Visualize Health Disparities using Geographic Information System (GIS)

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Coronavirus Outbreak
This map shows the general distribution of malaria in South America.

Geographers often use maps as a tool to explore spatial patterns and questions.
Beyond these physical factors, what else might help explain the distribution of malaria? Which of these three factors seems to be the most closely related to malaria?
Spatial analysis using maps to associate geographic information with disease can be traced as far back as the 17th century.

Today, recent developments and the widespread diffusion of geospatial data acquisition technologies are enabling creation of highly accurate spatial (and temporal) data relevant to health research.

This has the potential to increase our understanding of the prevalence, etiology, transmission, and treatment of many diseases.
Geographers at work, then

Geographers at work, now
GIS (Geographic Information System)

- Computer-based tool that analyzes, stores, manipulates and visualizes geographic information on a map.

- “The Science of Where is applying a data-driven approach that uses geography to unlock the understanding.”

What Public Health Questions Can GIS Answer?
Mapping Where Things Are

Areas of malaria risk
Mapping Health Disparities

Heart Disease Death Rates, 2000-2004
Adults Ages 35 Years and Older by County
Mapping Disease Density
Mapping Accessibility
Mapping How Things Have Changed

Percentage of Change in Reported Cases of Acute Hepatitis B
2010-2014

Data Source: Centers for Disease Control and Prevention
GIS

With GIS we can perform:

- Data Integration
- Spatial Analysis
- Visualization
Data-driven Geography

"To ensure we provide the best possible information to people who need it, and to meet increasing demands for fast, accurate data, and make intelligent decisions, based on data—we must constantly improve how we track and report illness and other health conditions. This takes strategic planning and a coordinated effort to bring together tools, technology, people, and partners." --- CDC Strategy on Public Health Surveillance and Data.
Spatial Analysis

- How much?
- Where?
- Who?
- How far?
- Why?
- Likelihood?
- How many?
- Which one?
- Is it a cluster?

Is there a pattern?
Visualization

- Data can be viewed in new and different ways
- Reveals hidden relationships
- Provides better communication
EMU CDC REACH Project

- **CDC REACH Program** is leading by PI Dr. Tsu-Yin Wu, "Evidence-Based Strategies to Empower Asian Americans in Reducing Health Disparities" is a five year project (2018-2023) as an effort to improve health of all Americans through its Racial and Ethnic Approaches to Community Health (REACH) program funded by Centers for Disease Control and Prevention (CDC). Dr. Xining Yang takes the lead role in active living domain using geospatial technology and citizen science approach to promote active living community in Michigan.

- **Eastern Michigan University** (EMU) is one of the 31 recipients of CDC REACH five-year grant programs awarded in September 2018 and the only one solely focused on Asian Americans as their priority population.
Goal and Plan for Active Living

What

• Collaborate with partners to improve physical activity in priority population(s) to connect sidewalks, paths, bicycle routes, public transit with homes, early care and education, schools, worksites, parks, or recreation centers through implementing master plans and land use interventions.

How

• Safe Routes to School
  • Form a multi-sector active transportation team.
  • Work with stakeholders and community partners to conduct needs assessment of the active transportation needs.
  • Plan a series of SRTS events and programs to promote physical activity to the local community.
Environment-Behavior-Planning

Geography of Hamtramck

- Hamtramck is a city in Wayne County in the U.S. state of Michigan. The population is 22,423 as of 2010 census. Hamtramck is known as an immigrant city and its city council became the first majority Muslim city council in the U.S in 2015. As the most diverse city in the State of Michigan, Hamtramck has reason to not only celebrate, but promote diversity. The government of the city have adopted the saying, “The world in two square miles” – and it truly is.

- In 2011, Hamtramck was voted the “Most Walkable City” in Michigan. In Hamtramck, the residents, old and young alike, walk throughout the City daily and walking safely to and from school is a priority. The City is focused on making that walk safer and a little more pleasant by improving pedestrian travel.
Transportation

Schools

Population

Crime and Safety

Walkability Map
Children who live closer to school are more likely to walk to school

Spatial Data Analysis on Distance

Over 86% of students who walk to school live within 500 meters of Dickinson East Elementary, Hamtramck, Michigan
Mix land-use promotes active living

Spatial Data Analysis on Diversity

A mix of everyday destinations including grocery or convenience stores, fast food restaurants, masques and parks are found in the 500-meter buffer of the school.
Hamtramck Health Atlas, A Web GIS Visual

Hamtramck Health Atlas

This atlas is a visual representation of some of the demographic, socio-economic, built environment, food environment, transportation, and safety barriers that residents of Hamtramck neighborhood face in accessing opportunities to lead healthy, productive lives.

The atlas presents data in a way to help inform decision makers about where City investment and resources are needed most in order for those living in Hamtramck’s underserved neighborhoods to reach their full potential. In the future, additional indicators may be added as needed to the sub-indices to refine and improve the view of equity in Hamtramck.

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Incorporate qualitative data and stories.

Invite policymakers to access Hamtramck Health Atlas to inform actions and recommendations for land use intervention.

We need your feedback to the atlas.

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Scan or Take a Picture to access Hamtramck Health Atlas, a Web GIS Visual
https://www.emich.edu/chdis/our-work/resources/health-atlas.php