Improving Health through Housing and Neighborhood Development in Galveston, Texas: Use of Health Impact Assessment to Develop Planning Tools and Coordinated Community Action

HIA Summary Report

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Introduction

Since Hurricane Ike hit Galveston, Texas, in 2008, the island city has undergone a substantial recovery process including critical infrastructure and the built (physical) environment, as well as a healthy social environment. Hurricane Ike damaged 75% of the housing and buildings on the Island, including 569 units of public housing, of which only 60 units have been recovered to date. Neighborhoods near the bay, bayous, or lakes were devastated. One especially hard-hit neighborhood was the North Side, a historically African-American neighborhood, and the location of the majority of all public housing before the storm. The losses created challenges for many Galveston residents, especially those with the least means to relocate. At the same time, the rebuilding process creates an opportunity to make housing and neighborhood development choices that promote a healthier future for island residents with a history of neighborhood health challenges.

The City of Galveston and Galveston Housing Authority have agreed to a plan to rebuild some of the public housing through two mixed-income developments, with the Texas General Land Office overseeing the development and management of additional scattered site housing units. Scattered site housing refers to single family and small multi-family rental properties that are owned and managed by a public or non-profit housing organization. These units would be permanently eligible as a housing option for recipients of rental subsidies who were not subsidized through a housing choice voucher. These homes may be clustered or isolated relative to other scattered site units, and can be located anywhere within the Galveston Housing Authority's jurisdiction. Although the terms of agreement specify that scattered site housing units will be new construction, preferably developed from vacant lots or lots with dilapidated/uninhabitable houses (see Article 10e and Article 3 of the Conciliation Agreement, respectively, found in the appendix of the technical report at www.utmb.edu/cehd), there is concern that some rehabilitated housing may be used due to lack of affordable lots.

Box 1. What is a Health Impact Assessment (HIA) and how is it different from a Fair Housing Assessment?

"HIA is not a health risk assessment. HIA is a management tool to assess complex societal decisions that may have health implications and options for managing the health effects. It is not meant to just identify risks, and its purpose is not to determine if a proposal or policy is a good idea of not. HIAs offer recommendations to address data gaps, establish a monitoring framework, maximize benefits, and minimize risks." Institute of Medicine, 2012

Like most HIAs, this one includes a set of recommendations for decision-makers and the public that provide practical solutions to increase positive health impacts and mitigate, or reduce, negative health impacts. It does not attempt to answer questions of whether public housing should be rebuilt in Galveston or how many scattered site units should be built on the island. Nor does the study assert that health should be the only consideration in terms of where housing should be built. Rather, the focus is on identifying, then managing potential health impacts related to developing housing and to general neighborhood development in Galveston.

In contrast to a Fair Housing Assessment, this HIA does not take into account a number of indictors generally incorporated into such analyses, and does incorporate other indicators–because of their influence on health—that are not used in FHA's. Further, the methodology used in this HIA compares potential sites within Galveston, rather than grading them against a standard, which makes the HIA analysis an inappropriate substitute for an FHA.

Figure 1: Map of Galveston County

Study purpose and recommendations

This Health Impact Assessment (HIA) uses an evidence-based approach to develop recommendations for improving the health of neighborhoods through supporting decisions related to the location and design of scattered site housing as well as broader neighborhood improvements. The primary question addressed by this HIA is:

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

A secondary research question for the project is:

Which interventions related to the neighborhood-level built environment could most improve the health of City of Galveston residents?

For scattered site development, the HIA offers a methodology for screening census blocks based on various health indicators that would most support the health of scattered site residents, a process for site selection, considerations for placing families in scattered sites and supporting their health, and interventions that would increase the number of census blocks with relatively higher scores in terms of positive health. Second, the HIA identifies priority neighborhood-wide interventions to address key community health needs for residents in general, and could be used by a variety of local governmental, civic, and community groups to enhance the livability, desirability and positive health impact of Galveston's neighborhoods. This report details the relationship between each indicator and key health priorities in Galveston, and identifies interventions or mitigating actions that various groups—such as the City, community organizations, neighborhood developers, or scattered site developers—could take to improve indicators' impacts on health. Mitigation strategies can include changes to ordinances and codes, programs, services, infrastructures, or a home's physical design.

Box 2. Community engagement.

This HIA was developed through a community-engaged process. Over twenty local representatives from governmental bodies and agencies, social services and health care organizations, the business community, and other community and civic leaders served on a Community Steering Committee (CSC), which has met over a period of two years to provide input into every phase of the research process. More than a dozen health-related subject-matter experts reviewed the research design and methodology. And over two dozen focus group participants comprised of residents from across the city who were receiving housing assistance provided perspective on the lived experience of many of the health indicators studied and their perceptions of specific barriers. The contributions of these individuals to the success of this work were invaluable.

Relevance of the research

This HIA follows a growing interest in communities across the U.S. to improve population health and prevent disease and disability through planning the built environment. Although the topic focus for this assessment is on housing, the research frames the housing issue within a broader "healthy neighborhood" focus. Consequently, the indicators relate less to housing units themselves (though we do comment on unit level issues), and more to the relationship between the geographic positioning of housing and health-enhancing or detracting influences ranging from access to healthy food to street safety. While this kind of an approach is not unique, this assessment contributes to advancing the HIA field both in terms of the combination of potential health impacts from several indicators into a "cumulative risk" model, along with innovative methodologies (including a process for weighting indicators).

The scientific link between housing, neighborhoods, and health

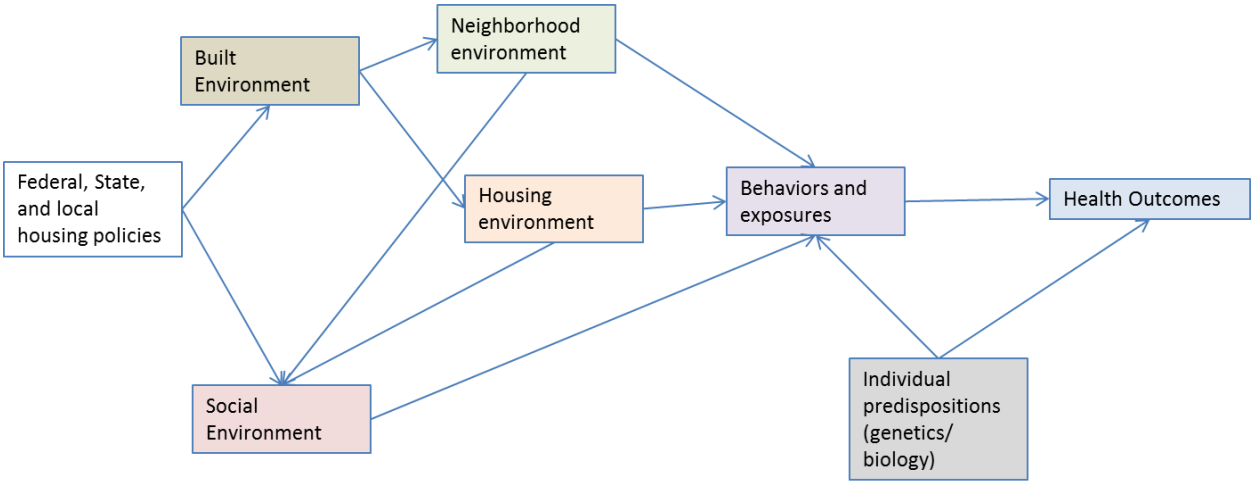
Although the traditional link between housing and health has been focused on issues related to the physical structure itself, research increasingly clarifies how the environment beyond the structure affects health, including neighborhood physical and demographic structures, regulations and building standards related to streetscapes, and air quality, to name just a few. Further, public housing and other low income residents in Galveston historically have often disproportionately experienced challenges extending to neighborhood conditions more broadly, such as poor access to healthy food outlets and

close proximity to industrial areas. These challenges, often called social determinants of health, correlate with a higher prevalence of health problems such as diabetes and cancer.

According to the Centers for Disease Control and Prevention, social determinants of health are "The complex, integrated, and overlapping social structures and economic systems that are responsible for most health inequities. These social structures and economic systems include the social environment, physical environment, health services, and structural and societal factors." (U.S. Department of Health and Human Services, 2000).

Housing policies have the potential to influence community health outcomes through multiple complex pathways. Figure 2, below, provides an overarching conceptual connection between housing policy and health outcomes. More detailed causal pathways diagrams related to each of the indicators examined are presented in the technical report.

