Geography and Geospatial Science Working Group (GeoSWG)
Advancing applications of geography and geospatial science in public health.

GIS Day

CDC/ATSDR GIS Day 2017 Agenda
November 15th
Chamblee Campus, Building 106, Room 1A/B/C

8:00 AM
Room 1A

NETWORKING, COFFEE
MAP GALLERY OPENS

9:00 AM
Room 1A

WELCOME
Andy Dent
GeoSWG Chair 2017

9:05 AM
Room 1A

INTRODUCTORY REMARKS
Robin Wagner
Chief Science Officer
Office of Public Health Scientific Services (OPHSS)

9:30 AM
Room 1A

PLENARY ADDRESS
Estella M. Geraghty
Chief Medical Officer and Health Solutions Director at Esri

10:15 AM

BREAK

10:25 AM
Room 1A

SESSION 1: GEOSPATIAL METHODS FOR BRIDGING THE GAP BETWEEN PLACE AND HEALTH

Moderator: Kim Elmore

Conference and Skype Info

(404) 553-8912 – Local
(855) 348-8390 – Long Distance

Conference ID's:
Room 1A – **7653784**
Room 1C – **3398605**

Skype:
Join Skype Meeting Room 1A
Join Skype Meeting Room 1C

Mapping Epidemics with the Help of Epi Curves
Presenter: Ian Dunn (Geospatial Research, Analysis, and Services Program)
Author: Ian Dunn
National Center for Environmental Health/Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Studies, Geospatial Research, Analysis, and Services Program

Public health professionals traditionally use two methods (geospatial mapping and epidemiological curves) to visualize disease progression during an infectious disease outbreak. They map the number of total cases at any given time, the number of new cases in a given time period, and the number of days between new cases to identify the geographic distribution of the disease. They also calculate the epidemiological curve to visualize the stage and magnitude of the outbreak. While both methods are useful, neither capture the stage, magnitude, and geographic distribution of an outbreak. Combining these approaches typically takes multiple maps or the production of animations; both approaches are time-consuming and complicated.

To help improve disease outbreak visualization we developed the Slope Visualization Tool (SVT), which calculates the slope of the epidemiological curve for every geographical unit at multiple points in time. This tool allows users to visualize the stage, magnitude, and geographic distribution of an outbreak through a single map. We applied the SVT to visualize the 2014-2016 Ebola outbreak in West Africa and the recent Zika outbreak in Puerto Rico to demonstrate this unique capability.

The SVT is the first tool that provides public health professionals a clear and concise method to apply and visualize epidemiological curves geospatially. This can be used to assess the effectiveness of interventions across space and time leading to the more rapid conclusion of an outbreak. Next steps include more research on how the SVT can be applied to both seasonal and chronic illnesses as well as implementing multivariate mapping capabilities into the tool.

Ian Dunn is a consultant with DRT Strategies and has been with the GRASP team since 2015. Prior to working with GRASP, Ian developed, implemented, and managed geographic information systems for the City of Perrysburg, Ohio and the Franklin County, Ohio Emergency Management Agency. Ian has been working with geographic information systems and science for over 10 years and his professional interests include enhancing cartographic visualization of disease, simplifying complex tasks using python, improving field data collection methods, and exploring the relationship between place and health.

Geographic access to and utilization of pulmonary rehabilitation among Medicare beneficiaries with COPD in the Southeastern United States in 2014

Presenter: Kevin Matthews (Division of Population Health)
Author: Kevin Matthews[1], Anne H. Gaglioti[2], James B. Holt[1], Anne G. Wheaton[1], Janet B. Croft[1]
[1]National Center for Chronic Disease Prevention & Health Promotion, Division of Population Health, Epidemiology and Surveillance Branch
[2]National Center for Primary Care, Department of Family Medicine, Morehouse School of Medicine

Pulmonary rehabilitation (PR) is a treatment for respiratory diseases such as chronic obstructive pulmonary disease (COPD). The purpose of this study is to demonstrate how to create service areas for any specific billable medical procedure—such as PR—using health care utilization data. These areas represent how far the supply of PR observed at a provider location extended into the population under the assumption that providers only supply their nearest populations. We used 100% Medicare claims data for all beneficiaries aged ≥65 years who were diagnosed with COPD, or who used PR for COPD, in 2014. COPD was defined by the International Classification Diseases, 9th edition Clinical Modification (ICD-9-CM) codes 490-492 or 496. PR for COPD was identified using ICD-9-CM code G0424. Provider locations were organizations that billed Medicare for PR services in 2014 (n = 426). We found that county-level utilization of PR was positively associated with county-level supply of PR.

Kevin Matthews is a Geographer in the Epidemiology and Surveillance Branch in the Division of Population Health, National Center for Chronic Disease Prevention & Health Promotion. He has over 21 years of professional experience using GIS in both government and academic settings. His focus over the past ten years has been on spatial demography to address public health issues. His research interests include the analysis of geographic patterns of access and utilization of healthcare and spatial analysis of cancer and other chronic diseases in the United States.

Combining contact tracing with targeted indoor residual spraying significantly reduces dengue transmission

Presenter: Gonzalo M. Vazquez-Prokopec (Emory University)
Author: Gonzalo M. Vazquez-Prokopec
Department of Environmental Studies, Emory University, Atlanta, GA; Department of Environmental Health, Rollins School of Public Health, Emory University, Atlanta, GA; Fogarty International Center, National Institutes of Health, Bethesda, MD

The widespread transmission of dengue viruses (DENV), coupled with the alarming increase of birth defects and neurological disorders associated with Zika virus, has put the world in dire need of more efficacious tools for Aedes aegypti–borne disease mitigation. We quantitatively investigated the epidemiological value of location-based contact tracing (identifying potential out-of-home exposure locations by phone interviews) to infer transmission foci where high-quality insecticide applications can be targeted. Space-time statistical modeling of data from a large epidemic affecting Cairns, Australia, in 2008–2009 revealed a complex pattern of transmission driven primarily by human mobility (Cairns accounted for ~60% of virus transmission to and from residents of satellite towns, and 57% of all potential exposure locations were nonresidential). Targeted indoor residual spraying with insecticides in potential exposure locations reduced the probability of future DENV transmission by 86 to 96%, compared to unsprayed premises. Our findings provide strong evidence for the effectiveness of combining contact tracing with residual spraying within a developed urban center, and should be directly applicable to areas with similar characteristics (for example, southern USA, Europe, or Caribbean countries) that need to control localized Aedes-borne virus transmission or to protect pregnant women's homes in areas with active Zika transmission. Future theoretical and empirical research should focus on evaluation of the applicability and scalability of this approach to endemic areas with variable population size and force of DENV infection.

