



The Analytics for Equity Initiative

Holistic spatial flood vulnerability assessment for historically underserved communities: A trial analysis for Houston, Texas

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Research Theme: Health Equity in the Wake of Climate Change

Research Questions: 1) What characteristics of the built environment contribute to vulnerability in flood-prone areas? 2) How does vulnerability and risk to flooding vary across underserved communities within urban areas?

Data: USA Structures; County Assessor data/HISDAC-US; Harris County road network (TIGER/Line); Fathom-US 2.0; National Flood Hazard Layer (NFHL); Centers for Disease Control/Agency for Toxic Substances and Disease Registry Social Vulnerability Index (SVI); National Flood Insurance Program (NFIP) Redacted Policies

Abstract:

Climate change, rapid development, and insufficient land use planning are exacerbating the threat and consequences of flooding in many communities across the United States (US). Research has consistently revealed the unequal distribution of flood exposure, placing a disproportionate burden on minority and lower-income communities in the US. Despite growing understanding of flood risk inequities based on social characteristics, less is known about what characteristics of the built environment contribute to vulnerability in flood-prone areas, or how social and physical vulnerability interact. It is even less clear how social and physical vulnerability are compounded by other factors such as financial vulnerability, namely flood insurance, as well as vulnerabilities created by gaps in existing flood management policies. This research develops and assesses a novel building-level index of flood risk that facilitates a more comprehensive spatial measurement of the concentration of flood risk across communities within urban areas, particularly those which have historically been 'underserved'. This project conducts a case study of flood-vulnerable Harris County, Texas, the second most populous county in the US, and home to Houston, Texas, to respond to the following three primary objectives: 1) Develop a composite Flood Vulnerability Index that measures exposure to flooding, and social, built environment, and financial vulnerability at high spatial resolution; 2) Measure spatially concentrated flood risk at the scale of buildings and neighborhoods, within FEMA and federally-overlooked 100-year flood zones; 3) Identify spatial patterns in compounding flood risk among historically underserved and overlooked communities and identify flood vulnerability hotspots. This study will advance the understanding of potential compounding factors leading to inequitable vulnerability to flood hazards. It will also fill a knowledge gap related to how characteristics of the built environment relate to social and financial vulnerability, as well as different types of flood exposure.



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