH

Alberto Edeza, *Sexual Networking Apps and PrEP*

Adedotun Ogunbajo, *Spatial Distribution of HIV Testing Centers and Associated Factors in New York City*

Arjee Javellana Restar, *Spatial Distribution and Facility-Characteristics of HIV/AIDS Community Mental Health and Substance Use Care-Related Services in New York City*

LUNCH BREAK, 11:45 AM –1:00 PM

SESSION III:
ACCESS TO CARE AND HEALTH OUTCOMES

Sylvia Shangani, *Spatial Patterns, Proximity to Health Care Facilities and Uptake of HIV Testing in Kenya: A Geographical Analysis of Weighted Survey Data*

Matthew Murphy, *An Analysis of Accessibility to Primary Care Clinics for Rhode Island Residents with Medicaid Coverage*

Aderonke Ilegbusi, *Meals on Wheels Rhode Island Recipients, Healthcare Utilization, and Location*

Lauren Flynn, *Language Spoken and Differences in Health Outcomes and Access to Care Among Hispanics Residing in Rhode Island*

SESSION IV:
SURVEILLANCE, GOVERNMENT OVERSIGHT, AND SPACE

Brett Culbert, *Viewshed Analysis of Six Elegant Views "Taken on the spot" in the River and Gulf of St. Lawrence*

Selim Sazak, *The Enemy You Can't See: Using Geospatial Analysis to Assess the Role of Base Siting in the Tactical Success of Terrorist Attacks—The Case of Turkey's Kurdistan Workers Party (PKK)*

Hannah Kimmel, *Geographic Surveillance of American Firearm Policy and Gun Violence Incidence in the 21st Century*

PRESENTATION ABSTRACTS

Emerson Baptista – Migratory Dynamics in the Cocoa Region of Brazil
Studying internal migration (or mobility, in general) in Brazil is a complex exercise given the size and diversity of the country. The aim of this paper is to analyze the migratory movements in the southern coastal region of Bahia (Brazil) in recent decades by focusing on variation in the migratory experiences of current residents (rural owners) of the region. Migratory inflows will be investigated taking into account reasons why immigrants decided to live there (e.g. employment, family, quality of life, etc). The data used in this study come from a survey applied in 3,000 rural properties randomly selected from 150 census tracts in southern Bahia. In each tract, we then conducted a complete listing of all farms to form a sampling frame, from which we interviewed 20 randomly selected farms in each tract. We examine the representation in this sample of lifetime residents of the region, in-migrants, and return migrants. We then analyze the differences in the average timing and the variability in the timing of most recent arrival between in-migrants and return migrants to see how the flows identified in the census result in the composition of landowners in the region today. We similarly analyze the motivations for migration across these groups to assess whether economic opportunity seems to be driving both groups, or whether the motivations are different and/or have changed over time.

Chelsea Carter – The Road to the Urban Interstates: A Case Study from Detroit
My research examines the plans and effects of urban sections of the US Interstate Highway System. Using a case study approach, I look at how policy makers determined interstate highway routes within the city of Detroit and how the construction of these roads affected housing values, racial composition, and population density. I use GIS to digitize two documents to add to my existing data set. First, I digitize the planned interstate routes which I then compare to actual construction to see if deviations are systematically correlated with any observable characteristics at the census tract level. Second, I digitize census blocks from the 1960 census of housing that will allow me to separate short-run (1950-1960) vs. long-run (1950-1990) effects of urban interstate construction on neighborhood outcomes.

Brett Culbert – Viewshed Analysis of *Six Elegant Views* "Taken on the spot" in the River and Gulf of St. Lawrence
Consideration of the Saint Lawrence River as a scenic space worthy of representation was relatively rare until the Battle of Quebec (1759)—during the Seven Years' War—when British draftsmen began depicting the surrounding landscape as a scenographic theatre for a grand military drama. While this particular battle marks the end of France's stronghold in North America, victory came to the British at the cost of many lives including the celebrated leader of the campaign, General James Wolfe. To commemorate his sacrifice and Britain's territorial acquisition, a set of engravings, "Six Elegant Views of the most remarkable Places in the River and Gulph of St. Lawrence" (1760) were commissioned and published by the Crown's Geographer, Thomas Jefferys. These views establish a visual narrative of the final progression of General Wolfe and his regiment "Taken on the spot": a reference in each print's title block to the authenticity of topographical underlays that were sketched in the field by military engineers for the Crown's Ordinance Survey. This project is an attempt to verify the underlying topographical information in a selection of these views by reconstructing and locating each scene within the cartographic space of the Saint Lawrence River as it was documented by the British at the time.