Research at the Vazquez-Prokopec lab lies at the interface between ecology, statistics and public health and aims to understand the major determinants in the occurrence, transmission and local propagation of major vector-borne and parasitic diseases. Primary research areas at the Vazquez-Prokopec lab include ecology of infectious diseases, urban ecology and global health. We take a multi-disciplinary approach to study the contribution of urban landscapes to the occurrence of vector-borne diseases, the biology and ecology of insect vectors and disease reservoir hosts, the contribution of human and vector behavior to pathogen transmission and the role of host movement in disease transmission dynamics.

Current active projects at the Vazquez-Prokopec lab study the urban ecology of West Nile virus in Atlanta, GA; the spatial epidemiology of dengue virus in Cairns, Australia; the contribution of human movement to the dynamics of dengue virus transmission in Iquitos, Peru; the contribution of animal movement on pathogen spillover into Gombe National Park, Tanzania; the eco-epidemiology of Chagas disease in northwestern Argentina.

Widespread recent increases in county-level heart disease mortality across age groups
Presenter: Adam Vaughan (Division for Heart Disease and Stroke Prevention)
Author: Adam Vaughan
National Center for Chronic Disease Prevention and Health Promotion, Division for Heart Disease and Stroke Prevention, Epidemiology and Surveillance Branch

Recent national trends show decelerating declines in heart disease mortality, especially among younger adults. We examined recent county-level trends in heart disease mortality by age group. Using a Bayesian spatiotemporal model and National Vital Statistics Systems data, we estimated overall rates and percent change in county-level heart disease mortality from 2010 through 2015 for four age groups (35-44, 45-54, 55-64, and 65-74). County-level trends by age group showed geographically widespread increases, with 52.3%, 58.5%, 69.1%, and 42.0% of counties experiencing increases for ages 35-44, 45-54, 55-64, and 65-74, respectively. Increases were more prevalent in counties with initially high heart disease mortality and those outside large metropolitan areas. National trends have masked local increases in heart disease mortality. Reversing these trends, especially among adults younger than age 65, may require intensification of primary and secondary prevention, focusing policies, strategies, and interventions on younger populations, especially those living in less urban counties.

Adam Vaughan is a spatial epidemiologist in the Epidemiology and Surveillance Branch in the Division for Heart Disease and Stroke Prevention. His research focuses on spatiotemporal analyses of small area heart disease and stroke outcomes. He also works with the GIS Capacity Building Project, which trains state and local health departments on GIS. He received his PhD and MPH from Emory University.

Geospatial Analysis to provide CDC (National Center on Birth Defects and Developmental Disabilities), Local Health Departments (LHDs), and Field Assignees (FA) with unique insights into demographics and distribution of physician specialists of interest in high risk areas for Zika
Presenters: Andrew Dané (Deloitte)
Authors: Andrew Dané, Olga Robinson
Location Intelligence, Deloitte

To elevate the CDC Zika campaign, Deloitte is employing location intelligence modeling and building a geospatial solution to provide demographic and physician profiles of jurisdictions that were identified as high risk areas for Zika. The solution will help end users to plan services for Zika-affected families and to optimize provider network. Deloitte has developed a web-based mapping application that integrates dozens of datasets to more effectively investigate demographic associated risk factors, supply and distribution of Zika healthcare specialists, and distribution of Zika-related health markets. With this robust system in place, LHDs and FAs and may easily visualize community-based trends to further understand the unique populations they serve, and ultimately tailor their services network to maximize Zika relief impacts.

Andrew Dané is the lead developer for the Geospatial Zika Application, and has been involved in several other CDC and HHS campaigns. Andrew is a Consultant within the Geospatial Analytics team of Deloitte Advisory, for which he provides expertise in GIS technologies, and performs GIS design and computer programming to implement web mapping applications and custom geospatial tools. Mr. Dané is proficient in a number of Geospatial technologies, data analysis software, and programming languages including ArcGIS, Python, HTML, CSS, JavaScript, JQuery, Bootstrap, Leaflet, PHP, Oracle, SQL, and R.

Olga Robinson (co-presenter) is a healthcare professional with clinical and public health background and expertise in clinical information systems, redesign of service delivery, and execution of public health programs. Olga is a Senior Manager at Deloitte's Federal Healthcare practice. Prior to her work in the U.S., she managed large healthcare and public health programs for the UK's National Healthcare System (NHS).

11:40 AM   **LUNCH/BAKEOFF JUDGING**

12:45 PM   **POSTER SESSION**
Room 1B   **View Map Gallery Submissions**

SESSION 2A: GIS IN PUBLIC HEALTH EMERGENCIES

Moderator: Erica Adams

EpiSample: A smartphone Application for Population Based Surveys
Presenter: Jodi Vanden Eng (Global Immunization Division)
Authors: Jodi Vanden Eng
Center for Global Health, Global Immunization Division

Population cluster surveys represent the gold standard for collecting representative data to assess needs, implementation effectiveness, and impact of various interventions for defined populations. Cluster survey methodology should be conducted using a probability sampling approach to reduce non-sampling errors and minimize bias. Generating household listings for each cluster, a key component of proper selection of households, can be time consuming and costly.

EpiSample, an open source application that allows users to generate household listings for second-stage sampling using global positioning systems (GPS). This software allows survey implementers to map and list households using GPS, combine lists to create a complete sampling frame for a cluster, automatically select a simple random sample of households, and navigate back to selected houses for interviewing.

This tool can be used to improve sampling for surveys, emergency response, or other monitoring and evaluation activities in situations where a sampling frame is incomplete, outdated, or unavailable.

Jodi Vanden Eng has been a Mathematical Statistician at the Centers for Disease Control and Prevention for over 12 years, currently working in the Global Immunization Division and prior to that she spent 10 years with the Division of Parasitic Diseases and Malaria. One of her main interests is to promote the development a smartphone application that uses GPS to improve sampling for household surveys.

