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Machine Learning Approach to Project Heat-related Disease Burden

Harris County Public Health, Texas

Harris County Public Health (HCPH) collaborated with the Houston Advanced Research Center (HARC) to produce heat-related disease burden estimates. The three-phase approach included creating a local health impact function, utilizing BENMap to produce future disease estimates under different climate scenarios, and creation of a machine learning model to make future analysis faster.

Based upon recent climate projections and reports, extreme heat is an increasing concern for Harris County. There have been multiple attempts to understand how many extreme heat days to expect in the future, but few efforts to connect temperature increases to health effects at the local level. The HCPH Climate Program sought to follow the Centers for Disease Control and Prevention's (CDC's) BRACE framework and create disease burden estimates for Harris County, however the process and analysis were unfamiliar. HCPH needed to create disease burden estimates and build internal capacity to recreate the analysis for other climate impacts, such as air quality and flooding. These estimates will be paired with local climate vulnerability assessments to prioritize issues, communities, and potential solutions in Harris County.

Project Description

HCPH worked with local scientists at HARC to create heat-related disease burden estimates for all of Harris County, Texas at the zip code level. HARC trained HCPH data analysts on how to create a health impact function, how to use BENMap and how to create a machine learning model. This project focused on extreme heat and health, however the skills learned are transferable to other climate and health impacts such as air quality and flooding.

Project Outcome

Through this project, HCPH and HARC created a heat and health impact function for Harris County, zip code-level disease burden estimates for the entire county, and a machine learning model. Building internal capacity was a high priority throughout this project and four full-time HCPH data analysts were trained during the process and a manual was created for future analysts. The HCPH Climate Program plans to use the results from this project to plan and prioritize mitigation and adaptation initiatives in Harris County.

Lessons Learned

HCPH's partnership with HARC was a great asset during this project as HARC scientists are more experienced with developing health impact functions and disease burden estimates. While the HCPH analysts were able to achieve all outputs, more time is needed to fully understand what the results mean for different communities. Additional time to review the outputs with the National Association of County and City Health Officials and CDC staff would have been useful and allowed HCPH to ground-truth the model. It would have also been beneficial to expand the planning phase and discuss the various models for creating the health impact function. A more in-depth understanding of the benefits and limitations of each model would have been beneficial as HCPH continues to build out new health impact functions related to other climate impacts.

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