Figure 2. Pathways between policies, neighborhood and housing environments and health



Priority health issues in Galveston

Although little health information about residents of the City of Galveston is available, at the county level, residents fare better than the rest of Texas on some health indicators, including: deaths from heart disease, sexually transmitted infections, mammography screening rates, adults with health insurance, number of primary care physicians, violent crime rates, and teen birth rates. However, Galveston County residents are at greater risk than other Texans for other health indicators, including prevalence of diabetes, low birthweight babies, and preventable hospital stays, as well as premature death in general. Residents of Galveston County are specifically at higher risk of death due to stroke, cancer, kidney disease, chronic liver disease, unintentional injuries, and suicide (UWPHI, 2013). Galveston County faces a higher number of years of potential life lost than the State average, meaning that County residents are likely to die younger. Levels of obesity and physical inactivity in the county are similar to state levels, but are still poor compared to national benchmarks.

Table 1. County Health Rankings and Other Statistics			
	Galveston County	**National Benchmark***	**Texas**
Health Outcomes			
Premature death	7,839	5,317	6,928
All Cause Death Rate (per 100,000)	808.6		781.2
All Cancer Death Rate (per 100,000)	181.0		167.6
Breast Cancer Death Rate (per 100,000)	26.8		21.6
Lung Cancer Death Rate (per 100,000)	51.8		45.7
Stroke Death Rate (per 100,000)	48.9		45.8
Deaths from Unintentional Injuries (per 100,000)	40.9		40.0
Diabetes Death Rate (per 100,000)	27.1		23.1
Health Behaviors			
Adult smoking	16%	13%	18%
Adult obesity	30%	25%	29%
Physical inactivity	25%	21%	25%
Excessive drinking	16%	7%	16%
Motor vehicle crash death rate (per 100,000 population)	15	10	15
Sexually transmitted infections	393	92	476
Teen birth rate (per 1,000 female population ages 14-19)	48	21	60
Social & Economic Factors			
Unemployment	9.1%	5.0%	7.9%
Children in poverty	22%	14%	27%
Inadequate social support	23%	14%	23%
Children in single-parent households	30%	20%	33%
Violent crime rate (per 100,000 population)	394	66	483
Air pollution-ozone days	10	0	18
Access to recreational facilities (facilities per 100,000 pop)	8	16	7
Limited access to healthy foods	9%	1%	9%
Fast food restaurants	48%	27%	52%
* 90th percentile, i.e., only 10% are better; Note: Blank values reflect unreliable or missing data; Source: 2013 County Health Rankings; Health Facts Profile 2009			

These county-level health indicators provide averages representing all county residents. However, low income families and neighborhoods often suffer higher rates of disease and preventable death (Bosma, van de Mheen, Borsboom, and Mackenbach, 2001; Lantz and Pritchard, 2010; Wen, Browning, and Cagney, 2003), and the City of Galveston has higher rates of low income residents than the county as a

whole. Consequently, City of Galveston residents likely experience a higher rate of disease and illness than county residents as a whole.

Additionally, data gathered during the development of Galveston's Human Capital Plan from heads of households displaced from public housing by Hurricane Ike revealed that 49% have high blood pressure, 26% suffer from arthritis, 21% have diabetes, and 19% have asthma. Thirty-nine percent of these respondents also reported that a child in their household had asthma symptoms. Additionally, 29% of the respondents indicated that they experienced depression, anxiety, or high levels of stress. Many respondents lacked health insurance (30%), primary care (39%), or regular dental care (57%). The same report found that more than half of the respondents did not exercise regularly, with two-thirds indicating that they lacked places to exercise. Half had a self-described unhealthy diet and 17% indicated that they desired nutrition classes for themselves or their family (Urban Strategies, Inc., 2012). The Galveston Children's Report Card, a self-report survey of local public high school and middle school students, indicates that particular behavioral health challenges for local children include violence and suicidal ideation (Freeman, et al., 2009).

Table 2. Demographic profile of GHA's DHAP residents, City of Galveston, Galveston County, State of Texas, and U.S. populations.

Demographics	DHAP	City of Galveston	Galveston County	State of Texas	Nation
Female Head of Household	88.20%	15.12%	13.20%	13.90%	12.60%
Race/Ethnicity					
African-American	86.70%	18.60%	13.50%	11.50%	12.20%
Hispanic	9.10%	31.30%	22.40%	37.60%	16.30%
White, non-Hispanic	3.80%	45.00%	59.30%	45.30%	63.70%
American Indian / Native Alaskan	0.40%	0.40%	0.40%	0.30%	0.70%
Asian	0.00%	3.10%	2.90%	3.80%	4.70%
Age Distribution – Total Population					
0 – 17	47.10%	19.30%	25.50%	27.30%	24.00%
18 – 24	16.60%	13.10%	8.80%	10.20%	9.90%
25 – 44	8.90%	24.80%	26.40%	28.10%	26.60%
45 – 64	10.80%	29.30%	28.10%	24.00%	26.40%
65+	16.20%	13.60%	11.30%	10.30%	13.00%
Age Distribution – Children					
0-5	31.10%	35.70%	32.30%	33.70%	32.70%
6-12	43.50%	37.20%	39.50%	39.00%	38.70%
13-17	25.40%	27.20%	28.20%	27.20%	28.60%
Household Size					

1	18.40%	36.70%	24.70%	24.20%	26.70%
2	41.00%	32.50%	32.30%	30.30%	32.80%
3	16.80%	13.10%	16.90%	16.60%	16.10%
4+	24.30%	17.70%	26.10%	28.80%	24.40%

Source: US Census 2010, 2007-2011 American Community Survey 5-year estimates; Human Capital Plan Working Together for Galveston - Galveston, Texas, 2012.

Who would be affected by improving neighborhood conditions and scattered site housing in Galveston?

Low income residents, such as residents who would be living in scattered site housing, as well as other low income residents living in the surrounding neighborhood, are more vulnerable to weaknesses in the health fabric of neighborhoods than middle and high income residents. These low-income households typically have more health risk factors and worse underlying overall health status than higher income populations, as well as economic and social stressors (such as lack of a vehicle, or lack of social support), which make them particularly vulnerable to poor health-related neighborhood conditions (see Tables 1 and 2 above).

In Galveston, public housing residents displaced by Hurricane Ike are highest on the waiting list for public housing spots, including the potential scattered sites. Demographically, in addition to being low income, this population is disproportionately minority, and has fewer years of formal education and poorer health status than the general population.

However, it is not clear at this point how many of those former public housing residents will choose to occupy scattered sites (for instance, by some estimates, up to 60% of public housing residents from before Hurricane Ike are still located on the island, housed in other subsidized housing or in private housing; it is possible, too, that many of those who moved off the island will no longer be interested in moving back). If they choose not to live in the scattered sites, or if there are additional sites available for occupancy, others on the waiting list will likely be offered placement. Given the number of units planned to be developed—approximately 386 at the time this report was developed—it is particularly important to ensure that our local neighborhoods can effectively support them as well as their neighbors.

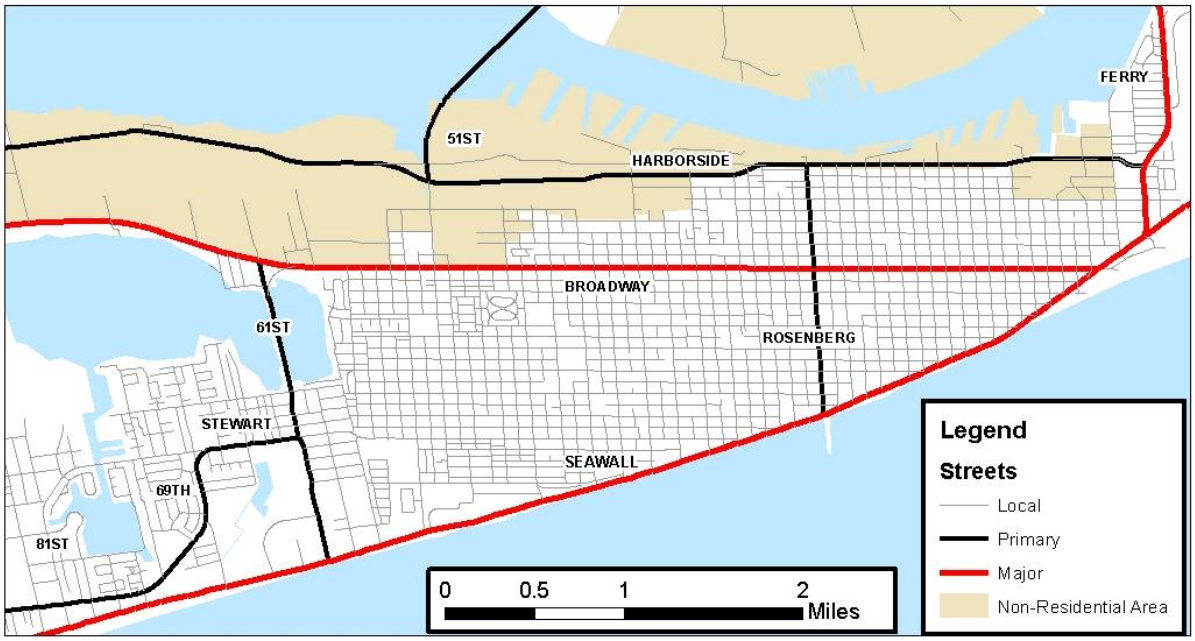
Additionally, the indicators, findings, and recommendations presented in this study are clearly relevant to general neighborhood interests in advancing healthy communities, and implementing these recommendations would potentially benefit the larger island population in general.