Using Satellite Imagery to Support Polio Outbreak Response in Borno State, Nigeria
Presenter: Jeff Higgins (Geospatial Research, Analysis, and Services Program)
Author: Jeff Higgins
National Center for Environmental Health/Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Studies, Geospatial Research, Analysis, and Services Program

Insurgent violence and subsequent military retaliation has led to a humanitarian crisis in the state of Borno in NE Nigeria. Hundreds of thousands of civilians have been displaced from their homes, and wide areas are inaccessible to health and humanitarian workers. In 2016, circulating wild polio virus was found in Borno State. In order to support the outbreak response, the polio program required a better understanding of the populations remaining in inaccessible areas. CDC GRASP has been using high resolution satellite imagery to assess the status of settlements in Borno to improve population estimates for planning interventions.

Jeff joined GRASP in the summer of 2016. His professional interests include GIS for emergency response, GIS automation using Python and R, big data, cartography, and geography education. Before joining GRASP, Jeff lived and worked in Japan and speaks conversational Japanese.

GIS In the Emergency Operation Center
Presenter: Langdon Sanders (City of Sandy Springs)
Author: Langdon Sanders
City of Sandy Springs, GA

Learn how the City of Sandy Springs integrates GIS into their Emergency Operations Center (EOC). The City of Sandy Springs developed an agile mapping system for tracking real-time data during storm events. The GIS map hosted through ArcGIS Online is a centrally managed communication tool to facilitate dispatch of operations, brief management and shift leaders, educate the public, and help field workers respond to incidents. Key components of the system include a central web map displaying real-time field data collection, accurate reference layers, and mobile access to the same map for all parties. The map allows user input of field data including uploading of photos, updating statuses, and adding notes. After the event, data can be exported for reporting to other agencies and clean-up efforts. The GIS team has become a standard part of our EOC deployment providing on-the-fly analysis and other spatial products.

Langdon enjoys providing web GIS integrations in city government. He is a GIS Analyst at the City of Sandy Springs where he specializes in Public Works, Fire, and Emergency Management. He pioneered the use of GIS in the Emergency Operations Center at the city to provide a real-time mapping platform for tracking field events and reference data. He enjoys cartography, design, and is always looking to learn new spatial technologies. He previously provided GIS support to Forsyth County, Georgia and the City of Kettering, Ohio. He graduated with a Master's in Public Administration with GIS Certification from Wright State University (Dayton, OH), and attended Hendrix College (Conway, AR) for his undergraduate degree in Anthropology.

Using free GIS feeds and products to track natural disasters
Presenter: John Holcomb (Division of Select Agents and Toxins)
Author: John Holcomb
Office of Public Health Preparedness and Response, Division of Select Agents and Toxins

This will be both a hands on and live demonstration of free natural hazard feeds using Google Earth. It will cover hurricane, wildfire, earthquake, winter weather, severe weather (Tornados), and others along with how to load user generated geo-coordinates into Google Earth.   All feeds and software are available at no cost.

John Holcomb is the Lead Security Specialist at the Division of Select Agents and Toxins (DSAT). He managed DSATs response procedures for 3 years. He has presented this subject at ESRI and 3 times at the largest security conference in the United States- the American Society for Industrial Security (ASIS).

1:15 PM
Room 1C

SESSION 2B: SPATIAL DETERMINANTS OF HEALTH AND ACCESS TO CARE

Moderator: Andrew Berens

County-Level Variation of Interpersonal Primary Care Continuity Among Medicaid Enrollees with Ambulatory Care Sensitive Conditions
Presenter: Anne Gaglioti (Morehouse School of Medicine)
Authors: Anne Gaglioti
National Center for Primary Care, Department of Family Medicine, Morehouse School of Medicine

Health systems based on primary care have been shown to have lower mortality, lower costs, better quality, and less inequity. One characteristic of primary care responsible for these outcomes is continuity of care over time. Interpersonal continuity refers to the continuity between a single provider and patient over time and has been associated with improved health outcomes. Ambulatory care sensitive conditions (ACSC) are conditions that can be managed most effectively in a primary care setting, and there is significant geographic variation in outcomes for these conditions and well-documented inequities in outcomes for ACSC among racial subgroups. Variation in primary care continuity for patients with ACSCs may impact variation in ACSC outcomes among racial subgroups and by place. We will explore the variation of county level rates of interpersonal primary care continuity (IPCC) among Medicaid enrollees with ACSC. We will also examine rates of IPCC among racial/ethnic subgroups at the county level.

Dr. Gaglioti is a practicing family physician and serves as the Associate Director for Research at the National Center for Primary Care at Morehouse School of Medicine. She has an interest in employing spatial methods to primary care health services research focused on health equity.

Geographic inequalities in progress against lung cancer among women in the United States, 1990 – 2015
Presenter: Katie Ross (Emory University)
Authors: Katie Ross
Emory University, Rollins School of Public Health, Department of Epidemiology

Lung cancer death rates began declining among women in the United States in 2002; little is known about decline at the county level, where many tobacco control policies are enacted. We examined change in county-level lung cancer death rates among women in the U.S. from 1990 – 1999 to 2006 - 2015. Rates were obtained from the National Cancer Institute's Surveillance, Epidemiology and End Results (SEER) database. Optimized hotspot analysis was used to identify clusters of counties with slow declines or increase in lung cancer death rates. From 1990 – 1999 to 2006 – 2015, lung cancer death rates rose by 13% among women in Hotspot 1 (in Central Appalachia), by 7% among women in Hotspot 2 (in the Northern Midwest), and decreased by 6% among women in the non-hotspot U.S. Targeted intervention in hotspot counties could reduce the excess burden of lung cancer among these women and prevent widening geographic inequity.

Katherine Ross, MPH is a PhD student in the Department of Epidemiology at the Rollins School of Public Health, Emory University. She received her M.P.H. in Epidemiology from Emory University in 2017, and her B.S. in Public Health from the University of Miami in 2015. She is interested in spatial analysis, health services research, and disparities in outcomes for patients with chronic diseases. She was previously an ORISE Fellow in the Program Services Branch, Division of Cancer Prevention and Control at the Centers for Disease Control and Prevention.