Through view shed analysis at particular points within the river valley, this study will explore whether or not these views were truly *taken on the spot* or fabricated after the fact to heighten the aesthetic appeal of this critical moment in Anglo-American history.

Alberto Edeza – Sexual Networking Apps and PrEP
Pre-exposure prophylaxis (PrEP) has been shown to be efficacious in reducing risk of HIV-infection among high-risk groups, but barriers remain in uptake and adherence to this once-daily medication. An oft cited barrier to uptake and adherence is the need for regular visits to a health care provider; in the absence of PrEP knowledgeable providers, interested parties may find it difficult to begin using PrEP. This project explores regional trends in uptake of pre-exposure prophylaxis among HIV-uninfected men who have sex with men who use mobile sexual networking apps, as well as the availability of PrEP-knowledgeable health care providers in key regions across the country, with special focus on metropolitan areas with high interest but few providers.

Lauren Flynn – Language Spoken and Differences in Health Outcomes and Access to Care Among Hispanics Residing in Rhode Island
More than one in ten residents of the United States now speak Spanish at home, with about half of these people reporting their ability to speak English as less than "very well" and therefore have limited English proficiency. Language preference as well as English language proficiency have been associated with health-related behaviors and disease prevalence. My project will focus on comparing access to care among English-speaking and Spanish-speaking individuals in Rhode Island, more specifically focusing on English-speaking versus Spanish-speaking Hispanics in Rhode Island. I will use GIS census data to determine the location of those who have limited English proficiency and speak Spanish. I will then map geographic factors that can affect access to care and health outcomes such as the RIPTA bus route, the presence of bike paths, and the location of hospitals in Rhode Island. Next, I will map various health outcomes such as asthma, hypertension, and preventive care utilization using both census and BRFSS shapefile data. The goal of this project is to highlight where in Rhode Island healthcare services for limited English proficiency individuals needs to be ameliorated.

Lillian Hancock – The Biogeographic and Climatic Space of *Rumicastrum* (Montiaceae)
As evolutionary plant biologists and ecologists, we want to know how plants evolved and diversified to cope with a drying planet. One key adaptation in plants to aridity is Crassulacean Acid Metabolism (CAM) photosynthesiss. CAM photosynthesis is a complex syndrome of traits that improves water use and photosynthetic efficiency in plants under drought and temperature stress. It has evolved from the more typical C3 photosynthetic pathway – the pathway found in most green plants – likely hundreds of times, and is a ubiquitous and important ecological adaptation in drier regions of the world. In addition to full CAM, there are recognized C_3-CAM intermediate phenotypes (facultative CAM and low-level CAM). The most speciose succulent, CAM-evolving group in Australia is *Rumicastrum* (Portulacineae). These small, succulent herbs display broad variation in habitat, growth form, vegetative morphology, flower number and architecture, life history strategies, and photosynthesis (C3, C3-CAM intermediate, CAM). In this study, I map the geographic distribution of *Rumicastrum* (~70 species) across Australia in efforts to understand where these species live, if species that are more closely related to each other are found in similar regions, and to see if there is a relationship between photosynthesis

type and climatic space. To date, there has been no thorough analysis of the climatic space occupied by C_3-CAM intermediate species and how this space compares with that of C_3 and CAM photosynthesis.

Aderonke Ilegbusi – Meals on Wheels Rhode Island Recipients, Healthcare Utilization, and Location

Meals on Wheels (MOW) is a federally-funded program that aims to support vulnerable senior American citizens. However, in the past few years, millions of fewer meals have been provided to seniors and hundreds of thousands of fewer seniors are being served. In Rhode Island, MOW is the only non-profit home-delivered meal program, serving nearly 1300 meals per day. This study aims to look at the income per capita of RI counties and neighborhoods to determine its relationship to various healthcare utilization in Rhode Island, including hospital inpatient and outpatient services, and skilled nursing facility use. Major differences in utilization before and after receiving meals, and the possible relation to not only county and neighborhood, but also distance to the closest hospital, skilled nursing facility, or outpatient clinic, will also be investigated.

Data come from Meal on Wheels Rhode Island's (MOWRI) client list, Medicare Master Beneficiary Summary File, and claims data, which provide baseline demographic data and Inpatient, Outpatient (Emergency Room), and Skilled Nursing Facility usage. To be included in this analysis, along with the criteria needed to qualify for MOW, clients had to also be aged 65 or older at the time they began receiving meals. The final sample size was 5543 clients. To start, a map of RI will be divided into its five counties and will be further divided into its 25 neighborhoods and the per capita income for the counties and neighborhoods will be shown. The zip codes of the sample will be used to indicate in which counties and neighborhoods MOWRI recipients reside. Locations of major hospitals, outpatient clinics, and skilled nursing facilities (provided by the Department of Health) will then be indicated on the map. There will be separate maps that indicate locations of recipients who had each healthcare utilization within the last 180 days prior to starting MOW and within the 180 days after starting MOW. The distances of those recipients who did have a utilization to their nearest healthcare center will be calculated and compared to those recipients who did not have a utilization event.