Geographic boundaries and analysis level

This HIA analyzes available data for the area within the City of Galveston city limits (spanning from the ship channel in the east to San Luis Pass in the west, including Pelican Island). Depending on the indicator, data were available at the point, parcel, census block, or census tract level. For data at the

census tract level, statistical techniques using regression models were utilized to estimate values at the more refined census block level. In Galveston, a census block is typically one-half to one actual city block, in contrast to a census tract, which can extend dozens of city blocks or even, in the case of the west-end, for miles. Final reporting of results occurred at the census block level.

Figure 3. Map of the urban core of the City of Galveston, Texas.



The term "Galveston's Urban Core" is used frequently throughout this report. This area encompasses the densely populated eastern end of the island, bounded roughly by the East End Flats, Seawall Boulevard, 91st Street, and Harborside Drive. Approximately 80% of Galveston's resident population lives within this area, with the remainder of the residents living in the less densely populated areas on the west end and in East Beach developments.

Approach

The research team, working with the Community Steering Committee, identified a number of potential indicators related to neighborhood quality and health, with 23 being ultimately selected for use in this HIA. These 23 indicators were linked to health outcomes and social determinants of health particularly relevant for the City of Galveston and especially for supporting the health and well-being of low income and public housing residents. Examples of linkages to health include indicators with evidence-based connections to outcomes such as high blood pressure, mental health and stress, educational attainment,

diabetes, asthma, cancer, and injuries, among others. Many of these indicators act along the similar causal pathways. For example, proximity to parks, proximity to recreation facilities, and presence of pedestrian safety measures can all increase physical activity, which helps prevent a number of diseases including heart disease, stroke, some kinds of cancer, depression, diabetes, and a number of other ailments. Other common pathways included access to employment, access to goods and services, and exposure to environments that increase allostatic loads among residents (high stress environments).

Indicators were then divided into groups: Neighborhood-level (public data) indicators, Block-level inspection indicators, and Unit-level inspection indicators. Existing secondary data for neighborhood-level assessment indicators were used to compare census-blocks in Galveston to one another, in order to generate relative scores of these indicators. The results of this evidence-based approach can provide neighborhood-level health-specific guidance on selection and mitigation options to decision makers considering a given address in Galveston for development into scattered-site properties. These scores also provide an evidence-based data source for guiding broader, neighborhood- or community-wide development efforts.

The 23 indicators are described briefly in this section, including how each indicator was measured, how it influences health, how Galveston generally fares in terms of each indicator. Also discussed are possible mitigation actions for a variety of public and private agents. These entities include the scattered site developer, the City government and others involved in neighborhood planning such as the North Side redevelopment planner, and public and private business and community groups.

The potential interventions to mitigate health harms are intended as a guide for improving the health impact of neighborhood areas and potential scattered sites. Consequently, the first four indicators—population density, concentration of single-parent households, and racial/ethnic diversity—may influence choices about whether to develop a scattered site, but offer few short-term options for change. A more thorough discussion of each indicator, including, pathway diagrams and feedback from focus group discussions is provided in the Assessment section of the technical report.

Neighborhood-level indicators

The first 16 indicators reflect data at the Neighborhood level, characterizing conditions in a broad area near potential housing sites. These indicators use publicly available data from sources such as the US Census and form the basis of the primary analysis. Neighborhood level indicators represent the largest spatial scale compared to the block- and unit-level indicators described in subsequent sections.

***1. Population density*.** Population density is measured as the number of people living in census blocks within ¼ mile of the center of a census block. Low density areas are likely to have fewer transportation options, fewer stores and services, and may inhibit social connections. These pathways lead to broad health outcomes including obesity, heart disease, all-cause morbidity and mortality, and poor mental health and suicide.

- ***Galveston findings:*** Generally, the areas between 1st Street and 91st Street (except the industrial areas generally north of Post Office Street between 27th and west) have appropriate

population density to support residents. The majority of Galveston's services and residents live in this area, and the area is served by Island Transit. Outside of this area, population density drops dramatically, posing challenges for health of lower income residents.

2. Concentrated poverty, using single-parent households as a proxy. This indicator measures the proportion of single-parent households in a Census block and the surrounding census blocks within ¼ mile, and serves as a useful proxy for concentrated poverty because the two are highly correlated in Galveston. This approach also accounts for the fact that Galveston has a large student population which tends to be captured in poverty data, but is less predictive of older adults living in poverty. Poverty influences health through stress, reduced access to education and employment, higher crime rates, and social isolation. Concentrated poverty has been linked to higher rates of death generally, as well as higher rates of mental illness, injury, weakened immunity, infant mortality, and a wide range of chronic diseases.

- ***Galveston findings:*** There are hot spots (or areas of concentrated single-parent households) in Galveston in areas with long-standing poverty. Also included in areas of high poverty concentration were the census blocks containing Gulf Breeze and Holland House, which are the two existing public housing complexes serving older residents. Also, census blocks where the two mixed-income developments are slated to be built were included in the poverty calculation using current occupancy plans.

> ***Focus Group Perspective: Poverty Concentration***
>
> Some focus group participants thought that many decision-makers in Galveston see areas of concentrated poverty as generally unworthy of an investment of time or resources, which in turn continues to keep those areas unhealthy. For example, one participant noted about one higher-poverty area that there was "No involvement in that area, let's just put it like that ... there's nobody coming out there, they [the "powers that be" on the island] don't want to be bothered with them." Many focus group participants also said that areas of concentrated poverty on the island tend to breed a sense of hopelessness among residents. This hopelessness is expressed in many ways, from criminal activity to lack of care for the environment to fear of going outside. It is particularly problematic for children in these areas, who have few positive role models.

3. Racial/Ethnic Diversity. This indicator measures the density of minority groups (individuals who did not self-identify as white non-Hispanic or individuals who self-identify as two or more races) living in census blocks within ¼ mile of the Census block. Racial or ethnic residential segregation can also result in unequal opportunities in education or employment, stress, and greater exposure to crime and environmental hazards such as poor air quality. As a result, this indicator is linked to injuries, obesity-related chronic diseases, infant mortality, mental health, and rates infectious disease, and an overall greater risk of illness or premature death.

- ***Galveston findings:*** Galveston has a higher proportion of African-Americans and lower proportion of Hispanics relative to the state of Texas (18.6% vs. 11.5%, and 31.% vs. 38%, respectively). Although African Americans live in various neighborhoods across the island,

particularly since the storm, historically there have been pockets of racial concentration such as areas north of Broadway and west of 27th St, as well as some areas just south of Broadway mid-isle. Rapidly changing demographics in the Hispanic/Latino population suggest that the distribution of Hispanics is broadening across the island, especially since the storm.

4. Elevation above base flood level. This indicator describes whether a census block is in a 100-year flood plain or not (based on the currently approved 2002 FEMA FIRM maps). Homes located in 100-year floodplains are at greater risk for property damage and displacement, which could have a wide range of negative health effects through disrupted social networks and family stress. There are also risks for lifelong consequences for children in impacted families, including depression, behavioral problems, and academic delay. It may also increase exposure to contaminants, which has been linked to higher rates of cancers, respiratory and skin diseases, and disorders of the kidneys and circulatory system.

- ***Galveston findings:*** approximately ¾ of the populated census blocks are located in the 100 year flood plain, mostly along the north side of the island; the largest concentration of high blocks (those not in the flood plain) are south of Broadway (near the Seawall) between 25th and 53rd Streets.
- ***Possible mitigations:*** Raising homes in flood plains is a requirement of the scattered site housing program and would mitigate threat of flooding, though raising homes significantly could affect neighborhood design or social interaction.

5. Proximity to parks. This indicator measured distance in feet from the center of the Census block to the nearest public park or greenspace. Proximity and access to parks is associated with increased physical activity, which can prevent heart disease and stroke, diabetes, some types of cancer, sleep disorders, joint disorders, and obesity. Proximity to greenspace has also been associated with lower rates of stress and violence, improved mental health, and increased social interaction.

- ***Galveston findings:*** The urban core of Galveston has a good geographic distribution of parks, with nearly 93% of census blocks (and 90% of residents) being within less than ½ mile from at least 1 park. There are a variety of sizes of parks and amenities available at parks across the island, including a skate park, swing sets, soccer fields, tennis courts, dog parks, public golf courses, areas for walking and bicycling, and community gardening space. These amenities provide a variety of social and physical activities

Focus Group Perspective: Proximity to Parks.