Impact of Built Environment on Access to Rotavirus Vaccine
Presenters: Lilly Immergluck (Morehouse School of Medicine) and Mike Edelson (InterDev)

Authors: Lilly Immergluck[1], Mike Edelson[2]
[1]Morehouse School of Medicine, [2]Interdev

Purpose: Rotavirus (RV) is the leading global cause of severe diarrhea in children. In the US, RV vaccines have significantly reduced this burden. The purpose of this study is to examine the relationship between a child's built and social environment and access to RV vaccination. We hypothesize that socioenvironmental factors affect the ability of a child to complete the RV vaccine. Methods: Secondary data analysis of children who were diagnosed with acute gastroenteritis in 2010, 2011, and 2013 from 3 pediatric hospitals in Atlanta, Georgia. Individual level data (demographics, place of residence, and primary care providers (PCPs)) was collected; fecal samples were tested for RV; and RV vaccine dates and doses were obtained. All patients' identified home and respective PCP locations were geo-coded. Area level factors were collected from the US Census data. Preliminary Results: We geocoded 702 enrolled children and their PCP practice locations during the 3 year study period, determined if they had 'complete' or 'incomplete' RV vaccine status, determined RV vaccine access variables, and identified geographic clusters based on RV status. Discussion/Conclusion: Findings from this study will begin to identify barriers, which contribute to vaccine access.

Dr. Lilly Immergluck is a general pediatrician, pediatric infectious disease specialist and pediatric health services researcher. Dr. Immergluck is Associate Professor and Director of the Pediatric Clinical and Translational Research Core at the Clinical Research Center at Morehouse School of Medicine; she holds an adjunct appointment as Associate Professor of Pediatrics at Emory University. She also serves as the Research Director for the Pediatric Emergency Medicine Associates, whose physicians provide emergency care at Scottish Rite Children's Hospital, Wellstar Health System, and Erlanger Children's Hospital in Tennessee. As a pediatric health outcomes researcher, she focuses on acute and chronic conditions that are preventable in the primary care and emergency settings. In today's project, she shares her interest to understand how socio ecological factors might impact risks for vaccine preventable conditions in infants and children.

Mr. Mike Edelson is InterDev's GIS Manager, with more than 15 years of experience in geospatial technologies in private, governmental, and military settings. Mr. Edelson has traveled to and managed multiple large GIS military master planning projects for dozens of military installations throughout the Middle East, including Afghanistan, Iraq, Kuwait, India, Bangladesh, and Qatar. He was also a key participant and contributor in multiple local governmental startups, including the new Georgia cities of Sandy Springs, Johns Creek, Milton, Brookhaven, and Tucker. Mr. Edelson and his GIS team was awarded URISA's Exemplary Systems in Government award in 2014 in the Enterprise Systems Category for work performed for the City of Brookhaven. Mr. Edelson currently manages a consortium of GIS departments in the Atlanta area including Sandy Springs, Dunwoody, Tucker, and Decatur.

Integrating GIS and Agent Based Modeling to improve understanding of childhood nutrition
Presenter: Liora Sahar (American Cancer Society)

Authors: Liora Sahar[1], Jay Schindler[2], Joseph Bauer[1]
[1]American Cancer Society
[2]Northrop Grumman Corporation

The process of Modeling can be used effectively to improve understanding of public health problems, examine interventions, support better decision making and enhance public policies. Integrating Geographical Information Systems (GIS) and Agent-Based Modeling (ABM) technologies provides an opportunity to explore behaviors within a changing social and physical environment. The authors generated an agent based model that incorporates GIS layers (streets, homes, corner stores locations) and simulates students' daily routes to school and home along optimal routes. The model integrates multiple variables that may influence food selection & consumption behaviors including individual, biological, social and environmental factors. We demonstrate advantages of using an ABM framework to examine and integrate the complex nutritional behavior. The integration of technologies allows researchers to test various interventions in time-efficient manner to better focus resources towards programs and interventions.

Liora Sahar, PhD, is a Strategic Director for Geospatial Research within the Statistics & Evaluation Research Center at the American Cancer Society. The focus of her work within the society is to engage in geospatial research with application to ACS mission and income decision-making.

Jay Schindler, PhD, is a public health scientist and researcher with a background in agent-based modeling and simulation, analytical methods, and using animation for data visualization and enhanced comprehension. He does work at Northrop Grumman Corporation linking and integrating data sets, extrapolating alternate realities from existing data, and evaluating interventions and other activities using cost-effective methods.

Joe Bauer, Ph.D. is a social and behavioral scientist and a research methodologist by training. He has worked at the Global Headquarters at the American Cancer Society in Atlanta, Georgia for 12 years conducting evaluations, survey research, and design research/usability testing.

A Geospatial Analysis of Opioid Population Determinants and Substance Abuse Relief for the Health Resources Services Administration (HRSA)
Presenter: Shane Engel (Deloitte)
Authors: Shane Engel, Andrew Dane
Location Intelligence, Deloitte

To allow for better analysis of HRSA substance abuse funding as it relates to opioid demand, Deloitte developed a prototype Geospatial application that visualizes state level funding (supply), drug prescriptions and overdose statistics (demand), along with vital population health demographics. The resulting dashboard effectively organizes this robust dataset, displaying important data elements as interactive mapping layers and various charts to drive analysis. Additionally, Deloitte performed advanced geospatial and statistical analysis techniques to investigate environmental, social, and behavioral determinants of opioid abuse for local populations, allowing HRSA to better understand which type of healthcare programs would be most effective from a community standpoint. Along with statistical analysis of heath predictors, Deloitte performed funding and site optimization techniques to represent the impacts of HRSA funding and site allocation scenarios.

Shane Engel is leading the Geospatial Zika initiative and has been an Analytics Advisor with Deloitte since 2013, strategizing and implementing analytics programs and solutions that align with health mission objectives. Although he has experience working with broader analytics (including predictive analytics, natural language processing, big data, and business intelligence dashboards), he specializes in applying GIS software and geospatial data to solve location-based problems. He has over 14 years of experience helping clients understand analytics ecosystem and trends, navigate changing customer expectations, and align solutions with a range of forward-looking technology options. He has helped some of the largest government institutions and Fortune 500 companies within the retail, transportation/ logistics, healthcare, emergency management, and environmental industries.

Combining the Old and the New: Digitizing historic data to create a species distribution map of Aedes aegypti in South Africa
Presenter: James Fuller (Global Disease Detection Operations)
Authors: James Fuller
Global Disease Detection Operations, Center for Global Health

During the early 20th century, scientists in South Africa conducted extensive field work to characterize the presence of several medically important mosquito species, including Aedes aegypti. However, no national-level data is currently available to describe the geographic distribution of such mosquitoes in the country. To better characterize the distribution, I have georeferenced this historical data and used modern climate models and remote sensing to create a species distribution map of Ae aegypti across South Africa. Boosted regression tree models showed that long-term temperature, vegetation density, human population density, and land cover were strong predictors of Ae aegypti occurrence. As expected, the models predicted high probabilities of occurrence along the Indian Ocean coast, including Durban, and the northeastern savannahs. There was also a high probability of occurrence in areas near Pretoria, where international travel could lead to autochthonous transmission of arboviruses.

