

A GIS-Based Climate Change Tool to Identify Vulnerability with Implications on Social Equity

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Project Goal:

Develop a multidisciplinary, evidence-based visualization tool of climate-related risks, vulnerabilities, and policies that provides relevant data to local policymakers and the general public about the potential public health co-benefits of mitigation and adaptation activities.

Challenges:

1. Currently, most climate-related environmental data is not easily available at a scale useful to local government (e.g., census block group scale).
2. Many potential data sources at the local level either do not gather relevant data or do not geospatially code the data.
3. Absence of a coherent municipal policy across departments for protecting privacy in geospatially-coded data can prevent all data sharing.

Methodology:

Piloted an environmental public health indicators (EPHI) tool in Austin, Travis County, Texas that combines the following data sets in a GIS viewer at the census block group scale:

- Environmental Hazards
- Health
- Demographic
- Policy

Criteria for choosing baseline indicators:

- Location-specific climate event;
- Data availability based on relevant spatial-temporal scale; and,
- Quantifiable risks previously identified in the public health literature.

The GIS viewer supporting the tool, Geospatial Emergency Management Support System (GEMSS), is a geospatial clearinghouse and data services network created by Texas Natural Resources Information System (TNRIS), a division of the Texas Water Development Board.

Overview of Central Texas Climate Change Environmental Public Health Indicators Tracking Tool:

Baseline Research Period: 1999-2005

Environmental Hazards: Extreme Heat (EH); River Flooding (RF)¹

¹ Determined using Borden and Cutter's (2008) methodology for calculating natural hazard mortality. Reference: Borden and Cutter, Spatial patterns of natural hazards mortality in the United States, *International Journal of Health Geographics* 2008, 7

Event Definition:

Extreme Heat

Heat Index exceeds 105°F for at least two consecutive days. (NWS definition)

River Flooding

≥ 4” rain over a 24-hour period (Note: Based on local study. WMA exposure definition ≥ 2” over a 24-hour period)

Associated Baseline Health Measure:

Extreme Heat

Age-adjusted cardiovascular mortality rate.

River Flooding

Age-adjusted diabetes and hypertension mortality rate as a proxy for potential risk of medical care displacement/disruption.

Vulnerability Indicators:

Elderly (% of individuals above 65 years of age)

Ethnicity (% of Blacks; % of Hispanics)

Population Density (# of individuals/sq miles)

Socially Isolated (% of individuals living alone)

Renters Status (% of individuals renting)

Impervious Surface /Lack of Vegetative Cover

Average Surface Temperatures

100 – Year Flood Plain

Low Water Crossing (dot density of LWC points)

Emergency Notification Service Areas

Event:

Both

Both

Both

Both

Both

Both

EH

RF

RF

RF

GEMSS Layer:

Cardio Rate

Diabetes & Hypertension Rate

Current

Current

Current

Potential

Current

Current

Current

Current

Current

Associated Baseline Health Measure:

Municipal Tree Planting and NeighborWoods Program

Future Land Use Zoning Encouraging Population Density

Sidewalks, Bike Lanes and Mass Transit Stops

Weatherization Projects

Energy Star Roofs

Vegetated roofs

Certified “Green” Buildings

Photovoltaic Installations

Fan/air Conditioning Giveaway Program Installations

Residential Power Saver Program

Type:

Both

Both

Both

Both

Both

Both

Mitigation

Mitigation

Adaptation

Adaptation

GEMSS Layer:

Current

Current

Current

Potential

Potential

Potential

Potential

Potential

Potential

Potential

Results:

1. Climate change is already having a disproportionate impact on vulnerable groups.
2. The pilot EPHI Tracking Tool can enhance emergency response capacity and inform future policy.
3. Flexible tool that is replicable in other locations and at other scales.

Next Steps:

1. Validate the current research through an analysis of heat- and flooding-related morbidity.
2. Use data generated by the tool to: a) brief policymakers on the potential vulnerabilities and public health co-benefits associated with climate change policies; and, b) launch a community awareness campaign targeted to vulnerable populations around the links between climate change and public health.