One group had a lively discussion about the diverse quality of parks in Galveston, and how proximity did not necessarily mean that one used the park. Some participants avoided parks next to areas perceived to have high crime (while discussing one park, one participant exclaimed, "oh no, that's where my nephew got shot!" and said she would never go there). Other parks could be unusable after rain or if people tended to let their dogs off leash there. One participant noted that while she didn't use a nearby park, she enjoyed having it near her, and for that reason saw it as contributing to her neighborhood's health. However, that same park was also seen as unhealthy by others because it is bounded on one side by a very busy street–making it potentially dangerous for children playing at the park, especially those who are unsupervised by parents.

for children, families, and adults. However, data on utilization of the various parks are needed since there is likely to be may be variability in park usage by residents.

- ***Possible mitigations:*** Although park space and distribution of parks in Galveston is generally good compared to other communities, given the need to increase physical activity among residents, it may be worthwhile to assess usage both in terms of the general population and among demographic and racial groups to identify opportunities to increase use. Evaluating the distribution amenities available across different parks is also warranted. Focus group comments and other local research suggest a need to review safety needs and support for culturally diverse design at parks to increase usage. If residential areas are expanded, parks should continue to be incorporated into land use plans. Additionally, developing a walking/biking loop through the city connecting parks and green spaces could enhance use of parks and improve pedestrian and bicycling safety.

6. Proximity to recreation facilities. As with proximity to parks, this indicator measured distance in feet from the center of the census block to the nearest recreation center. There are some links between proximity to recreational facilities and levels of physical activity and social interaction, with consequent impacts on chronic diseases and mental health. If recreation centers also offer after school and summer educational programs, they have a further positive impact on health.

- ***Galveston findings:*** Galveston has two recreation facilities, equating to a ratio of approximately 4 centers per 100,000 population. Even if the 2 larger baseball and soccer complexes (associated with Schreiber and Sand Hill Crane Parks) are included in the count (which would bring the count to 8 per 100,000), Galveston still ranks below the national goal of 16 per 100,000 as set by the County Health Rankings project. These centers are located in different parts of the urban core of the island (the more dense area of the city) and offer a variety of free and low-cost opportunities for physical activity and educational programs for children and families, including after school and summer programs.
- ***Possible mitigations:*** For long term planning, mitigations should include increasing the number of publicly funded recreation centers, with an emphasis on enhancing access by low income residents. Shorter term mitigations could include ensuring adequate funding for staffing, programming, and well-maintained facilities, improving transportation for children to the existing centers, and introducing amenities and activities with demonstrated success in usage and results. Focus group and other local research suggest a need to expand child and youth education and physical activity programs.

7. Proximity to public elementary schools. This indicator measured distance in feet from the center of the Census block to the nearest public elementary school. Although Galveston does not assign school districts, distance to school is one factor that determines walking or bicycling to school, which can increase levels of physical activity.

- ***Galveston findings:*** Galveston Independent School District (GISD) operates public elementary schools from four locations in Galveston, which are broadly distributed across the island though with slightly higher density west of 61st street. GISD is a “schools of choice” district, where

schools are open enrollment; however, at the elementary level, proximity to school offers other opportunities such as traffic calming in the surrounding neighborhood, additional public green space or parks, and other amenities. Also, schools serve additional community functions such as serving as voting locations or sites for adult education, community meetings, or citizenship classes. From a perspective of promoting health through increased physical activity such as walking to school, three aspects of the baseline conditions relative to public housing in Galveston make this a relevant item for consideration in the future location of housing units: children under 18 years of age make up 47.1% of the public housing population in Galveston (Urban Strategies, Inc., 2012); 95% of the public housing population are African American or Hispanic (Urban Strategies, Inc., 2012), and Black and Hispanic students report being less physically active than other ethnic groups (Freeman et al., 2009).

- ***Possible mitigations:*** Support neighborhood access to local schools with proven strategies such as the Pedestrian Environmental Quality Index, Safe Routes to School principles, and Complete Streets guidelines in order to provide safe and convenient walking routes.

8. Density of licensed childcare. This indicator measured number of licensed childcare centers within ¼ miles of the center of the Census block divided by the number of people living within the same distance. Availability of childcare is a possible factor in child care utilization by low income families, which may improve childhood development outcomes. It could also increase access to employment for mothers of young children, potentially increasing the family's ability to make healthful purchases such as food and medical care, reduce stress, and improve mental health.

- ***Galveston findings:*** Childcare, and in particular affordable quality childcare, is a crucial issue for public housing residents. Children made up 47% of the public housing population in Galveston before the hurricane, and the 2012 Urban Strategies report found that only about 60% of those public housing households with pre-school aged children were satisfied with the quality of early childhood care their children are receiving. While there is a relatively even distribution of licensed child care facilities across the residential areas of Galveston, challenges including insufficient availability of spaces, uneven quality of care, and low accessibility in terms of affordability and hours of operation may prevent the health benefits of these facilities from being fully realized. Galveston Sustainable Communities Alliance found that approximately 800 additional spaces would be needed to close the gap between the number of "at risk" and/or "economically disadvantaged" preschoolers—who are shown to benefit the most academically from early childhood education--and the number of spaces in high quality early childcare education centers available, not including the estimated 195 additional children aged 0-5 that would be added through the public housing recovery. Particular needs were identified for infants, for improving the quality of care across centers, to ensure affordability, and to expand hours for parents who work nights and/or weekends
- ***Possible mitigations:*** Mitigation opportunities include locating family housing, such as three (or more) bedroom units, in areas with more childcare services, facilitating the expansion of child care services through streamlining administrative requirements , relaxing zoning

requirements, or co-locating childcare sites with public facilities such as schools or recreation facilities.

9. Proximity to health care services. This indicator measured distance in feet from the center of the Census block to the nearest health care service provider. Travel time to health care services can influence utilization rates for some services.

- ***Galveston findings:*** Health Care clinics are currently relatively well distributed across the island, with a ratio of approximately 1 clinic per 5,000 residents, which is a relatively appropriate ratio of clinics to population. However, lack of health insurance poses the most significant barrier to residents, and to low income residents in particular.
- ***Possible Mitigations:*** Mitigation in relation to access to health care services should focus on ensuring transportation access and on expanding insurance coverage. Although increased geographic access to clinics is not particularly needed at this time, this indicator should be monitored, especially in light of the various changes taking place within the health sector related to health reform and the potential for rapidly changing local access.

10. Proximity to affordable healthy food outlets and concentration of unhealthy food outlets. This element was measured by a combined factor including distance from the center of the Census block to the closest major grocery store and the density of smaller grocery stores, convenience stores, and fast food restaurants within ¼ mile of the center of the census block. Proximity to a grocery store is associated with increased consumption of healthful foods and lower rates of obesity and chronic disease, while density of convenience stores and fast food restaurants shows a possible link to higher rates of obesity and chronic disease.

- ***Galveston findings:*** Galveston has five major grocery stores, 3 of which are concentrated toward the southwest end of the urban core of the island (on the south side of the island, between 52nd and 70th Streets), and one at the far east end of the island. There are also two smaller markets with less variety, located in otherwise underserved areas between the larger stores. The result is a large swathe of land in the middle of the urban core of the city without easy access to healthy food. Convenience stores and fast food restaurants are much more highly distributed across the island, and are relatively dense.
- ***Possible mitigations:*** Potential mitigations include zoning changes that limit the number, location, or concentration of unhealthy food vendors, such as fast food restaurants or convenience stores that do not offer competitive healthful products, or reduce barriers to operating businesses that sell healthful foods. Additionally, jurisdictions can encourage access and consumption of healthy food through incentives that support the operation of grocery stores and farmers markets, the availability of healthier products at convenience stores, or the use of federal SNAP and WIC benefits to purchase healthy choices. Public investments including scattered site housing or public parks can provide space for food gardens. Focus group feedback suggests that offering nutrition and cooking classes could also support healthy eating and increase demand for access to healthy foods.

11. Density of businesses permitted to sell alcohol for off-site consumption. This indicator is measured by the number of licensed alcohol outlets within ¼ mile of the census block relative to population in the same area. Research has consistently connected greater density of alcohol outlets with elevated rates of crime and violence regardless of alcohol consumption rates, which contributes directly to increased injury risk and may also contribute to stress, lack of social connections, chronic disease rates, and risky behaviors. Alcohol retailer density may also be associated with excessive alcohol consumption, which contributes to chronic disease, risky behaviors and greater general morbidity.