James was an ASPPH Fellow with CDC's Division of Global Health Protection in Pretoria, South Africa. Dr. Fuller is an infectious disease epidemiologist, responsible for building statistical and GIS capacity among CDC's partners in Southern Africa. He has taught GIS courses and workshops at the University of Pretoria and for the Ministries of Health in Namibia, Zambia, and South Africa. Dr. Fuller received a PhD in epidemiology from the University of Michigan in 2015, and is currently a contractor within CDC's Global Disease Detection Operations Center in Atlanta, Georgia.

Tweet Analysis for Emergency Response and Preparedness
Presenter: Matt Weber (Geospatial Research, Analysis, and Services Program)
Authors: Matt Weber
National Center for Environmental Health/Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Studies, Geospatial Research, Analysis, and Services Program

The GRASP emergency response team recently tackled the challenge of finding a use for twitter data to assist in emergency response. Using georeferenced tweets logged during the 2017 hurricane season, we were able to accurately identify the areas heavily damaged by hurricanes.

Matt is a Lead Technologist within the Geospatial Research Analysis and Services Program (GRASP) at the CDC. He is assigned to multiple GRASP projects as the lead geospatial database developer and is technical team lead on DataTrack, a geospatial data inventory and search system. He has over 10 years of experience in geospatial algorithm, database and application development.

Evaluating the spatial spillover of antibiotic-resistant Escherichia coli between chickens and humans in rural northern Ecuador

Presenter: Hayden Hedman (University of Michigan)
Authors: Hayden Hedman
University of Michigan

Increased overlap of human-animal contact have promoted recent inclines of emerging infectious diseases. The use of antibiotics in animal husbandry has promoted not only antibiotic-resistant bacteria among livestock but also the cross-species transmission between other livestock, wildlife, and humans. The spillover of antimicrobial-resistant commensal bacteria demonstrates a pressing concern for veterinarian science, ecology, and public health. It is critical to evaluate the spillover of antibiotic-resistant bacteria with a holistic approach that accounts for how agricultural practices affect the ecology and evolution of drug-resistant microbes.

Hayden is a Ph.D. candidate investigating the spillover of antibiotic-resistant bacteria from poultry to humans under Dr. Joseph Eisenberg and Dr. Lixin Zhang at the University of Michigan.

Mapping Mortalities following Hurricane Harvey, Harris County, TX August-September, 2017

Presenter: Amy Lavery (Epidemic Intelligence Service)
Authors: Amy Lavery
National Center for Environmental Health/Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Studies, Geospatial Research, Analysis, and Services Program, Epidemic Intelligence Service

Hurricane Harvey made landfall on the Texas coast August 25, 2017. The powerful storm produced record rainfall in many regions of up to 40-61 inches. Water levels rose as high as 9 feet above normal levels in the Houston area, which was impacted with the most rainfall. Following the storm, the Epidemiology and Surveillance Task Force at the Emergency Operations Center at the Centers for Disease Control and Prevention collected media reports on mortalities in the storm impacted regions. Ninety-three deaths were reported in the media and confirmed by the Texas State Department of Health Services. To better understand the relationship between mortality and environmental conditions, the approximate location of death was mapped in relation to modeled inundation levels and the social vulnerability index of the location census tract.

Amy Lavery is an Epidemic Intelligence Service (EIS) Officer and began working with the Geospatial Research and Analysis Services Program and the Office of Environmental Health Emergency Management in August of 2017. Her primary interests are modeling environmental exposures in relation to health outcomes, particularly looking at potential causes or factors that exacerbate chronic diseases.

Reducing Your Workload by Increasing Automation with Python and SQL

Presenter: Ian Dunn (Geospatial Research, Analysis, and Services Program)
Author: Ian Dunn
National Center for Environmental Health/Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Studies, Geospatial Research, Analysis, and Services Program

One of the many challenges during the Hurricane Maria response was managing and disseminating a constantly updating flow of pharmacy status data from Rx Open (https://www.healthcareready.org/rxopen). Data needed to be downloaded, processed, mapped, and shared via both pdf maps and web maps. This proved to be a very time consuming process, which led to GRASP developing a fully automated method for this process. Learn how GRASP used Python, SQL, and Data Driven pages to reduced hours' worth of work down to minutes.

3:00 PM
Room 1A

SESSION 3A: EVALUATION AND CAPACITY BUILDING OF GEOSPATIAL SYSTEMS

Moderator: Stephanie Foster

Evaluation of Geocoding in a Nationwide Surveillance System

Presenter: Amy Lavery (Epidemic Intelligence Service)
Authors: Amy Lavery[1,2], Stephanie Foster[1], Andrew Dent[1], Reda Wilson[3], Loria Pollack[3]
[1]National Center for Environmental Health/Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Studies, Geospatial Research, Analysis, and Services Program
[2]National Center for Environmental Health/Agency for Toxic Substances and Disease Registry, Office of Environmental Health Emergency Management
[3]National Center for Chronic Disease Prevention and Health Promotion, Division Of Cancer Prevention And Control, Cancer Surveillance Branch

Surveillance of disease is important for understanding disease burden in our communities and for making decisions about public health actions. Knowing the place of disease occurrence is fundamental for evaluating exposure relationships, identifying access to care, and allocating resources. Geographic data within the National Program of Cancer Registries (NPCR), CDC's population-based cancer surveillance system, were evaluated to understand the impact of accurate geocoding within disease surveillance. We determined the number of states geocoding and assessed the quality of the geocodes. Additionally, we surveyed a small sample of states to understand how state registries geocodes data and to learn how they use the geocoded information. This presentation will highlight the findings and discuss the implications of precise location data in disease surveillance.

