

Quantifying Health Impacts from Multiple Sources:

The creation of a relative index for assessment and modeling of recommendations

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Photo by Robert Stanton / Houston Chronicle

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Background & Setting

Galveston, Texas

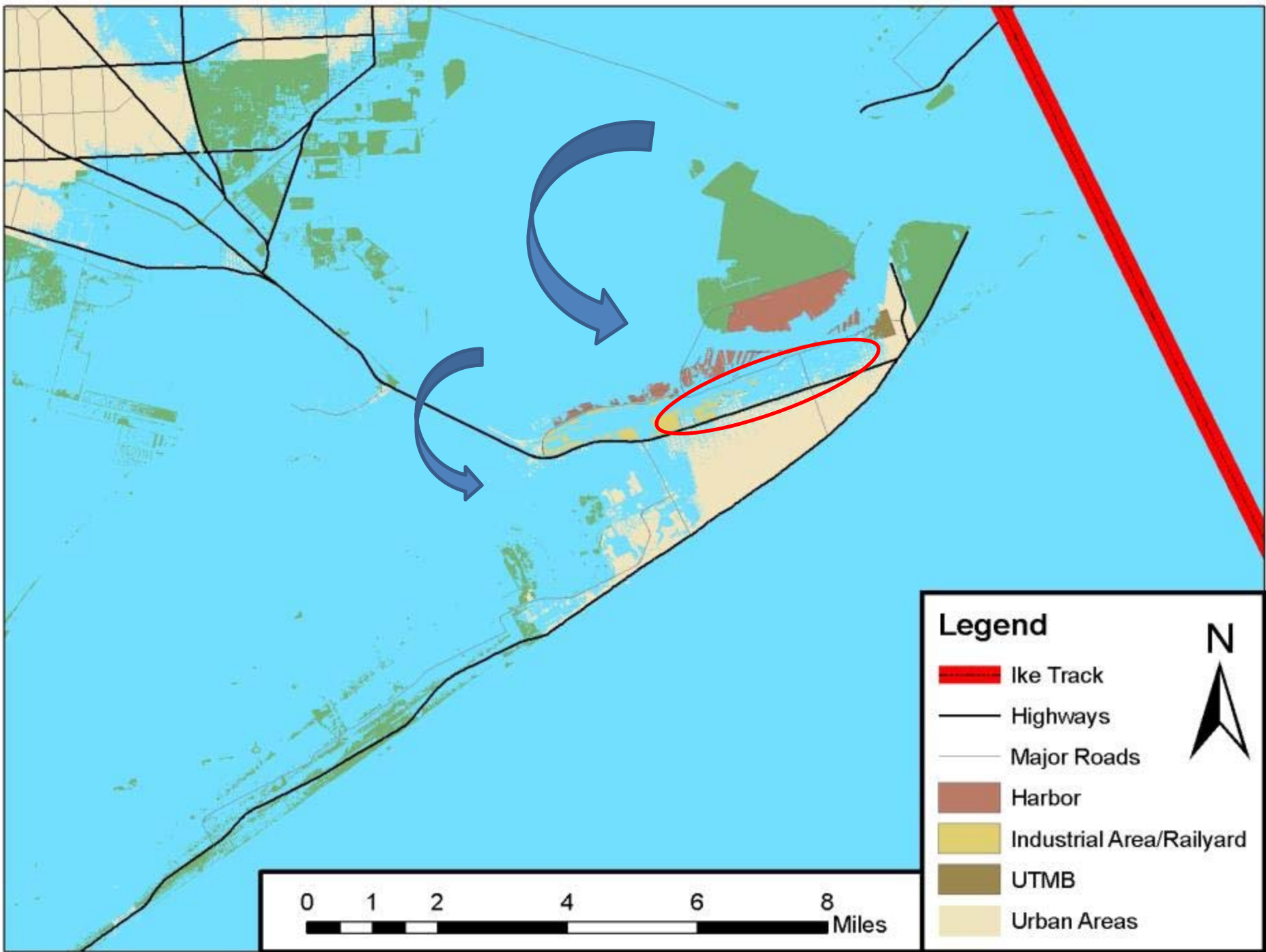
Barrier island 1 hour
southeast of Houston

Population: 48,444, with gusts
to over 400,000

Resident population is
Relatively older
Less resourced
Majority-Minority

Hit by Hurricane Ike in 2008





Why conduct an HIA?