Tammy Jiang – The Longitudinal Association Between Neighborhood Deprivation and Risk of Depression

Depression is one of the most common mental disorders, with approximately 350 million people of all ages living with depression globally. Environmental factors such as the neighborhood in which people live can affect risk of depression. A neighborhood refers to a person's immediate residential environment that is hypothesized to have material and social characteristics relevant for health. This study aims to examine the association between lifecourse neighborhood deprivation and incident depression using data from the New England Family Study, a 50 year prospective birth cohort study. This project investigates the impact of neighborhood socioeconomic status at birth, age seven, and adulthood on the risk of depression in adulthood. Understanding the time point during which neighborhood deprivation contributes more to risk of depression allows us to identify possible windows for interventions to reduce the burden of depression.

Hannah Kimmel – Geographic Surveillance of American Firearm Policy and Gun Violence Incidence in the 21st Century

The American Medical Association (AMA) named gun violence as a public health crisis in mid-2016. With over 30,000 fatalities annually, the United States exhibits the highest rate of gun-related deaths compared to any other industrialized country. The burden of gun violence may be measured by more than fatalities, and for this study, gun violence will be stratified by one of four types: mass shooting, suicide, homicide and gun-related injury, and accidental shooting. The specific policy examined will be the categorization of open carry laws, and if permits are required to do "open carry" firearms in that state. By mapping the geography of state's policies around firearms as well as the incidence of these four types of gun violence among the population, and assessing these distributions spatially, this project will contribute to the historic lack of research in this field. In addition to illustrating nation-wide firearm reports and state-specific policies, this project aims to map the geography of gun vendors and locations offering gun buy-backs. Broadly, this project aims to use GIS methods to identify the scope of the public health problem of gun violence and the potential risk and protective factors of vendors and buy-back locations, respectively. These address questions raised by Drs. Marian Betz, MD, MPH and Megan Ranney, MD, MPH at the January 2017 AMA Conference, and future incorporation of these findings and data visualization may utilized in public health efforts to promote gun violence prevention.

Matthew Murphy – An Analysis of Accessibility to Primary Care Clinics for Rhode Island Residents with Medicaid Coverage

Recent changes in the requirements needed to qualify for Medicaid coverage through the Affordable Care Act has meant an increase in the number of individuals covered by the public health insurance program. While this is an important step to improving accessibility and affordability of health care services, other potential barriers to accessing the health system include a lack of primary care providers accepting new patients with Medicaid coverage or the proximity of providers to the populations with Medicaid coverage. Through mapping the population in Rhode Island covered by Medicaid and the location of primary care clinics, this analysis attempts to provide greater insight into the potential barriers to accessing primary care health services. Using the national Census data from 2015, the number of individuals with Medicaid as their primary insurance was mapped using GIS software by census tracts. The Census data was then combined with the locations of primary care clinics in the state accepting new Medicaid patients using the 2015 Statewide Health Inventory to assess for distribution of these clinics and their correlation with the population density of those with Medicaid coverage.

Adedotun Ogunbajo – Spatial Distribution of HIV Testing Centers and Associated Factors in New York City

The HIV epidemic in the United States continues to be a major public health problem. In New York City, HIV incidence and prevalence is disproportionately concentrated in certain neighborhoods. The most recent HIV surveillance report by the New York City Department of Health and Mental Hygiene found that zip codes in the Chelsea-Clinton, Central Harlem-Morningside Heights, and East Harlem neighborhoods had the highest HIV incidence and prevalence in 2015. Research has shown that engaging in HIV testing can help prolong life of those infected through engagement in antiretroviral medication and reducing risk of infecting sexual partners. The aim of this project is to explore the spatial distribution of HIV testing

centers across New York City. Additionally, the distribution of HIV testing center will be overlaid on neighborhood data on HIV incidence, prevalence, and other sociodemographic factors to explore possible patterns and trends.