State Health Departments Apply GIS Skills to Blood Pressure Medication Adherence

Presenter: Michele Casper (Division for Heart Disease and Stroke Prevention)
Authors: Michele Casper[1], Dorota Carpenedo[2], Brendan Darsie[3], Jeff Durthaler[1], Claire Fleming[4], Lucille Im[5], Mary Catherine Jones[6], Sharon Murphy[7], Carrie Oser[2], James Peacock[4], Matthew Ritchey[1], Linda Schieb[1], Alexandria Simpson[3], Brandy Sutphin[5], Joshua Tootoo[8], Adam Vaughan[1], Marie Lynn Miranda[8]
[1]Division for Heart Disease and Stroke Prevention, CDC
[2]Montana Department of Public Health and Human Services
[3]California Health and Human Services Agency
[4]Minnesota Department of Health
[5]Arkansas Department of Health
[6]National Association of Chronic Disease Directors
[7]IHRC, Inc.
[8]Rice University

Blood pressure medication adherence is a key component in the prevention of heart disease and stroke. In order to enhance the capacity of state health department staff to use Geographic Information Systems (GIS) to address blood pressure medication adherence in their communities, the Division for Heart Disease and Stroke Prevention, in collaboration with the National Association of Chronic Disease Directors and Rice University, provided an advanced GIS training focused on blood pressure medication adherence. Four state health departments were selected to participate – Arkansas, California, Minnesota and Montana. This presentation will provide an overview of the GIS skills included in the training and examples of the maps that health department staff produced to document geographic disparities, assess gaps in clinical, community and public health services for blood pressure medication adherence, inform programs and policies related to blood pressure medication adherence, and strengthen partnerships with organizations that support blood pressure medication adherence.

Michele Casper is an epidemiologist and serves as the Team Lead for the Small Area Analysis Team within the Division for Heart Disease and Stroke Prevention at CDC. Her work, and the work of the team, is focused on analyzing spatiotemporal trends of heart disease and stroke morbidity and mortality, making robust, small area data widely available, and enhancing capacity of health departments to use GIS for the prevention and treatment of heart disease, stroke and other chronic diseases.

GIS in Laboratory Program Development in Ghana and Tanzania

Presenter: Wangeci Gatei (Division Of Global Health Protection)
Authors: Wangeci Gatei
Center For Global Health, Division Of Global Health Protection, Epidemiology, Informatics, Surveillance And Lab Branch

Real-time biosurveillance through a national laboratory system able to rapidly detect and contain public health threats at the source is a key component of Global Health Security Agenda and the International Health Regulations. The Centers for Disease Control and Prevention provide technical assistance to numerous countries to strengthen laboratory systems in diagnostics and pathogen detection. However, information available in countries is often limited for program planning. Using geocodes and country specific data on health infrastructure we are using GIS as a critical tool in visualization of laboratory networks, mapping disease endemicity and countries' infrastructure for overall strategic planning, work plan development and decision making. Results from Ghana and Tanzania will be presented.

Wangeci is a Laboratory Scientist at EISL/DHHP/CGH/CDC. Her background is in molecular epidemiology and population genetics. She has conducted malaria drug resistance research and field epidemiology of neglected tropical diseases. She was a Senior Lab Advisor in Rwanda CDC country office as a program manager in Laboratory Systems with a focus on tier lab network, specimen transportation, lab accreditation, supply chain management and blood safety. To manage these programs she trained in GIS for data visualization and program mapping. She is currently supporting implementation of Global Health Security in Laboratory Systems, Biosafety & Biosecurity, workforce development in West Africa and East Africa. Wangeci has a doctorate in Tropical Medicine, University of Liverpool, UK; MSc University of Prince Edward Island, Atlantic Veterinary College, Canada; Veterinary Med. U of Nairobi, Kenya. In 2012, she received a Certificate on GIS from U of Twente, Netherlands.

Using Geospatial Mapping To Maximize Public Health Resources In Support Of U.S. Department of Housing and Urban Development's (HUD) Smoke-Free Rule

Presenter: Sonia Tetlow (Office On Smoking And Health)

Authors: Sonia Tetlow[1], Brian Gurbaxani[2]
[1]National Center for Chronic Disease Prevention and Health Promotion, Office On Smoking And Health
[2]Office Of The Associate Director For Science

Approximately 480,000 Americans die from smoking each year, including 41,000 from secondhand smoke (SHS) exposure. One-third of adults living in public housing currently smoke cigarettes, which is approximately double the smoking rate in the general population. Through a collaborative effort, CDC's Office on Smoking and Health (OSH), Office of the Associate Director for Science (OADS), and the Georgia Institute of Technology developed a geospatial tool to advance coordinated and effective state and local public health strategies that support implementation of HUD's new smoke-free rule. OSH worked with a senior design team from Georgia Tech's Industrial and Systems Engineering program through the on-going "Capstone Experience" facilitated by OADS, to develop an interactive mapping tool identifying public housing locations, and to characterize them using parameters that could inform resource deployment, including size, resident population characteristics, estimates of tobacco use and SHS exposure, and proximity of various healthcare facilities: https://chhs.gatech.edu/smokefree/.

Sonia Tetlow is a contractor in CDC's Office on Smoking and Health. She received her MPH in health policy from Emory's Rollins School of Public Health in 2015. She previously worked as an ORISE fellow in CDC's Office of the Associate Director for Policy on the evidence review and development of the Health Impact in Five Years (HI-5) Initiative. Research interests include health policy, behavioral health, spatial analysis, economic analysis, and social determinants of health.

Brian Gurbaxani works in the OADS as a technical interface between the CDC and its academic partners, presently mainly with GA Tech. A systems engineer for 11 years, Brian is a computational biologist at the CDC since 2004 and a GA Tech adjunct professor of electrical and computer engineering (2007) and industrial and systems engineering (2016). He supervises both graduate (PhD) and undergraduate thesis work for the CDC, and especially Capstone senior design since 2014.

3:00 PM
Room 1C

SESSION 3B: MERGING PLACE AND HEALTH USING SPATIAL STATISTICS

Moderator: Mark Hartnett

Demographic and spatial disparity in HIV prevalence among incarcerated population in the US: A state-level analysis

Presenter: Srimoyee Bose (Georgia State University)

Authors: Srimoyee Bose
Georgia State University

The purpose of this study was to explore empirically the presence of any spatial and demographic disparity in the Human Immunodeficiency Virus (HIV) infection rate among the prison inmates across 48 states in the US and compare the results for 2000 and 2010. HIV infection is a severe health issue for incarcerated populations in the US. In 2010, the rate of diagnosed HIV infection among inmates in state and federal prisons was five times more than the non-incarcerated population. The National Prisoner Statistics database was used to find the demographic disparities in HIV prevalence rate based on incarceration rate, gender, race/ethnicity, the proportion of non-US citizens, and proportion of population below 18 years. State-level spatial mapping, Pearson correlation coefficient, and Moran's I statistic (univariate and bivariate) were computed based on these demographic characteristics using QGIS and Geoda software. There was a statistically significant pattern of spatial disparity in overall, male and female HIV infection rates across the state prisoners, with South and South-Eastern states facing a higher risk of infection. There was also statistically significant bivariate spatial association of HIV infection rate with the covariates: whites (negative), blacks (positive), non-US citizen (positive), and prisoners under age 18 years (positive) for both 2000 and 2010. There was a statistically significant higher HIV infection rate among the female prisoners in comparison to the male prisoners. It is of prime importance to examine the state-level disparities in HIV infection rate based on place and demographics. This is because evaluating the spatial pattern will help in accessing the relevant local information and provide federal agencies with better knowledge to target interventions and prevention programs toward the subgroup of the population at higher risk and help in controlling and reducing HIV infection prevalence.