- ***Galveston findings:*** In terms of locations, the majority of Galveston's outlets are located in tourist hotspots and along major thoroughfares, but a number are concentrated near residential areas. Galveston's tourism industry is a driver of its relatively large number of alcohol outlets. There are 50% more alcohol outlets in the City of Galveston per 1,000 population than in the county overall. Violent crime is much higher in Galveston County compared to the national benchmark set by the County Health Rankings project (394 vs. 66 per 100,000 residents). Additionally, over one-third of Galveston's children report driving with someone who has been drinking, and 15.5% of teens report drinking and driving.
- ***Possible mitigations:*** Approach cities have taken have been to develop standards for approving permits and locations for alcohol outlets that limit the number of permits based on population size (especially for permits located in residential rather than tourist areas of the city), prevent high concentrations of alcohol vendors in residential areas, and limit or enforce against security issues.

12. Presence of pedestrian safety measures. This indicates a stop sign, traffic signal, speed limit below 30 mph, or some other traffic calming measure within ¼ mile of the center of the Census block. Pedestrian safety measures such as narrow lanes, street trees, on-street parking, crosswalks, speed limits, stop signs, and traffic signals can help lower traffic speed, reducing injury rates and increasing physical activity with the health benefits described above.

- ***Galveston findings:*** Galveston has set its base speed limit as 30 miles per hour in most areas of the city (following state code). However, some residential areas—mostly higher income neighborhoods—have lower speed limits; while others (particularly the main thoroughfares, such as segments of Harborside Drive, Broadway, and Seawall Boulevard) have higher speed limits (reaching 40 miles per hour in some areas). There are also other traffic calming measures in residential areas, including many two- and four-way stop signs, as well as traffic signals along more travelled streets.
- ***Possible mitigations:*** To reduce traffic related injuries, new real estate development should reduce or eliminate off-street parking, limit driveways, and install wide, complete sidewalks and streetscaping. At the neighborhood level, reducing the speed limits from 30 to 25 on residential streets where accidents are most frequent could be a direct route to lowering injuries. Other interventions to increase safety include increasing number and quality of sidewalks, crosswalks, medians, speed humps, bulbouts, chicanes, stop signs, traffic signals. A local Galveston example

of a city sponsored, community driven process to enhance pedestrian safety is the City's Families, Children and Youth Board through its Renaissance Zone program.

13. Proximity to truck routes. This indicator was measured based on distance to a city-designated truck route or a road with published Texas Department of Transportation traffic count data. Living near a truck route can increase exposure to air pollution, which increases risk for respiratory disease, heart disease, and low birth weight, as well as the rate of death by any cause. It may also increase noise exposure which is associated with sleep disturbance, stress, and disrupted learning.

- ***Galveston findings:*** In addition to increased death rates in general compared to Texas and the rest of the nation, Galveston County experiences elevated deaths from lung cancer, asthma and respiratory illness, cancer, and heart disease. The City of Galveston has numerous residences very close to truck routes, which suggests that the health impacts seen at the county level may underestimate the impact in the City.
- ***Possible mitigations:*** Locating sensitive uses – residences, child care facilities and schools, and medical centers – outside of the truck route corridor can reduce potential risks to health. There may be some opportunities to further mitigate impacts by observing building codes designed for noise level reduction or indoor air quality protection. At the neighborhood level, mitigations include reviewing the official truck routes near residential areas, measuring truck traffic and emissions (particulates, noise, etc.), and strongly enforcing ordinances to create a buffer between truck and high traffic routes and residential areas. A Goods Movement Plan, which would focus on local distribution of goods within the City, could minimize truck volume near residential and other sensitive areas, potentially reducing negative health impacts.

14. Proximity to industrial areas. This indicator was measured based on distance from the center of a Census block to the nearest parcel that is zoned for heavy industrial or light industrial land use according to current zoning regulations. Living near an industrial facility may increase exposure to noise and air pollution, leading to some of the negative health outcomes described earlier.

- ***Galveston findings:*** Galveston's industrial areas are largely centered around the port and rail operations along the northern shoreline of the city. While there are residential areas that have somewhat of a buffer between the industrial areas, a number of neighborhoods have residentially zoned areas directly next to industrially zoned areas. Further, there are residential structures built in areas currently zoned for light industrial purposes.
- ***Potential mitigations:*** Scattered site properties could mitigate risks associated with proximity to industrial areas through testing, buffering, and filtration of soil and air contaminants, for instance with landscaping practices. At the neighborhood level, the mitigation efforts could include monitoring information on air, water, and soil quality, paying particular attention to residential and retail areas near industrial areas; strengthening zoning and building codes locally to provide a buffer between industrial areas and residential areas; considering proximity to industrial areas when advancing redevelopment plans; and encouraging reduction of emissions and containment of health-harming chemicals and waste products, especially prior to potential hurricane or flood events. Local businesses and landlords could support mitigation by

developing physical barriers to block out noise and light pollution, as well as careful selection of equipment and methods for reducing noise emissions. Such interventions were proposed during discussions in 2012 around the development of a marine container terminal on Pelican Island in Galveston.

15. Presence of environmental hazards. This indicator was assessed by measuring the distance from the center of a Census block to the nearest site on the EPA Facility Registry System. Close proximity to sources of contaminated air, water, or soil may increase exposure to environmental toxins, potentially contributing to kidney dysfunction or cancers as well as poor fetal development. Additionally, perception of contaminated properties can contribute to neighborhood disinvestment and stress.

- ***Galveston findings:*** A large proportion of potentially contaminated sites are located along major thoroughfares, as well as along the industrial area on the northern area of the city, including auto maintenance shops, waste water treatment facilities, and chemical storage facilities. Galveston County faces elevated rates of disease which are affected by proximity to brownfields and other environmental hazards, including the higher incidence of cancers, respiratory illness, and lowered quality of life due to high rates of poor physical and mental health days.
- ***Possible mitigations:*** Potential mitigations for environmental hazards are similar for those of industrial areas including identification, testing, and abatement. Additional improvements in health impact could be achieved by considering proximity to environmental hazards when advancing redevelopment plans; encouraging reduction of emissions and containment of health-harming chemicals and waste products, especially prior to potential hurricane or flood events; and cleaning up brownfields and safely repurpose into green space or other.

16. Proximity to bus route. This indicator was measured using the distance from a census block to the nearest Island Transit route. Increased transit access to employment opportunities may reduce joblessness, which can improve mental health as well as lower dependence on public assistance for food and other needs, especially for families using public housing benefits. Regular transit usage can also increase physical activity and thereby reduce chronic disease and improve mental health.

- ***Galveston findings:*** Galveston has been at risk for reduced transit funding following Hurricane Ike due to population loss. Funding has been extended temporarily and will likely remain in place as public housing residents return to the city. In terms of access, 81% of occupied residential census blocks are within ½ mile of a bus route, and 51% within ¼ mile. However, the regularity of the buses, the efficiency of the routes in getting people to essential services (such as the grocery store), and the ridership policies been noted by some residents as barriers to usage.
- ***Possible mitigations:*** Although geographic access to public transportation is good in Galveston, usage may be enhanced if the City were to identify key destinations and ideal routes, enhance ridership rules to better meet residents' needs, and program services according to tolerances for ride time, wait time, and cost as much as possible.

Block-level inspection indicators:

In addition to the neighborhood-level indicators that examine characteristics around potential housing sites broadly, the HIA also defined a number of indicators that focus on conditions over smaller geographies. The block-level indicators (numbers 17-21) represent information about the area immediately adjacent to a particular site, or on that site's "block" (this is not to be confused with the more technical unit of the census block). Beyond the block-level indicators are the unit-level indicators that are specific to the potential site itself (indicators 22 and 23), representing the smallest geographic scale of information. These remaining 7 indicators require primary data collection that could be undertaken as potential scattered sites are evaluated or as infrastructure or neighborhood improvement plans are developed. A pilot project was undertaken to test the importance of these indicators in the Galveston context, and these indicators were judged relevant to the study. The technical report includes the assessment tool developed for conducting the site inspections.

17. Tree canopy. Measurement for this indicator was based on the overall tree canopy for the area being assessed, including scores for the quality of the general tree canopy (including density of coverage by the canopy, number of trees, and coverage across the block-not just the street front). Research has demonstrated a link between the presence of trees in an area and more physical activity, lower risk of skin cancer, reduced risk of heat-related illness and injury, improved mental and behavioral health (both in adults and children), improved cognitive functioning and reduced stress, and greater environmental quality through improved air quality and other effects.

- ***Galveston findings***: During the pilot assessment, surveyors noted consistencies with post-Ike tree loss assessments by, for instance, by the Texas Forest Service. However, there have been a number of efforts to reforest the city following Hurricane Ike, which are likely to soon affect canopy levels.
- ***Possible Mitigations:*** The scattered site developer can plant trees on housing sites to invest in tree canopy development; larger canopy trees will generate benefits more quickly. At the neighborhood level, the city can plant trees in public land, incentivize private or not-for-profit tree planting, and limit tree removal.