Arjee Javellana Restar – Spatial Distribution and Facility-Characteristics of HIV/AIDS Community Mental Health and Substance Use Care-Related Services in New York City
Healthcare services specific to delivering and addressing various mental and substance use issues among populations impacted by the HIV/AIDS epidemic are vital to improve the health and wellness of this group. The purpose of this project is to explore the spatial distribution of facilities that offer mental health and substance use care-related services specifically to the HIV/AIDS community in New York City (NYC). Associated facility-characteristics including patients' age group (children, young adults, adults, and seniors), care type (mental health, substance use, both), and insurance type (Medicare, Medicaid, private, no Insurance, other) will be explored using Spatial Analyses procedures in ArcGIS software including descriptive statistics, Moran's I global and local autocorrelation, and OLS regression. Findings of this project could highlight non-randomness and differences in characteristics of facilities and could inform future mental and substance use health care programs in NYC.

Selim Sazak – The Enemy You Can't See: Using Geospatial Analysis to Assess the Role of Base Siting in the Tactical Success of Terrorist Attacks—The Case of Turkey's Kurdistan Workers Party (PKK)
Since 1984, Turkey has been engaged in a military campaign against the PKK, a separatist armed militia that the State Department lists as a "Foreign Terrorist Organization." Even though the exact number and composition of casualties is not disclosed, the conflict is estimated to have resulted in over 50000 deaths, including about 7000 security personnel. Since 2011, I have been leading an informal research group working to build a crowd-sourced database, identifying casualty data using open-source reports. What stands out from this dataset—of over 6000 data points—is that the most of the deadliest attacks were guerrilla raids on outposts: Ten of the twenty (and 35/70) deadliest days on the conflict timeline coincides with such attacks. Interestingly, most of these attacks were against a handful of outposts repeatedly over the years. Why is this the case?

The project utilizes ArcGIS's view-shed analysis feature to assess the hypothesis that these outposts were targeted because they were exposed. The PKK's theater of operations—Southeastern Turkey—is a rugged, mountainous terrain with an average elevation of 6000 feet. Many of the targeted outposts are repurposed customs posts, built on inter-montane plateaus, in sight of either a village or the chokepoint of a major road. Already under-fortified, these outposts are also vulnerable to attacks as they can be attacked from a higher elevation, exposed from multiple flanks, and inaccessible by land as the militant would cut off the supply routes by mining or ambushes.

Lee Scrivener – Lead Paint and the Reproduction of Poisonous Space in Baltimore City
Broadly considered a public health success story, rates of lead poisoning have declined considerably across the United States within the past decade. The city of Baltimore has shown this same trend, having experienced a steady citywide decline in blood lead levels since the mid-2000s. However, there is considerable heterogeneity below the citywide aggregate scale. Thus

this project seeks to answer two central questions: 1. What are the demographic and housing characteristics that are associated with neighborhood rates of lead poisoning between 1995-2015 in Baltimore city; 2. In the context of an overall citywide decline in lead poisoning, does the decline happen at different rates across populations or places? I have constructed a tract-level dataset that merges childhood blood lead test results, lead-related landlord violations, population demographics, and housing information for the city of Baltimore between 1995-2015. I use GIS mapping to visualize and analyze the varying concentrations of lead poisoning rates across neighborhoods and across decades, and to probe the linkages between rates of lead poisoning and characteristics of the social and built environment. Building on literature from environmental justice and neighborhood health, this project seeks to uncover the myriad ways in which the burdens of environmental hazards are disproportionately leveraged on poor and racial minority communities.

Sylvia Shangani – Spatial Patterns, Proximity to Health Care Facilities and Uptake of HIV Testing in Kenya: A Geographical Analysis of Weighted Survey Data

HIV is still a major health problem in developing countries. Despite large investments in HIV testing, only an estimated 45% of HIV-infected people in sub-Saharan Africa know their HIV status. This project aims to investigate the geographic distribution and spatial patterns of HIV testing in Kenya as well as determine whether distance to health care facility is associated with the likelihood of HIV testing. This project will use Kenya Demographic Health Survey (KDHS) 2014 data. The main covariate of interest is geographic distance to the nearest health care facility. Distances will then be used in the statistical analysis that relates the DHS number of people who had ever been tested for HIV and the closest distance to health care facility. Descriptive statistics will be employed to outline individual characteristics and summarize health care access and HIV testing. Beyond descriptive statistics, spatial pattern of HIV testing service utilization will be explored using GIS analysis approaches. Because respondents are grouped into villages/communities, aggregate data at the community level will be mapped to provide intuitive impression of spatial disparities in utilization of HIV testing services in the population. Multilevel multivariate logistic regression will be used to examine the impact of geographic access, as well as other covariates, on the probability of having been tested for HIV. This analysis will provide important information about HIV testing patterns in Kenya which could assist in the configuration of public health delivery systems to ensure maximum health care coverage and influence allocation of resources.