Srimoyee Bose is currently pursuing her Ph.D. in Public Health (Health Services Research and Policy) at Georgia State University. She has a strong background in Economics as well with a PhD in Resource Economics. She is trained in the quantitative and spatial analysis of large population databases such as the US Cancer Registry, SEER-Medicare, MEPS, NHANES, etc. Her interests lie in exploring the impact of geographic, socio-economic, demographic, and policy covariates variability in the prevalence of chronic and infectious disease outcomes. Her dissertation work focuses on evaluating the geospatial patterns, implementing multilevel modeling, and performing a survival analysis among young women diagnosed with breast cancer across the US, before and after the Affordable Care Act enactment. She has co-authored and worked as a reviewer for several publications and reports in the field of health services and health outcomes research.

Geospatial analysis of Inflammatory Breast Cancer and Associated Community Characteristics in the United States

Presenter: Lia Scott (Division Of Cancer Prevention And Control)
Authors: Lia Scott[1,2], Lee Rivers Mobley[2], Dora Il'yasova[2]
[1]National Center for Chronic Disease Prevention and Health Promotion, Division Of Cancer Prevention And Control, Program Services Branch
[2]Georgia State University School of Public Health

Inflammatory breast cancer (IBC) is a rare and aggressive form of breast cancer, always diagnosed at late stage where mortality outcomes and morbidity burdens are known to be worse. In this study, we identified spatial clustering of county-based IBC rates among US females and examined the underlying community characteristics associated with the clusters. There was statistically significant evidence of spatial clustering into high and low rate clusters. The average rate in the high rate clusters (n = 46) was approximately 12 times the average rate in low rate clusters (n = 126), and 2.2 times the national average across all counties. Significant differences were found in the medians of the underlying race, poverty, and urbanicity variables when comparing the low cluster counties with the high cluster counties (p<.05). Cluster analysis confirms that IBC may be influenced by social and economic environmental factors. Particular attention may need to be paid to race and urbanicity when considering risk factors for IBC and when developing interventions and alternative prevention strategies.

Lia Scott is an ORISE Fellow on the Evaluation Team of the Program Services Branch as an ORISE fellow. Lia is also a Second Century Initiative Doctoral Candidate in Epidemiology at the School of Public Health, Georgia State University. Through her current doctoral research, Lia hopes to address social and physical environmental impacts on triple-negative and inflammatory breast cancer diagnoses. She pairs geospatial analysis with advanced statistical modeling techniques, such as mixed modeling and structural equation modeling, to explore the connection between residential segregation, socioeconomic conditions, social capital, and disparate health outcomes. Prior to starting her doctorate, she earned her MPH in Epidemiology from Georgia State University and BS in Chemistry from Elizabeth City State University.

Risk Mapping of Bat Rabies in the Caribbean Islands

Presenter: Clint N. Morgan (Division of High-Consequence Pathogens and Pathology)
Authors: Clint N. Morgan, Yoshinori Nakazawa, Ryan Wallace
National Center For Emerging & Zoonotic Infectious Diseases, Division of High-Consequence Pathogens and Pathology, Poxvirus And Rabies Branch

Rabies control efforts vary significantly between Caribbean Islands, and island-specific risks of bat-rabies have not been quantified as surveillance activities are largely absent in this region given claims that many islands are historically rabies-free. We utilized the Analytic Hierarchy Process (AHP) to generate a risk map using five risk factors determined by bat rabies subject matter experts (SME's). We generated a pairwise-comparison matrix containing aggregated importance values assigned by SME's and calculated weights for each risk factor. Within ArcGIS raster files of each risk factor were created, cell values were reclassified to assigned risk categories, and we performed raster calculation to generate country-specific risk values. All five countries that have a history of bat-rabies were ranked highest (Trinidad & Tobago, Grenada, Cuba, Dominican Republic, and Haiti). The top five highest risk historically rabies-free countries included Aruba, St. Vincent & the Grenadines, Puerto Rico, Jamaica, and Dominica.

Clint N. Morgan received his B.S. in Ecology & Evolutionary Biology (2012), and M.S. in Biology (2015) from Angelo State University (member of Texas Tech University System) in San Angelo, TX. Clint Morgan's thesis work was focused on mammalian natural history and conducting habitat suitability modeling of the white-ankled mouse in Southern Texas, as well as responsible for conducting a baseline assessment of mammalian and herpetological fauna within a state natural area, contracted with Texas Parks and Wildlife Department. For two years he has worked within CDC's Poxvirus and Rabies Branch (PRB) on the Virus-Host Molecular Interactions team conducting laboratory diagnostics, and laboratory animal studies involving multiple animal models and pathogens. Currently Clint is working with PRB's Ecology & Evolutionary Analysis team primarily conducting GIS-work, laboratory diagnostics, and has conducted international field investigations into potential reservoir species of orthopoxvirus in the Republic of Georgia, Colombia, and the Republic of Congo.

Cluster analysis ranking in public health decision-making: Exploring childhood asthma inpatient hospitalizations in Cook County, Illinois, 2011-2014

Presenter: Katie Labgold (Emory University)
Authors: Katie Labgold[1], Kristen M. Wells[2]
[1]Department of Epidemiology, Emory University
[2]Department of Public Health Sciences, University of Virginia

In the context of widespread need and finite resources, relevant stakeholders are faced with the challenge of selecting communities to initiate programming. Cluster analysis is used to identify geographic areas with high rates of an outcome, however cluster analysis often identifies more communities than can be reasonably targeted. The purpose of this study was to explore four considerations for cluster prioritization when many clusters are identified. We obtained childhood asthma inpatient hospitalization data at the ZIP code level from the Illinois Department of Public Health. SaTScan was used to identify high rate clusters rejecting the null hypothesis that no regions had higher than expected inpatient hospitalization rates (P<0.05). We identified 13 high rate Gini clusters and ranked them by log likelihood ratio, prevalence ratio, total cases, and population at risk. We provide a framework to community stakeholders for weighing these four considerations when selecting geographic areas for targeted intervention.