18. Sidewalk quality. Measurement for this indicator was based on the existence and overall quality of the sidewalks for the area walked. The surveyors make note of the sidewalk quality in the area as being generally absent, under construction, or present with a quality score of very poor to very good. The presence and quality of sidewalks can have impacts on health by reducing the likelihood of pedestrian injuries, increasing physical activity and reduce chronic disease, and contributing to reduced crime.

- ***Galveston findings:*** The presence and condition of sidewalks varied across many sites, and appeared to be somewhat correlated with the other measures in the block assessment (but not perfectly). For example, one area scored relatively well with most of the measures, but sidewalks were completely absent. Another area had new sidewalks recently installed, but had a large number of vacant lots with tall grass and dilapidated buildings. It is worth noting that Galveston is currently implementing a large Department of Transportation grant to install curb cuts across the city, although it is not clear whether sidewalks will connect all of these

improvements. Therefore, assessment (and knowledge of near-future plans) at the time of site selection and development will be particularly useful for this indicator.

- ***Possible mitigations:*** In Galveston, property owners are allowed to install sidewalks, as per city ordinance. The Developer can install 5-foot or wider sidewalks with at least a 4-foot planting/ furniture zone between the sidewalk and street along the entire frontage of each property, using best practices to eliminate cross-slope on the sidewalk, ensure adequate sightlines, minimize flooding and maintenance issues, provide accessibility for persons with disabilities, create direct connections to walkways and entrances, and reduce driveway crossings. Additionally, the city should establish and enforce ordinances for sidewalk design, construction, and installation location relative to adjacent land use, for sidewalk maintenance, and for associated streetscaping and access management, and to continue to invest in infrastructure to install sidewalks.

19. Signs of physical disorder (presence of graffiti, vacant/unkempt lots, abandoned buildings). One tool for assessing physical disorder in neighborhoods is the Los Angeles Family and Neighborhood Survey (LA-FANS). This instrument was adapted to relate more specifically to the Galveston context, and for this assessment contains 11 measures. Measures include the general presence and degree of severity of abandoned cars, garbage, drug-related paraphernalia, empty alcohol containers, graffiti or painted-over graffiti, strong noxious odors, dilapidated buildings, vacant lots, and damaged exterior walls or peeling paint on existing structures in the area. Physical disorder, including blight, abandoned lots and structures, graffiti, and litter/trash dumping have been related to several pathways to health including stress, feelings of hopelessness, youth violence, physical activity, and social capital, which affect injuries, mental and behavioral health, and chronic illness.

- ***Galveston findings:*** During the piloting to measure Physical Disorder, surveyors noted strong congruence among the different measures with each other. For example, when empty alcohol containers were found, graffiti was generally present, as well as buildings with damaged exterior walls and abandoned cars. However, the magnitude of a given measure (i.e., how much graffiti) was also important.
- ***Possible mitigations:*** Scattered site developers could target dilapidated houses for development, thereby improving the neighborhoods. By focusing on renovating or replacing existing dilapidated structures rather than (otherwise orderly) vacant lots, developers of the scattered site program can improve the overall quality of the surrounding area. At the neighborhood level, the City could review consistency of trash pickup in all neighborhoods, enforce ordinances related to blight, and ensure public property is maintained. As recovery proceeds, abandoned houses will be demolished and neighborhoods will further improve. Abandoned lots could be converted to healthier green space, thus becoming an asset to the neighborhood.

20. Traffic calming. Assessment includes four measures for this indicator, including general presence of traffic calming devices (including stop signs, speed humps or dips, and crosswalks), the general flow of traffic, number of traffic lanes, and condition of the street for traffic in the area. In contrast to the

desktop assessment, the block assessment measures the presence of these measures as they lie directly related to the property of interest. The block assessment also assesses additional traffic calming measures in the immediate area (data which are not available otherwise). The links to health are as described above for the pedestrian safety measures.

- ***Galveston findings:*** *The piloting of the block assessment yielded additional information about potential health threats related to traffic in the immediate area.*
- ***Possible mitigations:*** At the neighborhood level, the City could undertake a number of best practices, including application of the Pedestrian Environmental Quality Index (PEQI) to evaluate neighborhoods and develop planning initiatives, installation and repair traffic calming measures such as narrow streets, raised or narrowed crosswalks, shared or play streets, roundabouts, and more.

21. Resident pride and security. Assessment includes four measures for this indicator: maintenance of yards, the number of buildings with bars on windows or gratings, the number of signs indicating property as being available for rent or sale, and the number of signs indicating a property was being protected by a dog. Perceived safety in one's neighborhood has linkages to several elements of health, including social cohesion, mental health, psychosocial stress, and physical health outcomes (particularly hypertension).

- ***Galveston findings:*** Findings regarding these measures varied significantly across pilot sites. However, at individual sites, the four measures used for this indicator correlated well (though the sample size used to pilot this instrument was far too low to make any assessment of statistical significance. Interestingly, areas where there was marked neighborhood deprivation (with significant numbers of abandoned and vacant property), the four measures became more incoherent, with unkempt yards and for sale signs being more prominent, but the presence of bars on windows or signs indicating property was protected by dogs being less prominent. This is likely due to there being mostly vacant/abandoned structures in the area. As such, this indicator may be most useful when used in areas that have structures that are predominately occupied.
- ***Possible mitigations:*** Utilization of Crime Prevention through Environmental Design principles can also reduce crime and improve neighborhood perceptions of safety, as described below. Community policing initiatives and community engagement in public planning and policy decisions can also promote a sense of ownership and security.

Unit-level inspection indicators:

The following unit-level inspection indicators relate to specific properties being considered for development, rather than the broader area surrounding them. In addition to HUD's inspection requirements and standards, we recommend two additional indicators.

22. Lead and toxic exposure (including soil). Exposure to lead in paint, soil, or water can occur in many cities and homes; exposure results in elevated blood lead levels which is clearly linked to learning disabilities, organ failure, and death, especially for children. Lead exposure has also been associated with depression and hypertension in adults and with long-term propensity to violent behavior.

- ***Galveston findings:*** Galveston has a significant amount of pre-1979 housing stock, much of which has deteriorated over long periods of time, with lead paint dust settling into the soil. In 2009, the CEHD undertook soil sampling after Hurricane Ike, and found lead deposited in soil across the flooded areas of the island. Further, although the rate of elevated blood lead levels among Galveston children has been declining, concerns remain regarding exposure, especially at lower exposure levels which are increasingly recognized to cause irreparable physical, mental, and cognitive health harms.
- ***Possible mitigations***: Although inspection of housing units to ensure that residents are not exposed to lead paint is a HUD requirement, given the potential of exposure in Galveston through soil in the yard of units, particular diligence should be placed on ensuring that scattered site homes and properties (including soil) do not present lead exposure threats. Working in partnership with the Galveston County Health District or UTMB, soil samples should be screened. We recommend testing more than one area of the soil, focusing on bare areas that appear to be dumping grounds or the drip line of a pre-existing structure, as these are areas with likely lead accumulation from exterior lead-based paint. If lead is detected in soil samples, abatement should be performed. Abatement methods associated with reduced lead exposure include removing contaminated soil and replacing it with uncontaminated dirt, planting and maintaining turfgrass, planting groundcovers and applying mulch in locations unsuitable for turfgrass, mulching garden beds, and enclosing soil around building foundations with landscape fabric and stone. If lead is detected in house paint on the property and is contained rather than abated, we recommend annual inspection for lead be maintained.

23. Crime Prevention through Environmental Design. The design of housing, including in relation to structure, landscaping, lighting, and security, can serve as an important crime deterrent. Environmental design elements can significantly reduce crime; crime can have a significant effect particularly on chronic disease (hypertension, heart disease, obesity), mental health and child health within a neighborhood, as well as mortality and disability. Pathways include stress and behavioral health, violence, economic distress, and physical activity. Use of Crime Prevention Through Environmental Design (CPTED) principles in site design and management have been associated with lower rates of property crime, reduced vice crimes, and a reduction in crime reports or calls to police.

- ***Galveston findings:*** Although the research team could not identify publicly available data related to crime at the neighborhood level in Galveston, estimates for major crimes committed in Galveston County overall are 442 per 100,000, compared to a rate of 503 for the State of Texas, however the county's crime rate is well above the RWJF County Health Rankings National goal benchmark of 73 per 100,000. Findings of the pilot assessment suggest that current design practices may inadvertently facilitate undesirable or criminal activity.