- Following Hurricane Ike, 569 public housing units were demolished
 - 4 barracks apartment style complexes developed in the mid-20th century
- Series of discussions and debate on rebuilding of these units
 - Hybrid approach utilizing mixed-income and scattered-site housing
 - Scattered site housing units to be selected from existing properties occupied by housing choice voucher holders

Which potential scattered site locations in the City of Galveston present the best options for supporting health for public housing residents?

Challenges and Final Approach

- Changing decision point over the course of the project
 - Identified common features across different plans
 - Boundaries – Conciliation Agreement
 - Broad elements of the plans – contains some number of scattered site properties
 - Certainty - General agreement that some number of units would be built on Galveston
 - Decided on a broad assessment of all census blocks
 - Similar calculations
 - No longer reliant on specific addresses
 - Provides relative scoring and comparisons across entire community

Indicators

Population Density

Poverty Concentration

Concentration of Minorities

Parks

Recreation Centers

Industrial Areas

Truck Routes

Elementary Schools

Alcohol Vendors

Grocery Stores

Fast Food and Convenience
Stores

Licensed Child Care Centers

Environmental Hazards

Health Care and Social Services

Pedestrian Safety

Bus Route

Base Elevation / Flood Plain

Proximity vs. Density

Proximity

- Distance to nearest feature
- Calculated in meters
- “Near” tool

Density

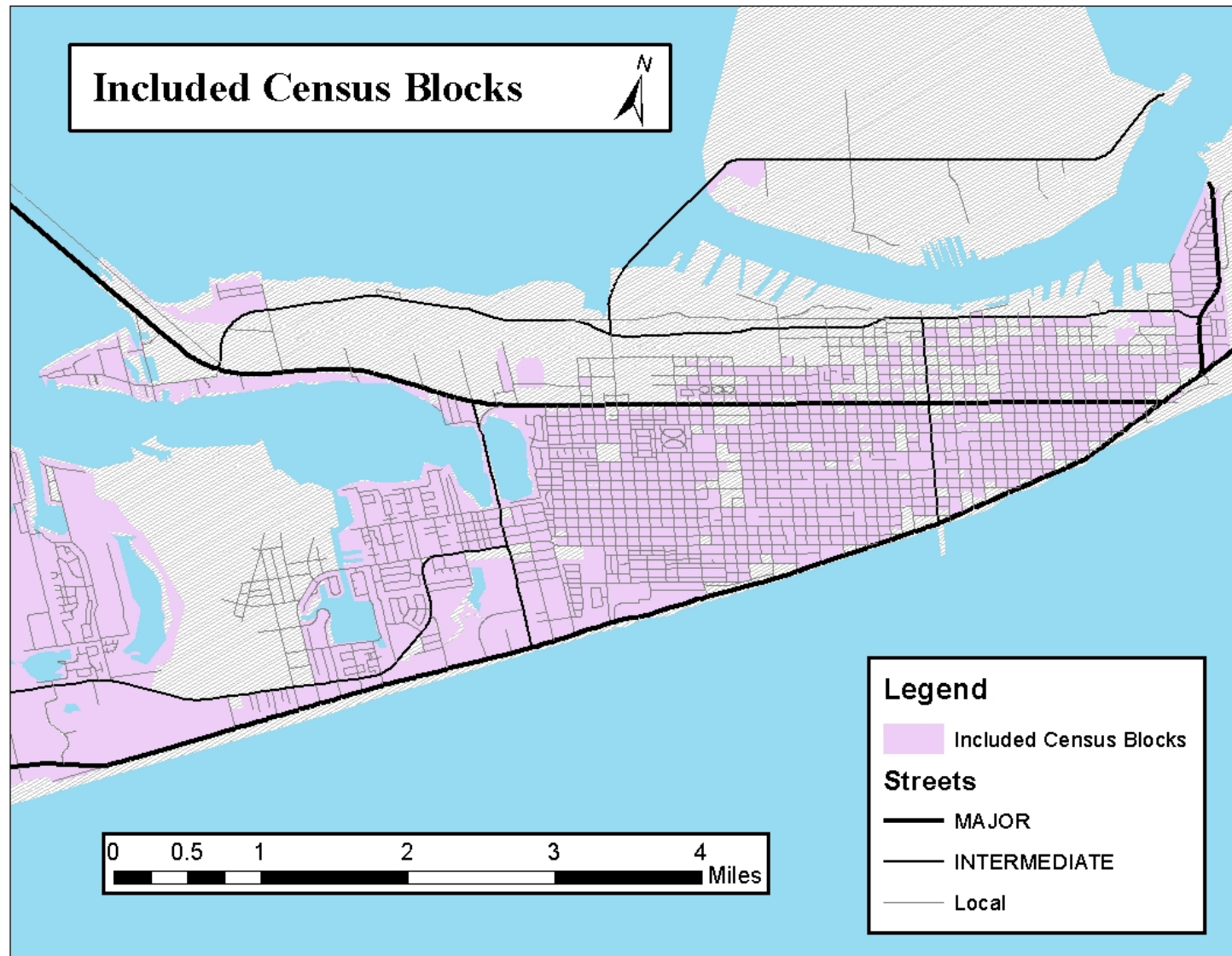
- Number of features per 1000 population for census blocks within $\frac{1}{4}$ mile
- Spatial joins