Katie Labgold is a PhD student in the Department of Epidemiology at Emory University. She received her BA in chemistry and archaeology at the University of Virginia in 2015, and her MPH at the University of Virginia in 2017. Her current research interests include social epidemiology, maternal and child health, and spatial epidemiology.

4:00 PM
Room 1A   **AWARDS AND FINAL REMARKS**
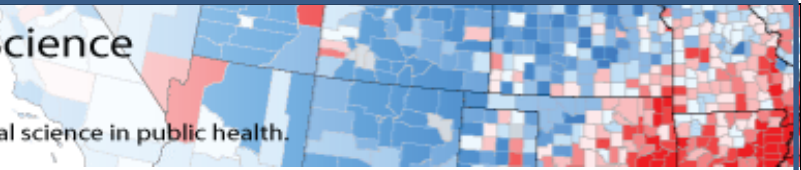
CDC/ATSDR GIS Day – Map Gallery
November 15, 2017

Using Satellite Imagery to Support Polio Outbreak Response in Borno State, Nigeria
Jeff Higgins, Andrew Berens, Nina Dutton, Bryant Jones, Steve Bullard, Brian Kaplan
CDC/ATSDR/DTHHS/GRASP

Spatial Analysis of Relative Change in HIV Testing Rates and Impact after Hurricane Sandy
Grete E. Wilt, MPH (1); Erica Elaine Adams, MS, MPH (1); Erin Thomas, PhD (2); Linda Ekperi, DrPH (2); Tanya Telfair LeBlanc, PhD (3); Ian Dunn, MS (1); Noelle-Angelique Molinari, PhD (3); Eric G. Carbone, PhD (2)
(1) CDC/ATSDR/DTHHS/GRASP; (2) CDC/OPHPR/OD; (3) CDC/OPHPR/DSLR

Social and Environmental Risk Factors to County Level Asthma Emergency Department Visits
Greta Wilt
CDC/ATSDR/DTHHS/GRASP

The Chronic Disease GIS Exchange and GIS Network: Supporting a Virtual Community of GIS and Chronic Disease Users
Sharon Murphy (1), Linda Schieb (2), Michele Casper (2), Joshua Tootoo (3)
(1) IHRC; (2) CDC/ONDIEH/NCCDPHP; (3) Rice University

Spatial Data Visualization
Brian Lewis
CDC/ATSDR/DTHHS/GRASP

Evaluating the spatial spillover of antibiotic-resistant *Escherichia coli* between chickens and humans in rural northern Ecuador
Hayden Hedman
University of Michigan

Polio Outbreak Response in DRC Using High Resolution Satellite Imagery:
A Four Way Partnership with Crowdsourcing
Ravi Shankar (1), Brian Kaplan (2)
(1) World Health Organization, Polio Surveillance, Lab & Data;
(2) CDC/ATSDR/DTHHS/GRASP

GIS In the Emergency Operation Center
Langdon Sanders
City of Sandy Springs, GA

Health Insurance Coverage Estimates, Percent Uninsured, 2013 and 2014
Mehrshad Nourani
The Coleman Group, Inc.

Disparities in Access to Ovarian Cancer Treatment
Shannon Graham
CDC/ATSDR/DTHHS/GRASP

Exploratory analysis of food access in Fulton County, GA using Tableau
Pearl Kaplan
CDC/ATSDR/DTHHS/ GRASP

Multilevel Small-Area Estimation of multiple Cigarette Smoking Status Categories using the 2012 Behavioral Risk Factor Surveillance System
Zahava Berkowitz, Xingyou Zhang, Thomas B. Richards, Lucy Peipins, S. Jane Henley, James Holt
CDC/ONDIEH/NCCDPHP

U.S. Cancer Statistics: New Data Visualizations- the Story Beyond Numbers
Simple Singh, Loria Pollack, Cathy Bledsoe, Anil Kolli, Vicki Benard, Lisa Richardson, Blythe Ryerson
CDC/ONDIEH/NCCDPHP

Sharing Robust Small-Area Heart Disease and Stroke Data
Linda Schieb (1), Sharon Murphy (2), Michele Casper (1)
(1) CDC/ONDIEH/NCCDPHP/DHDSP; (2) IHRC

Douala, Cameroon EOC Exercise Reference Map
William M. Hartnett
CDC/ATSDR/DTHHS/GRASP

CDC/ATSDR GIS Day – Map Gallery
November 15, 2017

GRASP Projects, Programs, and Partners: 2004 to 2016
William M. Hartnett
CDC/ATSDR/DTHHS/GRASP

Modeling riverine inundation by day in Harris County during and after Hurricane Harvey
Andrew Berens, Tess Palmer, Nina Dutton
CDC/ATSDR/DTHHS/GRASP

The Environmental Burden Index: Estimating Environmental Quality at the Census Tract Level
Jessica Kolling, Ian Dunn, Brian Lewis
CDC/ATSDR/DTHHS/GRASP

Congenital Syphilis, 2015
Kristin Lenoir, Candice McNeil
Wake Forest School of Medicine

A Comparison of Methods to Change Spatial Scale
Elaine Hallisey (1), Eric Tai (2), Andrew Berens (1), Grete Wilt (1), Lucy Peipins (2), Brian Lewis (1), Shannon Graham, (1) Barry Flanagan (1), Natasha Buchanan Lunsford (2)
(1) CDC/ATSDR/DTHHS/GRASP
(2) CDC/ONDIEH/NCCDPHP

Geographical Disparity in Prevalence of Diabetes-related Major Cardiovascular Conditions among Medicare Beneficiaries with Diabetes, U.S. States, 2013
Pyone Cho (1), Linda S. Geiss (1), Yan Zhang (1), Israel Hora (1), Ping Zhang (1), Olga Khavjou (2)
(1) Division of Diabetes Translation, NCCDPHP/CDC; (2) RTI International

Monitoring the Spatio-Temporal Variability of Urban Heat Islands: A Sensor Cloud-based Community-Centric Approach
Andrew Grundstein
University of Georgia, Department of Geography

Map Gallery Contest: All posters displayed in the Map Gallery will be judged in the following categories: Best Analysis, Best Cartographic Design, Most Original, and People's Choice. Winners will be announced at the poster session on November 15th.