- ***Potential mitigations.*** CPTED uses physical site design to create places that are physically, psychologically, and socially discouraging for minor and major criminal activity through "natural surveillance," "activity support," "territorial reinforcement," "access control" "target hardening," and "image maintenance. CPTED principles can be implemented at scattered site properties as well as in the design of public facilities.

Methods and findings

Through a review of the scientific literature, each of the neighborhood-level indicators was given a weight, based on the strength of the evidence linking the indicator to health outcomes, the quality of data source, and the importance of the impact on health, summarized in the table below. These weights were vetted with the Community Steering Committee for additional locally-specific considerations.

This assessment utilized two analyses, one to develop a system to support scoring of blocks and identify a variety of indicators that might need mitigation at a particular potential scattered site for a given address, and one to prioritize indicators for mitigation on a city-wide or neighborhood basis. Therefore, findings and recommendations fall into two broad categories: those related to scattered site development and placement of families in specific units, and those related to general neighborhood development.

Table 3. Weighting the Neighborhood-level indicators.

Indicator	a. Strength of Evidence (Max 4 Pts)	b. Strength of Indicator or Data Source (Max 4 Pts)	c. Impact on Health (Max 4 pts)
1. Population density	2	4	2
2. Concentration of Single Parent Households (proxy for concentration of poverty)	4	3	3
3. Concentration of Racial/Ethnic Minorities	2	4	2
4. Elevation above base flood elevation	3	1	2
5. Proximity to Parks	3	2	2
6. Proximity to Public / Low-cost Recreational Facilities	3	3	2
7. Proximity to Public Elementary Schools	2	4	1
8. Proximity to Licensed Childcare	2	2	1
9. Access to Health Care Services	3	2	3
10. Proximity to affordable healthy food outlets and concentration of unhealthy food outlets	3	3	3

11. Density of Businesses Permitted to Sell Alcohol in the Area	3	3	3
12. Presence of Pedestrian Safety Measures (lower speed limits, traffic calming measures, etc.)	3	3	3
13. Proximity to Truck Routes	3	2	3
14. Proximity to Industrial Areas	3	3	4
15. Presence of Environmental Hazards (i.e., brownfields, superfund sites, etc.)	3	2	3
16. Proximity to Bus Route	3	1	2

Scattered site perspective. The HIA methodology for the scattered site portion of the study uses a relative scoring system to identify how a variety of interventions could strengthen neighborhood health, including for scattered site residents. All of the populated census blocks in the study area (1754) were assessed in terms of the 16 neighborhood-level indicators. Blocks with higher scores did better across a wide range of the indicators, while those with lower scores sometimes had multiple challenges that would require more focused interventions. While there is no scientific basis for establishing a strict threshold for an acceptable score, the goal was to encourage scattered site development in areas of the city that better support resident health. Consequently, the score of the top 20% of census blocks in Galveston (350 of 1,754) was set as the threshold for relatively higher scoring blocks, though the number of census blocks achieving this score could be extended to include a larger percentage, or expanded through interventions and mitigations that would raise the score of some blocks.

Neighborhood and City-wide perspectives. The methodology for identifying indicators most relevant to general neighborhood improvements examines indicators on an individual and threshold-determined basis. These findings can be used to assist neighborhoods in developing their own priorities for intervention. Table 4 shows the impact of each indicator in relation to the number of census blocks as well as the population across the city that is affected.

Table 4. Impact of fully addressing various indicators in terms of general neighborhood development and health. (Sorted by Estimated population impact)

Indicator	#of Census Blocks affected	Est. Population Affected
Proximity to Recreation Center	933	30,425
Density of Alcohol Outlets	1,123	29,316
Presence of Pedestrian Safety Measures	2,936	26,030
Density of Childcare Providers	750	25,401
Proximity to a Grocery Store	1,015	25,125
Density to Less Healthy Food Outlets	879	24,834

Proximity to Truck and High Traffic Routes	770	20,780
Proximity to Park	3,224	18,693
Proximity to Elementary Schools	441	14,344
Proximity to Industrial Areas	215	5,740
Proximity to Bus Route	170	4,455
Proximity to Environmental Hazards	75	1,240
Proximity to Health Care Services	82	1,145

The indicators in Table 4 affect many of the priority health issues in Galveston, particularly those related to healthy eating, active living, safety and security, excessive drinking, environmental exposures, and child/youth support, including cancer, diabetes, chronic liver disease, accidents, high blood pressure, asthma, and poor mental health and suicide.

Recommendations

Based on the analysis undertaken for this HIA, this report offers recommendations for improving neighborhoods through the design of scattered site housing as well as broader neighborhood improvements. A specific process is proposed to the State of Texas General Land Office (GLO) and its designated scattered site developer(s) for incorporating health considerations in the evaluation and selection of scattered sites, use of specific indicators to gauge health impacts, and options for mitigating, or reducing, health-harming conditions either through design of the scattered site properties or through broader neighborhood-level mitigation strategies in cooperation with the City, neighborhood developers (including GLO-appointed developers for the North Side neighborhood plan), and community groups. Mitigation strategies can include changes to ordinances and codes, programs or services, infrastructure improvements, or elements of the physical design of housing that have been demonstrated to reduce potential negative health impacts, or ensure that positive impacts are realized.

Scattered site development

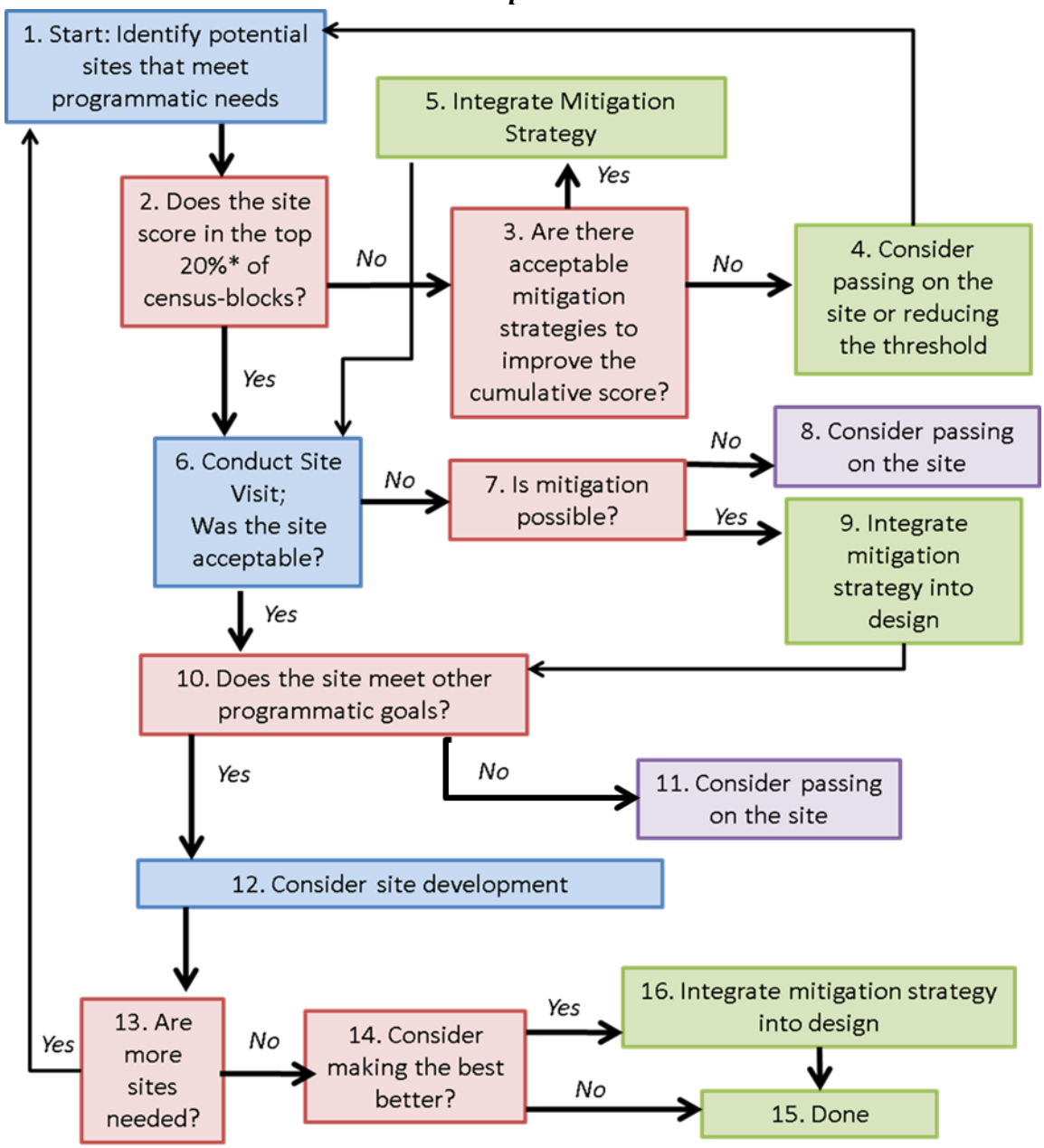
1. The GLO should follow an organized process for incorporating health impact profiles and specific plans to address negative health impacts through mitigation into the process for selecting scattered sites. This process, detailed in the technical report and illustrated in Figure 4, incorporates consideration for the various indicators as well as mitigation needs and options that could be integrated into the design of the individual units. **Prioritize sites that receive relatively higher cumulative scores (based on the 16 indicators for which data already exist), or sites for which mitigations could be undertaken to address weaknesses in relation to the individual indicators.**

2. The GLO should conduct inspections at potential scattered site locations using block-level inspection indicators, **and incorporate two additional unit-level inspection standards related to lead exposure and crime prevention** (the full report includes a tool for conducting the site inspections). Also, **evaluate the feasibility of unit-level health mitigations for sites that score poorly on specific indicators,** including parks and green space, pedestrian safety measures/sidewalks, proximity to truck routes and high traffic routes, proximity to industrial areas or environmental hazards, tree canopy, and physical disorder.