- Standardized using Z-Scores
 - Converted scores into common units
 - Enabled calculation of a cumulative score

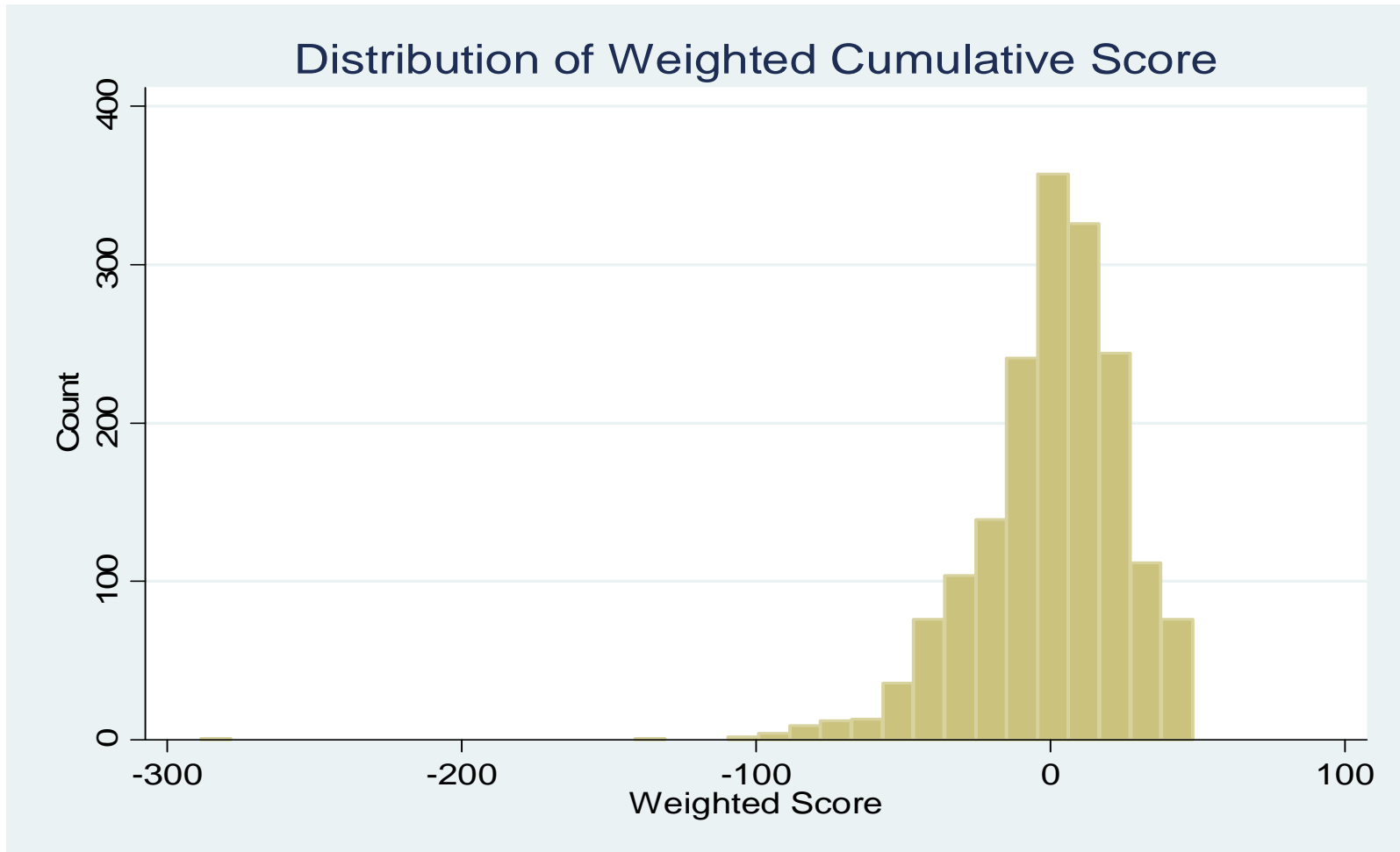
Scoring & Weighting

- Calculated raw and standardized scores for each indicator for every census block
- Applied Weighting Formula: Strength of Evidence + Impact
 - Strength of Evidence in the literature & Strength of Data Source
 - Consensus of 3 project researchers
 - Final vetting by community steering committee
- Calculated weighted cumulative score
- Calculated relative percentile rank for each indicator and overall cumulative score for occupied blocks

Ranked Blocks



Weighted Scores



Modeling Recommendations & Mitigation Strategies

- Capacity to model potential benefits to recommendations and mitigations focused on specific indicators
 - Determine an estimated improvement a given recommendation may have on a specific indicator (i.e., as good as the top 20% of blocks)
 - Give every block that is below that threshold the value of the 80th percentile
 - Calculate new cumulative impact score and compare to original scores
 - Results help to determine potential effectiveness for an intervention applied to a specific address (change in individual block score) or more broadly across the community

Modeling Recommendations

| Indicator | Number of Added Census Blocks | Percent of Census Blocks Added | Percent of Total Census Blocks in Galveston |