3. The GLO should incorporate specific health-related factors in placing families in specific scattered site units. The GLO has the opportunity to reduce the negative health impact of issues that cannot or are not mitigated through the built environment through its thoughtful placement of families in scattered site units. Once a scattered site is developed, it may have specific features that render it more appropriate to particular household profiles. For instance, specific considerations could include transportation needs, proximity to social networks such as family members or place of worship, proximity to schools (for households with children), and the added vulnerability and sensitivity of children and the elderly to environmental conditions. Although family size and space needs are generally considered in assigning specific families to housing (e.g. minimum number of bedrooms for a given household size), most of the health indicators presented in this assessment and how those indicators may impact a specific family are not considered during family placement. Attending to a family's health and health needs in relation to other features (or indicators) of a particular housing site could help avoid health-harming conditions that might affect that particular family, but have little impact on another family. Consequently, even if all mitigation strategies for a particular site cannot be implemented, effective matching of families can help reduce potential health harms.

4. **The Galveston Housing Authority's Human Capital Plan, aimed at supporting public housing residents, should use the findings of this HIA to inform Human Capital Plan priorities and address needs of specific families and the primary needs of public housing residents** in general, as well as incorporate supports for high priority health issues and health impacts of indicators that remain unmitigated. Such an approach could provide additional support to families' health and well-being through the Human Capital's key target areas of transportation access, job training, child development and education, and health and wellness initiatives. For example, as the Human Capital Plan rolls out, planning for the placement of services and the placement of families at specific sites should be conducted in concert, so as to maximize public housing residents' access to needed services. Additionally, educational and other social support services can serve as protective measures, particularly to support healthy eating and active living as well as positive mental health.

Figure 4. Proposed Process to the GLO for Selection of Scattered Sites in relation to health impact.



Neighborhood development

Given the significant continued efforts toward recovery from Hurricane Ike, it will be important for planners and developers to consider how they can best support positive health impacts both in general, and for vulnerable populations at most risk of experiencing negative health impacts, including many public housing residents. There are a number of ongoing recovery and other planning efforts through

the City, the Housing Authority, private entities, and others that could effectively incorporate the data and information provided in this research project.

Neighborhood and city-wide improvements for a number of the indicators could be undertaken by the City and its divisions, community groups, businesses and neighborhood plan developers, including those responsible for developing the anticipated North Side Neighborhood plan. Improvements through these mechanisms could both have the greatest impact on healthy neighborhoods in Galveston and provide the greatest efficiency of action. Specific recommendations include:

1. **Local leaders should convene community-engaged discussions to identify key indicators** and priorities for the Galveston community and various neighborhoods.

2. **The City should incorporate planning to address priority neighborhood health indicators**, as identified in this HIA, into its ongoing infrastructure and community development plans, as well as ongoing review of ordinances and regulations, to best improve neighborhood health profiles in Galveston. Broad-scale mitigation of these indicators would benefit neighborhood residents in general as well as any residents of scattered sites that might be located there in the future. The recommendations for health mitigations at the neighborhood level, presented in the technical report, are based on overall impact on the city, but specific priority issues can be identified for each neighborhood. The City has several recovery-specific and ongoing infrastructure initiatives underway, including new zoning and land use regulations, implementation of a Parks Master Plan, implementation of a Master Neighborhood Development Plan, and many other opportunities. Partners should include the City of Galveston Families, Children and Youth Board, the Department of Planning and Community Development, the Galveston Alliance of Island Neighborhoods, and various other community and business partners.

3. **The GLO's designate for developing a North Side Redevelopment Plan for Galveston should incorporate plans to address high priority health indicators for that area of town**. A redevelopment plan for the North Side of Galveston, the historically black neighborhood for which redevelopment planning, is expected to commence soon. As the recovery plan develops, decisions will likely affect the availability of new amenities, and perhaps new threats. Specific recommendations should include, but not be limited to, the addition of a grocery store, safety design measures, pedestrian safety, increased tree canopy, protection from industrial exposures, development of licensed childcare facilities, and oversight of density of alcohol outlets.

4. **The business community and large employers** in Galveston play an important role in shaping neighborhood health, and **can support priority health mitigations through their own actions**. For instance, as the Galveston Port operations expand and shift, consideration of priority indicators identified in this research can present planning options that enhance neighborhood health, without necessarily compromising the Port's own goals. Specific focus might be given to pedestrian safety and air, noise, and light emissions. Galveston Independent School District, too, could be an effective partner that would enhance its own mission and goals through attention to priority health indicators identified

in this research, such as through ensuring safe routes to schools and incorporating education on key issues into the school curriculum.

5. Community based organizations should engaged in coordinated planning to develop mitigation actions for both the physical and social environments, based on priority indicators identified in this research. Galveston has a number of community based organizations, joint community-City initiatives, and local funding groups involved in neighborhood development and improving equity in our community that could play a critical role in strengthening alignment of efforts to address priority issues. For instance, the Galveston Historical Foundation offers training on safe removal of lead paint; adding training on soil abatement, and incentivizing training for those renovating lead-prone housing to participate in training would strengthen mitigation of lead exposure, a particular problem in Galveston especially for children.

Monitoring and Evaluation

[PLACE HOLDER TEXT] Due to a politically contentious environment, with many Galveston residents and policy-makers adamantly opposed to any form of public housing on the island, this HIA was a lesson in navigating a volatile decision-making context. After multiple changes in decision-makers, in terms of both individuals and agencies, the HIA process proved to be effective in incorporating a public health framework into the housing discussion. The GLO ultimately became the decision maker and chose to incorporate a requirement for their future contractors (who will be developing the public housing) to use the results of the HIA as they select housing sites throughout the city. In addition to that success, strategic engagement with communities and recruitment of an advisory committee representing multiple perspectives proved effective in facilitating productive dialogue on the locally divisive topic of public housing, with many members of that committee indicating a desire to use information from the HIA in other endeavors.

Conclusions

This Health Impact Assessment has attempted to take a holistic look at how Galveston can best support healthy housing and neighborhoods. The research was aimed primarily at providing a framework for development of healthy scattered site public housing in Galveston, along with a significant amount of data analysis to support decision-making for scattered site development and broader neighborhood or city-wide development. Although the recovery of public housing in Galveston, led by the Texas General Land Office and the Galveston Housing Authority, provides an opportunity to strengthen neighborhood health in the city, there are important roles for the City government, the business community, and community organizations through both recovery processes and ongoing community and economic development initiatives. It will be useful, therefore, if local stakeholders proactively bring the findings of this HIA, and the data and analyses embedded in it, to the fore in conversations and deliberations to support development of pro-health planning in various venues.

Over time, additional publicly available data may be relevant to analyses such as this. For instance, the City of Galveston continues to improve the capacity and accessibility of its GIS database, and may soon have data related to blight and graffiti within the city. Further, coordinated efforts may also link other city databases together, such as public works data on street calming placement, sidewalk connectivity, and other infrastructure improvements; point-level data on various types of criminal activity from the Police Department; and code enforcement data from the Planning office. These additional sources of local data would be particularly useful in this type of analysis. Other information, such as the health impact of indicators related to social capital, were beyond the scope of this study, but could be developed to further enhance our understanding of how to strengthen recovery, especially for less advantaged residents, who were hardest hit by the storm.

As Galveston continues to recover and move into the future, many opportunities to use this analysis will emerge. The approach presented here should be viewed as a living research project, and as new data related to the built environment becomes available, it could be incorporated into the available database. The team also welcomes new local partnerships for planning the built environment as well as social and human capital locally. These partnerships, and the advancements they can achieve, are critical not only to the health of less advantaged communities in Galveston, but to the city's future.