|------------------------------------|-------------------------------|--------------------------------|---|
| Proximity to Truck Routes | 192 | 55% | 31.0% |
| Pedestrian Safety Measures | 108 | 31% | 26.2% |
| Density of Alcohol Outlets | 49 | 14% | 22.8% |
| Proximity to Recreation Facilities | 49 | 14% | 22.8% |
| Proximity to Industrial Areas | 49 | 14% | 22.8% |
| Proximity to Health Care Services | 48 | 14% | 22.8% |
| Density of Less Healthy Foods | 46 | 13% | 22.6% |
| Density of Childcare Providers | 45 | 13% | 22.6% |
| Proximity to Parks | 35 | 10% | 22.0% |
| Proximity to Grocery Store | 24 | 7% | 21.4% |
| Proximity to Elementary Schools | 13 | 4% | 20.8% |
| Proximity to Bus Route | 13 | 4% | 20.8% |
| Proximity to Environmental Hazards | 5 | 1% | 20.3% |

Limitations and Next Steps

- Network distance vs. “As the Crow Flies”
 - Smaller island with a grid-based street network
 - Network analyst can resolve this issue
- Establishment of weights can be more objective
 - Did include community input
 - Ground-truthing of scores helps to validate the results
- Assumed linear relationship between density/distance and relative health impact
 - A next step in refining the process
- Only valid within the geographic boundary of the study
 - Difficult for cross-community comparison

Thank You

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<http://www.utmb.edu/CEHD>